Environmental and Social Impact Assessment Report

The Proposed Construction and Operation of an Ammonia Sulphate Production Facility - Daures Green Hydrogen Village

Daures Constituency, Erongo Region, Namibia

March 2025

Document Information

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CONSULTANT'S EXPERTISE

I.N.K Enviro Consultants cc is the independent firm of consultants that has compiled the Environmental ESIA Report.

Immanuel N. Katali, the Environmental Specialist holds a B.Arts (Honors) Geography, Environmental Studies and Sociology and has ten years of relevant experience in conducting/managing Environmental and Social Impact Assessments (ESIAs), compiling Environmental and Social Management Plans (ESMPs) and Environmental Compliance/Monitoring Audits in Namibia. Immanuel is certified as an environmental practitioner under the Environmental Assessment Professionals Association of Namibia (EAPAN).

DISCLAIMER

I.N.K Enviro Consultants cc herewith declare that this report represents an independent, preliminary assessment of the proposed Construction and Operation of the Ammonia Sulphate Production Facility, on the request of Enersense Namibia (Pty) Ltd.

I.N.K Enviro Consultants cc has prepared this report based on an agreed scope of work and acts in all professional manner as an independent environmental consultant to Enersense Namibia (Pty) Ltd and exercises all reasonable skill and care in the provision of its environmental professional services in a manner consistent with the level of expertise exercised by members of the environmental profession.

The information, statements and commentary contained in this Report have been prepared by I.N.K Enviro Consultants cc from information provided by Enersense Namibia (Pty) Ltd. I.N.K Enviro Consultants cc does not express an opinion as to the accuracy or completeness of the information provided, the assumptions made by the party that provided the information or any conclusions reached. I.N.K Enviro Consultants cc has based this Report on information received or obtained, on the basis that such information is accurate and, where it is represented to I.N.K Enviro Consultants cc as such, complete.

I.N.K Enviro Consultants cc is not responsible and will not be liable to any other person or organization for or in relation to any matter dealt within this report, or for any loss or damage suffered by any other person or organization arising from matters dealt with or conclusions expressed in this report (including without limitation matters arising from any negligent act or omission of I.N.K Enviro Consultants cc).

This report must not be altered or added to without the prior written consent of Enersense Namibia (Pty) Ltd.

EXECUTIVE SUMMARY

Introduction and Background

Enersense Energy Namibia (hereinafter referred to as Enersense) intends to apply for an Environmental Clearance Certificate (ECC) for the establishment of an ammonia sulphate production facility with a projected output capacity of 300 kg per day. The proposed site for this facility is within the enclosed 30 hectares (ha) Daures Green Hydrogen Village, situated in the Daures Constituency, Erongo Region, Namibia. Please refer to figure 1 for the site layout map.

The Daures Green Hydrogen Pilot Project aims at focusing on short term viability, demonstration use cases and proof of concept of production of Green Hydrogen and Green Ammonia as an efficient and widely used source of nitrogen fertilizer in agricultural green schemes. The construction of these pilot infrastructure will cover a total land area of 30 ha pilot study area. This site has been cleared for the construction of phase 1 pilot activities such as the greenhouse, solar pv plant, houses, eco-lodge, campsite and training facility and laboratory.

The ammonia sulphate facility is proposed to be situated to the west of the existing solar photovoltaic (PV) plant and to the north of the planned Wind Turbines (a separate ECC application will be submitted), which are intended to be constructed and installed for the purpose of supplying electricity to the facility and electrolyser.

Project Motivation

Ammonium sulphate is used in agriculture in the world over, Namibia is no exception. The proposed project aims to supply ammonia sulphate fertilizer to Namibia's agricultural sector, to provide nutrients and enhance crop production and contribute to the country's food security.

Environmental and Social Impact Assessments Process

Environmental and Social Impact Assessments are regulated by the Ministry of Environment, Forestry and Tourism (MEFT) in terms of the Environmental Management Act, 7 of 2007. This Act was gazetted on 27 December 2007 (Government Gazette No. 3966) and enacted on 6 January 2012. The Environmental and Social Impact Assessment Regulations: Environmental Management Act, 2007 (Government Gazette No. 4878) were promulgated on 6 January 2012.

Applicable Laws and Policies

The EIA Regulations promulgated in terms of the Environmental Management Act, identify

certain activities which could have a substantially detrimental effect on the environment. These listed activities require environmental clearance from MEFT prior to commencing. The following activities identified in the regulations apply to the proposed project: Hazardous substance, treatment, handling and storage, and the manufacturing, storage, handling or processing of a hazardous substance defined in the Hazardous Substances Ordinance, 1974.

Public Participation

The public participation process for the proposed project is conducted to ensure that all persons and/or organisations that may be affected by, or interested in the proposed project, were informed of the project and could register their views and concerns. By consulting with relevant authorities and I&APs, the range of environmental issues to be considered in this Report has been given specific context and focus.

Assessment of Significant Impacts

The impact assessment presents the potential for positive and negative environmental and social impacts that can all be mitigated to acceptable levels. The most significant potential impacts (unmitigated) are:

- Fire and Explosion.
- Groundwater and Surface Water.
- Waste Management.
- Socio-Economic.

Conclusion

The assessment found that the proposed project presents the potential for minimal additional risks and related impacts in the mitigated scenario. Relevant mitigation measures have been provided and are included in the EMP that accompanies this scoping report. I.N.K believes that a thorough assessment of the proposed project has been achieved and that an environmental clearance certificate could be issued.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ACRONYMS, ABBREVIATIONS AND UNITS

Acronyms / Abbreviations / Units	Definition
BID	Background Information Document
DEA	Directorate of Environmental Affairs
EAP	Environmental Assessment Practitioner
ECC	Environmental Clearance Certificate
ESIA	Environmental and Social Impact Assessment
EMA	Environmental Management Act
ESMP	Environmental and Social Management Plan
I&APs	Interested and Affected Party
M^2	Square Metres
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism

1 INTRODUCTION

1.1 Purpose of the Report and Opportunity to Comment

This Environmental and Social Impact Assessment (ESIA) ESIA (including impact assessment) Report has been compiled and was distributed for a 7-day review and comment period as part of the ESIA process that is being undertaken for the proposed construction and operation of an ammonia sulphate production facility, as part of the Daures Green Hydrogen Village.

This report summarises the ESIA process being followed and provides an overview of the affected environment. It includes an assessment of the potential environmental impacts that the proposed activities are likely to have and sets out the consultants' recommendations to mitigate/minimize these impacts. The proposed management and mitigation measures relating to the proposed activities are documented in an Environmental and Social Management Plan (ESMP).

Registered Interested and Affected Parties (I&APs) are provided with the opportunity to comment on this ESIA (including impacts assessment) Report (see Section 2). Once the comment period closes, the Report will be updated to a final report with due consideration of the comments received, and it will be submitted to the Ministry of Environment, Forestry and Tourism (MEFT) for decision-making.

1.2 Introduction to the Proposed Project

Enersense Energy Namibia (hereinafter referred to as Enersense) intends to apply for an Environmental Clearance Certificate (ECC) for the establishment of an ammonia sulphate production facility with a projected output capacity of 300 kg per day. The proposed site for this facility is within the enclosed 30 hectares (ha) Daures Green Hydrogen Village, situated in the Daures Constituency, Erongo Region, Namibia. Please refer to figure 1 for the site layout map.

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The ammonia sulphate facility is proposed to be situated to the west of the existing solar photovoltaic (PV) plant and to the north of the planned Wind Turbines (a separate ECC application will be submitted), which are intended to be constructed and installed for the purpose of supplying electricity to the facility and electrolyser.

1.3 Motivation for the Proposed Project (Need and Desirability)

Ammonium sulphate is used in agriculture in the world over, Namibia is no exception. The proposed project aims to supply ammonia sulphate fertilizer to Namibia's agricultural sector, to provide nutrients and enhance crop production and contribute to the country's food security. Namibia's "Green Scheme Policy" (MAWF, 2008) states that "[t]he mandate of the Ministry of Agriculture, Water and Forestry is the promotion, development, management and utilisation of agricultural, water and forestry resources. It is, therefore, the objective of the Government to ensure agriculture productivity and food security in line with the Vision 2030 strategy."

The "Green Scheme Policy" (MAWF, 2008) goes on to state *"[t]he Green Scheme is designed to maximise irrigation opportunities along the maize triangle (Grootfontein, Tsumeb and Otavi) as well as in the North Central and North Eastern regions using the Kunene, Kavango and Zambezi rivers as well as the promotion of agro projects in the South using Orange River and dams such as Naute and Hardap. This policy aims at harnessing the resources of Government and other stakeholders in order to increase agriculture productivity and social development as envisaged in NDP III and Vision 2030 strategy."*

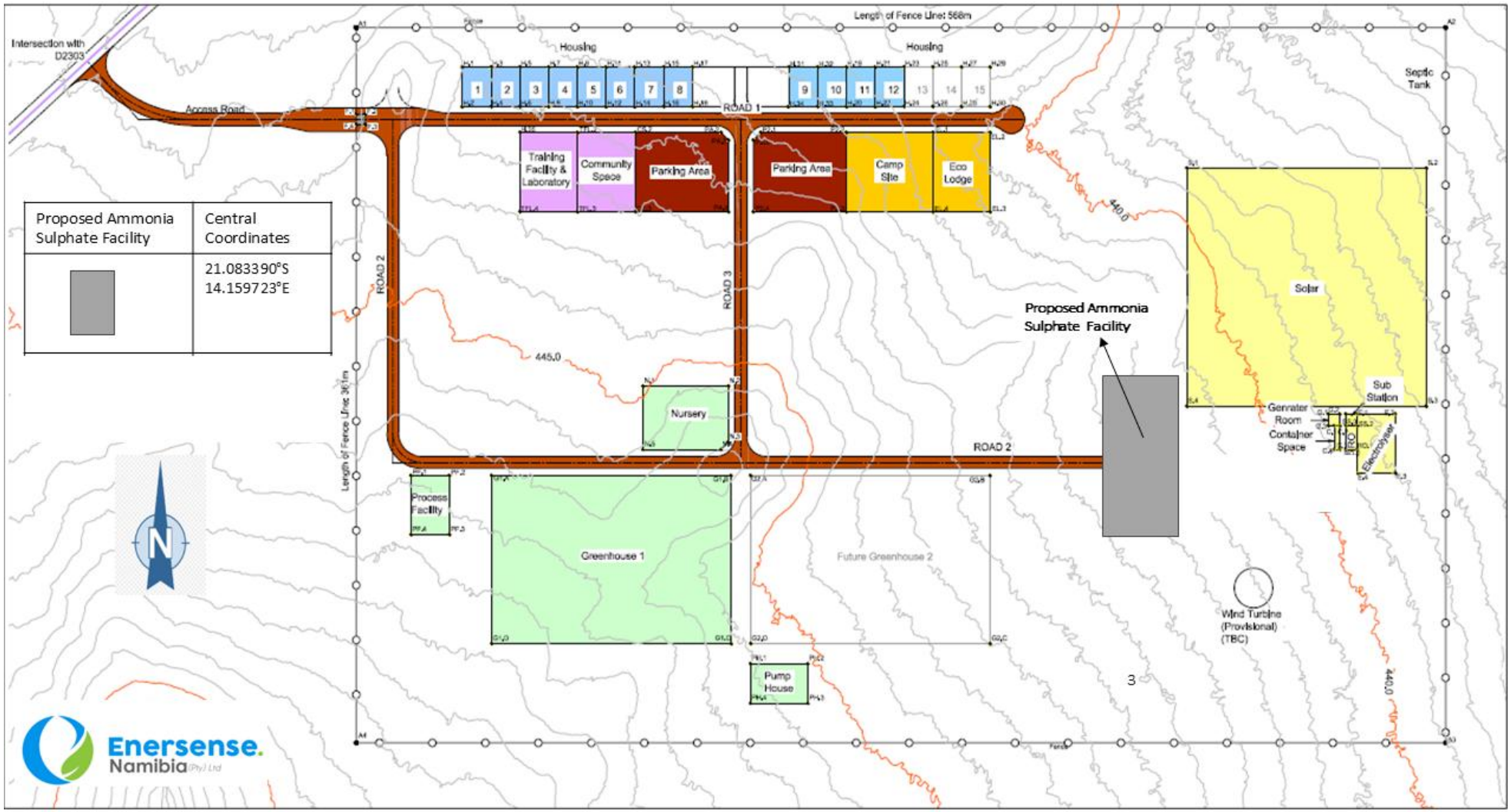

Figure 1: Daures Green Hydrogen Locality Map

1.4 Environmental and Social Impact Assessment Process

Environmental and Social Impact Assessments are regulated by the Ministry of Environment, Forestry and Tourism (MEFT) in terms of the Environmental Management Act, 7 of 2007. This Act was gazetted on 27 December 2007 (Government Gazette No. 3966) and enacted on 6 January 2012. The Environmental and Social Impact Assessment Regulations: Environmental Management Act, 2007 (Government Gazette No. 4878) were promulgated on 6 January 2012.

1.4.1 ESIA Process

The ESIA process that has been followed is summarized in the table below:

Table 1: ESIA Process

ESIA OBJECTIVES	CORRESPONDING ACTIVITIES
Project initiation, Screening Phase	
◆ Understanding of the environmental and social baseline relating to the proposed Project. ◆ Notify the decision-making authority of the proposed Project. ◆ Initiate the Environmental and Social Impact Assessment process. ◆ Site visits and identify environmental issues. ◆ Identify key stakeholders and early identification of other I&APs.	◆ Project Inception and initiation meetings to discuss the Project and ESIA process requirements. ◆ Liaise with various specialists ◆ Draft ESIA Schedule. ◆ Initiate baseline studies. ◆ Submit Application for authorisations and a Background Information Document (BID) to the authorities. ◆ Register the Project and Applications for environmental clearances with MEFT (DEA) on its online portal. ◆ Early identification of environmental aspects and potential impacts associated with the proposed Project.
Environmental and Social Impact Assessment Phase	

ESIA OBJECTIVES	CORRESPONDING ACTIVITIES
◆ Notify other regulatory authorities and I&APs of the proposed Project (via newspaper advertisements, BID, emails, site notices and telephone calls). ◆ Conduct Key Stakeholder and Public meetings. ◆ Carry out specialist investigations and establish baseline environmental conditions. ◆ Determine the terms of reference for additional assessment work. ◆ Compile ESIA Report and Issues and Response Report (IRR) ◆ Distribute the ESIA Report for review and comment by relevant authorities and I&APs. ◆ Assessment of potential issues, consider comments received and compile the ESIA final report. ◆ Submit the final reports to relevant Ministries for their review and final decision on the Applications for environmental clearance.	◆ Develop Public Participatory Process (PPP) Programme. ◆ Develop I&AP database. ◆ Prepare BID and distribute to I&APs. ◆ Notify government authorities and IAPs of the Project and ESIA process (telephone calls, e-mails, BID newspaper advertisements and site notices). ◆ IAP registration and comments. ◆ Meetings with authorities and IAPs. ◆ Investigations by appointed specialists. ◆ Compilation of ESIA Report and ESMPs. ◆ Distribute ESIA Report and ESMPs to all I&APs for review and comments. ◆ Assess potential issues, obtain comments and update the ESIA Report and ESMPs. ◆ Submit final documents to MAWLR and MEFT for review and decision-making.

Within this framework, the required components of the ESIA report are discussed in more detail as part of the ESIA Methodology in Section 8.

ESIAs are influenced by national legislation and a range of guidelines. The legislation applicable to this project and the ESIA process is discussed further in Section 3 below.

1.4.2 ESIA Team

I.N.K Enviro Consultants cc is the independent firm of consultants that has been appointed by Enersense to undertake the Environmental and Social Impact Assessment and related processes. Immanuel N. Katali, the EIA project manager and lead practitioner, possesses a

B.Arts (Honours) Degree in Geography, Environmental Studies, and Sociology, and boasts over nine years of pertinent experience in overseeing EIAs, formulating EMPs, and conducting Socio-Economic Studies. Immanuel is accredited as an environmental practitioner by the Environmental Assessment Professionals Association of Namibia (EAPAN).

Mr. Lucky Bengela, the Hazardous Risk Assessor, is a proficient Health and Safety Practitioner and Risk Assessor, boasting over two decades of expertise across various sectors including Mining, Construction, Infrastructure Development, and Fishing. Lucky holds official certification as a Health and Safety Practitioner from the Namibia Training Authority (NTA).

1.4.3 Applicable Listed Activities

The EIA Regulations promulgated in terms of the Environmental Management Act, identify certain activities which could have a substantially detrimental effect on the environment. These listed activities require environmental clearance from MEFT prior to commencing. The following activities identified in the regulations apply to the proposed project:

Table 2: Listed activities triggered by the proposed Project.

Listed activity
9. Hazardous substance, treatment, handling and storage
9.1 The manufacturing, storage, handling or processing of a hazardous substance defined in the Hazardous Substances Ordinance, 1974.

2 ESIA PROCESS AND METHODOLOGY

2.1 Source of Information

I.N.K used various sources to identify the potential environmental issues associated with the proposed project. The main sources of information for the preparation of this Report include:

- Feasibility Study of Producing Ammonia Sulphate for the Daures Green Hydrogen Project Report (Surge Sustainability Projects, 2023).
- Environmental and Social Impact Assessment Report for the Pilot Study for the Proposed Development of a Solar PV Power Plant to Produce Green Hydrogen and Green Anhydrous Ammonia (I.N.K Enviro Consultants, 2022).
- Archaeological and Heritage Impact Assessment for the Proposed Development of the Daures Green Hydrogen Village, Located Near Uis Settlement, within the Daures Constituency in the Erongo Region, Namibia (Excel Dynamic Solutions (Pty) Ltd, 2022).
- Proposed Ecological Baseline Assessment for Enersense's Development of the Daures Green Hydrogen Village, Uis settlement, Daures Constituency, Erongo Region (Excel Dynamic Solutions (Pty) Ltd, 2022).
- Information obtained from Enersense Energy Namibia (Pty) Ltd
- Literature research.

2.2 ESIA Methodology

The main purpose of the ESIA is to indicate which environmental aspects relating to the proposed project might have an impact on the environment, to assess them and to provide management and mitigation measures to avoid or minimise these impacts.

Table 4 outlines the ESIA requirements as set out in Section 8 of the Environmental and Social Impact Assessment Regulations that were promulgated in January 2012 in terms of the Environmental Management Act, 7 of 2007.

Table 3: EIA requirements

Requirements for an EIA Report	Reference in report
(a) the curriculum vitae of the EAP who prepared the report.	Appendix A
(b) a description of the proposed activity,	Section 4
(c) a description of the site on which the activity is to be undertaken and the	Section 4

location of the activity on the site.	
(d) a description of the environment that may be affected by the proposed activity and the manner in which the geographical, physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed listed activity.	Sections 6
(e) an identification of laws and guidelines that have been considered in the preparation of the ESIA Report.	Section 3
(f) details of the public consultation process conducted in terms of regulation 7(1) in connection with the application, including - (i) the steps that were taken to notify potentially interested and affected parties of the proposed application. (ii) proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the proposed application have been displayed, placed or given. (iii) a list of all persons, organisations and organs of state that were registered in terms of regulation 22 as interested and affected parties in relation to the application, (iv) a summary of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues.	Sections 2.3, 2.4, 2.5 and Appendix B
(g) a description of the need and desirability of the proposed listed activity and any identified alternatives to the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed activity or alternatives have on the environment and on the community that may be affected by the activity.	Sections 1.2
(h) a description and assessment of the significance of any significant effects, including cumulative effects, that may occur as a result of the undertaking of the activity or identified alternatives or as a result of any construction, erection or decommissioning associated with the undertaking of the proposed listed activity.	Sections 7 and 8
(i) terms of reference for the detailed assessment.	Section 7 & 8
(j) a management plan, which includes - (i) information on any proposed management, mitigation, protection or remedial measures to be undertaken to address the effects on the environment that have been identified including objectives in respect of the rehabilitation of the environment and closure. (ii) as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of the activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and (iii) a description of the manner in which the applicant intends to modify, remedy,	Separate Document

control or stop any action, activity or process that causes pollution or environmental degradation and remedy the cause of pollution or degradation and migration of pollutants.	

2.3 Public Participation Process

The public participation process for the proposed project is conducted to ensure that all persons and/or organisations that may be affected by, or interested in the proposed project, were informed of the project and could register their views and concerns. By consulting with relevant authorities and I&APs, the range of environmental issues to be considered in this Report has been given specific context and focus.

Included below is a summary of the I&APs consulted, the process that was followed and the issues that were identified.

2.4 The Proposed Ammonia Sulphate Production Facility Project I&APs

The table below provides a broad list of persons, group of persons or organisations that were informed about the project and were requested to register as I&APs should they be interested and/or affected.

Table 4: Ammonia Sulphate Production Facility's Project Stakeholders

IAP Grouping	Organisation
Government Ministries	◆ Ministry of Environment, Forestry and Tourism (MEFT). ◆ Ministry of Agriculture, Water and Land Reform.
Local Authorities	◆ Daure Daman Traditional Authority ◆ Tsiseb Conservancy
Nearest Communities	◆ Residents in Uis Settlement
Media	Newspaper adverts (Tuesday, 14 January and Tuesday, 21 January 2025): Die Republikein, The Namibian Sun and Allgemeine Zeitung Newspapers.
Other interested and affected parties	Any other people with an interest in the proposed project or who may be affected by the proposed project.

2.5 Steps in the consultation process

Table 6 sets out the steps that were followed as part of the consultation process:

Table 5: Consultation process with I&APs and Authorities

TASK	DESCRIPTION
Notification - regulatory authorities and IAPs	
Notification to MEFT	I.N.K submitted the Application Form (online system) as a form of project registration and notification to MEFT.
I&AP identification	A stakeholder database was developed for the proposed project and ESIA process. Additional I&APs will be updated during the ESIA process as required.
Distribution of background information document (BID), flyers and stakeholders meeting invitation letters	BIDs were made available to all I&APs on the project's stakeholder database. Copies of the BID were available on request to I.N.K. Stakeholder meeting invitation were given out to the residents of Divundu Village. The purpose of the BID was to inform I&APs and authorities about the proposed project, the ESIA process, possible environmental impacts and means of providing input into the ESIA process. Attached to the BID was a registration and response form, which provided I&APs with an opportunity to submit their names, contact details and comments on the project.
Newspaper Advertisements	Block advertisements were placed as follows: ◆ Die Republikein (14 and 21 January 2025) ◆ The Namibian Sun (14 and 21 January 2025) ◆ Allgemeine Zeitung (14 and 21 January 2025)
Public Meetings	Several consultations were made with I&APs. This included meetings and telephonic discussions. Meetings were held with key stakeholders as follows: ◆ Daure Daman Traditional Authority and Tsiseb Conservancy – Uis Settlement Office Boardroom on Wednesday, 29 January 2025. ◆ General public meeting – Uis Community Hall on Wednesday, 29 January 2025. The due date to register as an I&AP and submit comments was 07 February 2025. However, the ESIA report was made available at the Uis Settlement Office for additional commenting.
Comments and Responses	Minutes and Issues and Response of the meetings are prepared.
MEFT review of ESIA Report and ESMP	A copy of the final ESIA Report, including authority and I&AP review comments, will be submitted to MEFT on completion of the public review process via the online application system.

2.6 General Assumptions and Limitations

The key assumptions and limitations of this EIA Report are detailed below.

- It is assumed that the information provided by Enersense Energy Namibia (Pty) Ltd, relating to the project activities is accurate and that the project will be implemented and operated as described.
- The results of specialist input formed the basis for the assessment of impact significance. The specialist inputs are conducted by independent specialists considered to be experts in their fields. It was assumed that the information from these sources is relevant and accurate.

3 IDENTIFICATION OF APPLICABLE ENVIRONMENTAL GUIDELINES

3.1 Introduction

The Republic of Namibia has five tiers of law and several policies relevant to environmental assessment and protection, which include:

- The Constitution.
- Statutory law.
- Common law.
- Customary law.
- International law.

As the main source of legislation, the Constitution of the Republic of Namibia (1990) makes provision for the creation and enforcement of applicable legislation. In this context and in accordance with its constitution, Namibia has passed numerous laws intended to protect the natural environment and mitigate against adverse environmental impacts.

3.2 Line Ministries

The following line ministries are applicable:

3.2.1 Ministry of Environment, Forestry and Tourism.

The mission of the Ministry of Environment, Forestry and Tourism is to promote biodiversity conservation in the Namibian environment through the sustainable utilization of natural resources and tourism development for the maximum social and economic benefit of its citizens. MEFT develops, administers and enforces environmental legislation and policy.

The MEFT's Department of Environmental Affairs ("DEA") is mandated to give effect to Article 95L of the Constitution by promoting environmental sustainability. The Environmental Commissioner serves as head of the DEA. The DEA is responsible for, inter alia, the administration of the EIA process undertaken in terms of the Environmental Management Act, 2007 and the EIA Regulations 2012. The DEA will be responsible for issuing a decision on the application for an ECC, based on the recommendations from MFMR and MME. If approved, the DEA will issue an Environmental Clearance Certificate.

3.2.2 Ministry of Agriculture, Water and Land Reform.

Promote, Develop, Manage and utilize Agriculture, Water and Land Resources sustainably.

3.3 National Policies and Plans

Namibia's policies provide the framework to the applicable legislation. Whilst policies do not often carry the same legal recognition as official statutes, policies are used in providing support to legal interpretation. The following policies and plans are applicable:

3.3.1 The EIA Policy (1995).

This policy states that the principle of achieving and maintaining sustainable development must underpin all policies, programmes and projects under1akcn within Namibia. In particular, the wise utilization of the country's natural re- sources, together with the responsible management of the biophysical environment, must be for the benefit of both present and future generations.

3.3.2 Namibia's Environmental Assessment Policy for Sustainable Development and Environmental Conservation (1995).

This policy promotes accountability and informed decision making through the requirement of EIAs for listed programmes and projects.

3.3.3 Namibia Vision 2030.

Vision 2030 states that natural environments are disappearing quickly. Consequently, the solitude, silence and natural beauty that many areas in Namibia provide are becoming sought after commodities and must be regarded as valuable natural assets. Vision 2030 emphasizes the importance of promoting healthy living which includes that the majority of Namibians are provided with safe drinking water. The importance of developing wealth, livelihood, and the economy is also emphasized by Vision 2030. This includes infrastructure provision like transport, communication, water, and electricity.

3.3.4 The Harambee Prosperity Plan II

The Harambee Prosperity Plan II (HPPII) (covering the period 2021 - 2025) builds on the solid foundation of the inaugural HPP 2016 - 2020. It continues to prioritize the implementation of targeted policy programme in order to enhance service delivery, contribute to economic recovery and engender inclusive growth. HPPII aims to increase local electricity generation capacity from 624 MW (2020) to 879 MW by 2025.

3.3.5 Policy for the Conservation of Biotic Diversity and Habitat Protection, 1994.

A comprehensive conservation policy that integrates sustainable practices and natural resource management.

3.3.6 National Solid Waste Management Strategy (2020).

It provides the framework for future directions, regulations, funding and action plans to improve solid waste management in order to achieve consistency and coordination.

3.3.7 The National Climate Change Policy of Namibia (2010).

This policy identifies technology development and transfer to be a key issue for which strategies and action plans should be developed.

3.3.8 Atmospheric Pollution Prevention Ordinance of 1976.

Namibia has adopted the South African air pollution legislation for air quality control in the form of the

3.3.9 Atmospheric Pollution Prevention Act (Act No 45 of 1965) (APPA).

The Namibian Atmospheric Pollution Prevention Ordinance (No. 11 of 1976) does not include any ambient air standards with which to comply. Typically when no local ambient air quality criteria exist, or are in the process of being developed, reference is made to international criteria. This serves to provide an indication of the severity of the potential impacts from proposed activities. The most widely referenced international air quality criteria are those published by the World Bank Group (WB) and the World Health Organization (WHO). The newly promulgated South African ambient air quality standards can also be referenced since these have been developed recently after a thorough review of international criteria.

3.3.10 Hazardous Substance Ordinance of 1974.

To provide for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature

3.4 Summary of Applicable legislation and standards

The following legislation is applicable:

To provide a framework for a structured uniform public and environmental health system in Namibia.

3.4.1 Soil Conservation Act 76 of 1969.

covers the prevention and combating of soil erosion; the conservation, improvement and manner of use of the soil and vegetation; and the protection of water sources.

3.4.2 The Constitution of the Republic of Namibia of 1990.

The Constitution is the Supreme Law of Namibia.

3.4.3 Pollution Control and Waste Management Bill (3rd Draft September 2003).

This Act promote sustainable development; to provide for the establishment of a body corporate to be known as the Pollution Control and Waste Management Agency; to prevent and regulate the discharge of pollutants to the air, water and land; to make provision for the establishment of an appropriate framework for integrated pollution prevention and control; to regulate noise, dust and odor pollution; to establish a 'system of waste planning and management; and to enable Namibia to comply with its obligations under international law in this regard.

3.4.4 Labour Act, 2007 (No. 11 of 2007).

To establish a comprehensive labour law for all employers and employees; to entrench fundamental labour rights and protections; to regulate basic terms and conditions of employment; to ensure the health, safety and welfare of employees.

3.4.5 Environmental Management, Act 7 of 2007.

To enforce the policy on EIAs, the Environmental Management Act (EMA) (7 of 2007) has been compiled and is regulated by the Ministry of Environment and Tourism (MET). This Act was gazetted on 27 December 2007 (Government Gazette No. 3966) and the Environmental Impact Assessment Regulations: Environmental Management Act, 2007 (Government Gazette No. 4878) were promulgated on 6 February 2012. In terms of this legal framework certain identified activities may not commence without an Environmental Clearance - a certificate that is issued by MET. This environmental clearance can only be granted after consideration of an EIA.

3.4.6 Public and Environmental Health Act No. 1 of 2015.

To provide a framework for a structured uniform public and environmental health system in Namibia.

3.4.7 Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act No. 36 of 1947.

This Act makes provision for the control on the trade in and placing on the market and use of fertilizers, pesticides and biological control agents for use in agriculture, products for the feeding of domestic animals or livestock and substances used for the maintenance or improvement of health of domestic animals, livestock, poultry, birds, wild animals or fish.

3.4.8 Air Quality Act (No. 39 of 2004).

To reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development.

3.5 Applicable IFC Performance Standards

International Finance Corporation's (IFC) Environmental and Social Performance Standards define IFC clients' responsibilities for managing their environmental and social risks. The Performance Standards provide guidance on how to identify sustainability risks and impacts and are designed to help avoid, mitigate, and manage them as a way of doing business in a more sustainable way.

The following are the performance standards that are applicable to the construction and operation of the ammonia sulphate facility:

Table 6: Applicable Performance Standards

IFC Performance Standard	Description
1. Environmental and Social Management System	An environmental and social management system (ESMS) helps companies integrate plans and standards into their core operations—so they can anticipate environmental and social risks posed by their business activities and avoid, minimize, and compensate for such impacts as necessary. A good management system provides for consultation with stakeholders and a means for complaints from workers and local communities to be addressed.

2. Labour and Working Conditions	It asks that companies treat their workers fairly, provide safe and healthy working conditions, avoid the use of child or forced labor, and identify risks in their primary supply chain.
3. Pollution Prevention and Control	It guides companies to integrate practices and technologies that promote energy efficiency, use resources—including energy and water—sustainably, and reduce greenhouse gas emissions.
4. Occupational Health and Safety, Public Health and Security	It helps companies adopt responsible practices to reduce such risks including through emergency preparedness and response, security force management, and design safety measures.
5. Land Acquisition and Involuntary Resettlement	It advises companies to avoid involuntary resettlement wherever possible and to minimize its impact on those displaced through mitigation measures such as fair compensation and improvements to and living conditions. Active community engagement throughout the process is essential.
6. Biodiversity and Ecosystems	It recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and managing living natural resources adequately are fundamental to sustainable development.
7. Rights and Interests of Indigenous People	It seeks to ensure that business activities minimize negative impacts, foster respect for human rights, dignity and culture of indigenous populations, and promote development benefits in culturally appropriate ways. Informed consultation and participation with IPs throughout the project process is a core requirement and may include Free, Prior and Informed Consent under certain circumstances.
8. Cultural Heritage	Cultural heritage encompasses properties and sites of archaeological, historical, cultural, artistic, and religious significance. It also refers to unique environmental features and cultural knowledge, as well as intangible forms of culture embodying traditional lifestyles that should be preserved for current and future generations. PS8 aims to guide companies in protecting cultural heritage from adverse impacts of project activities and supporting its preservation. It also promotes the equitable sharing of benefits from the use of cultural heritage.

4 PROJECT DESCRIPTION

The information contained herein, is derived from the Feasibility Study of Producing Ammonia Sulphate for the Daures Green Hydrogen Project Report (Surge Sustainability Projects, 2023).

4.1 Ammonia Sulphate

Ammona sulphate is a salt formed by the reaction between Ammonia and Sulphuric acid. It is the most accessible source of low-concentration Nitrogen, is widely used in agriculture, and isalso a relevant component in the production of balanced fertilisation formulas. It is widely applied directly to the soil as a single product, is an excellent source of fertilization in crops which extract large quantities of sulphur from the soil, such as forage crops, vegetables (cruciferous vegetables, onions and garlic), cereals (wheat and barley) and grasses (maize, sorghum and sugar cane), among others. It mainly contains Ammonium (NH4+) and Sulphate (SO4-2), and it is an acid pH product that is recommended for application in limestone and alkaline soils due to its strong acidifying effect.

Its use as a fertiliser is because the need for sulphur is closely related to the amount of nitrogen available for the plant. Therefore, Ammonium Sulphate provides a balanced supply of both nutrients.

4.1.1 Chemical Properties

The table below summarises the chemical properties of ammonia sulphate.

Table 7: Ammonia Sulphate Chemical Properties

CHEMICAL	CHEMICAL CLASS	HANDLING & STORAGE	INCOMPATIBLE MATERIALS	REACTIONS & HEALTH CONCERNS
Mono-Ammonium Sulphate	Stable at ambient temperatures	Tightly closed containers. Cool, dry well-ventilated storage. Protect from moisture	Alkalis and caustic materials Copper and its alloy Strong acids	Emits irritating fumes when heated. Decomposition releases ammonia.

4.2 Process and Equipment Description

The entire process is based on receiving 300 kg/d of ammonia from the ammonia plant and operating continuously. Production is based on 24 hours/d and 335 days/y (92% uptime). The daily production rate (t/d) is determined by hourly rate (t/h) x 24 h/d; the annual tonnage (t/y) is determined by daily production rate (t/d) x 335 d/y.

In the simplest form the system will produce liquid ammonium sulphate (35 mass% concentration), but a subsequent process can produce a solid ammonium sulphate (8 mass% moisture), as demonstrated in Figure 3 which represents the block flow diagram of the overall process. In summary the process consists of the following steps:

1. Production and storage of liquid ammonia
2. Vaporisation of liquid ammonia
3. Production of ammonium sulphate by contacting ammonia diluted with air, with sulphuric acid in a scrubber
4. Storing of ammonium sulphate solution
5. Concentrating the solution into a solid product (the additional process mentioned above)

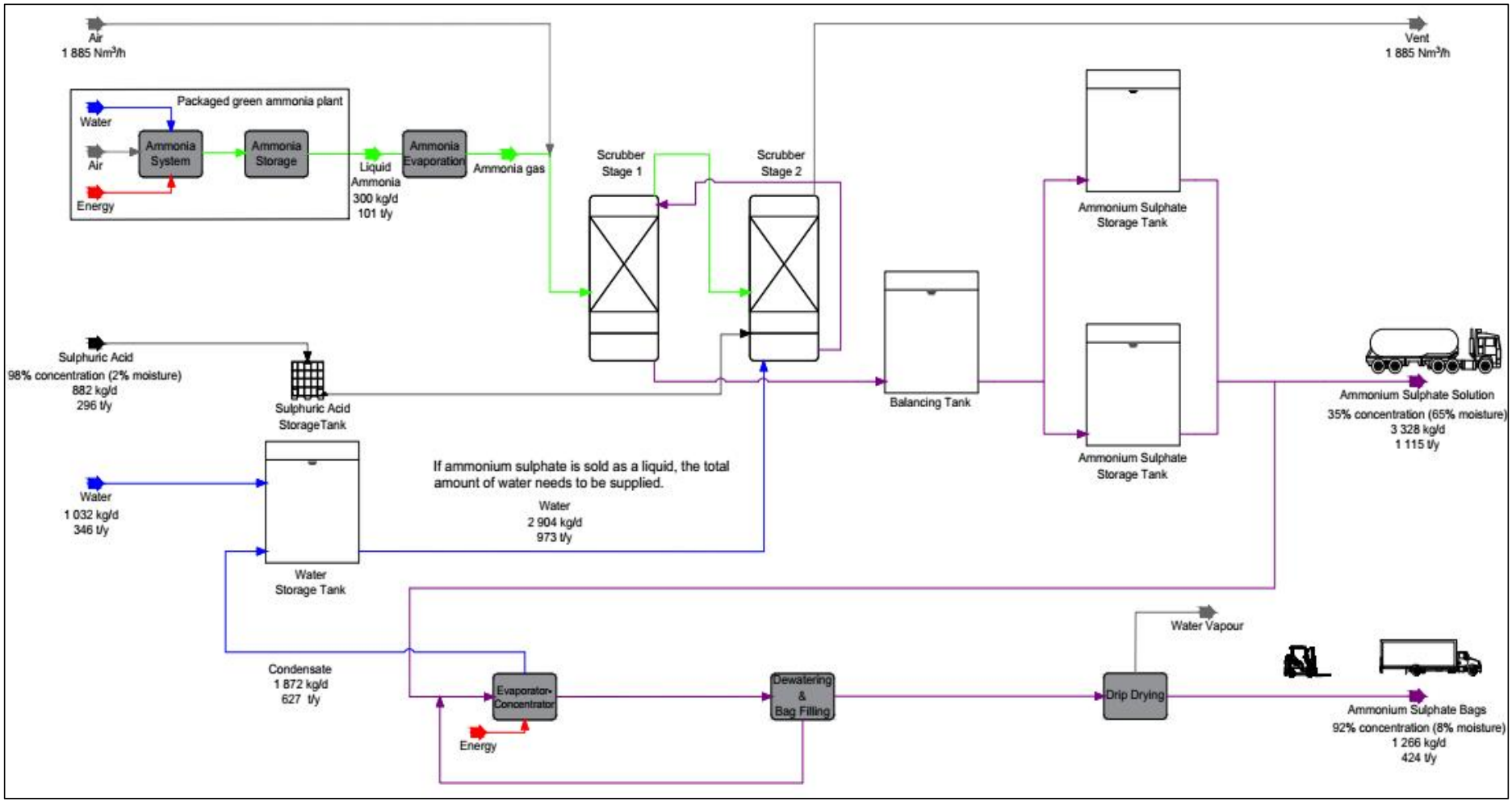

Figure 2: Block Flow Diagram of the production of ammonium sulphate fertiliser

Each process is described in more detail below.

4.3 Ammonia Production

The process begins with the production of pure liquid ammonia using the packaged green ammonia plant, e.g. supplied by FuelPositive. The product is manufactured as a containerized system, as depicted by Figure 4, making transport and site assembly effortless. The system is manufactured and placed inside a containerized vessel that can be easily transported, as depicted by Figure 4. Nitrogen is extracted from air via an air separation process and hydrogen is produced by electrolysis of water. These two intermediate products then react to produce ammonia in reaction vessels, the final product is stored as a liquid at -53 °C. The system is designed to produce 300 kg of liquid anhydrous ammonia/day and utilizes 476 kg of water/day.

Figure 3: FuelPositive's containerized ammonia production system

4.4 Temporary Product Storage for Exporting Purposes

Various companies will transport their products to Walvis Bay for temporary storage, until such time shipment arrives at the port. The products will be transported from the warehouse facilities via flatbed trucks to the port and loaded onto ships for export. This includes a full process of product storage, handling and transportation.

4.5 Ammonia Vaporization and Mixing of Air

The liquid ammonia, produced by the packaged plant, is vaporized in a vaporizer. Electricity is supplied to the vaporizer to generate heat to increase the temperature to above boiling point (-33 °C). The ammonia leaves as vapor.

A schematic of the electric ammonia vaporizer is provided in Figure 5. Heating coils are located inside the aluminium core where power is supplied. The unit has dimensions of 152 x 248 mm and consists of an inlet and an outlet, temperature sensor, float, and safety valves. Liquid ammonia enters the vaporizer through the inlet where it is heated, by means of the heating elements and is monitored with two thermocouples housed in a common sheath and a level float. In the case that the liquid levels rise too much, a safety valve will be triggered to prevent ammonia from leaking downstream. A safety pressure release valve will be triggered in the event of excess pressure build-up within the system. The temperature is increased to a point where the liquid ammonia boils and exits the unit through the outlet as vapor.

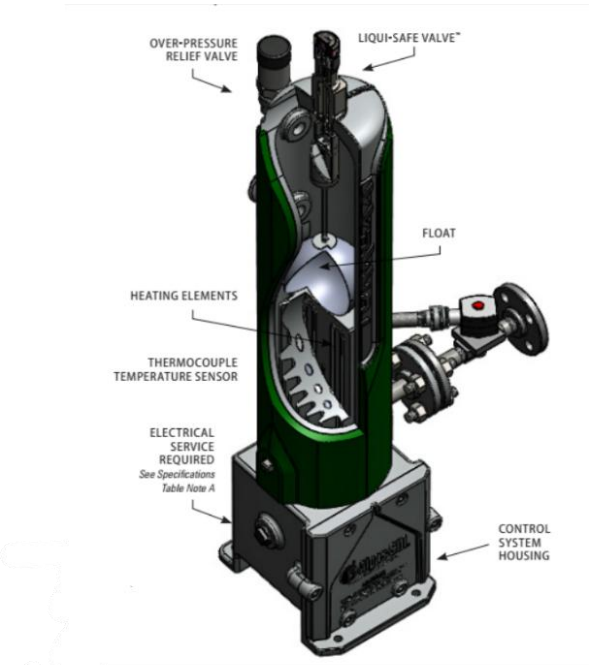

Figure 4: Ammonia vaporiser internal mechanisms

The reaction between ammonia and sulphuric acid to form ammonium sulphate is exothermic, meaning that heat is generated. Excessive heat generation results in high temperatures which

would require exotic construction materials to be used for the scrubber. To avoid this, ambient air will be mixed with the vaporized ammonia to dilute the ammoniato a 10 vol% ammonia or 10,000 ppm ammonia mixture. When this mixture is sent to the scrubber, the temperature will not be excessive.

4.6 Ammonium Sulphate Formation

The operating principle of a scrubber is to contact a gas, containing the target chemical (ammonia in this case), with a scrubbing solution with the aim of removing the target species from the gas and transferring it into the liquid. In other words, the gas is “scrubbed clean” of the target species. In most applications, the target chemical is an impurity in the gas stream. For example, a waste sorting process contains foul-smelling air which will need to pass through a scrubber to be cleaned. This will prevent odour from being released to the environment. Another example is removing harmful/odorous chemicals from flue gases of power plants. Scrubbers are thus widely used in industry. An image of a typical scrubber is provided in Figure 6, below.

Figure 5: A typical scrubber (air/gas entering via the duct on the right)

In this case the scrubber functions as a reactor to contact ammonia with sulphuric acid to make liquid ammonium sulphate. It is proposed to carry out this reaction in two stages, i.e. two scrubbers will be used.

- The first scrubber will remove the bulk of the ammonia but not all from the incoming ammonia-air mixture.
- The second scrubber will remove the remainder, ensure no ammonia is released to the environment. The virtually total reaction is ensured as fresh sulphuric acid will be dosed to the scrubbing solution of the second stage. The higher concentration of acid in this stage will ensure maximal ammonia removal.
- The scrubbing solution from the second stage is re-used as the scrubbing solution of the first phase, thereby the remaining unreacted acid is used up.
- Ammonia sulphate is produced in both stages and builds up in the scrubbing solution, i.e. the scrubbing solution from the second stage is the liquid ammonium sulphate solution.
- In this two-stage approach maximal ammonia recovery is ensured but at the same time acid is not dosed in excess.

The system consists of two scrubbing units each with a diameter of 600 mm and a packing height of 1,200 mm. An additional “balancing tank” is provided, which acts as a buffer tank for the storage of the liquid ammonium sulphate. A schematic of the system is provided in Figure 7, below. Both towers are constructed from thermo-plastic and are fitted with internals which include packing, spray manifolds, spray nozzles, demister packing and support grids. The unit is also supplied with extraction fans and recirculation pumps.

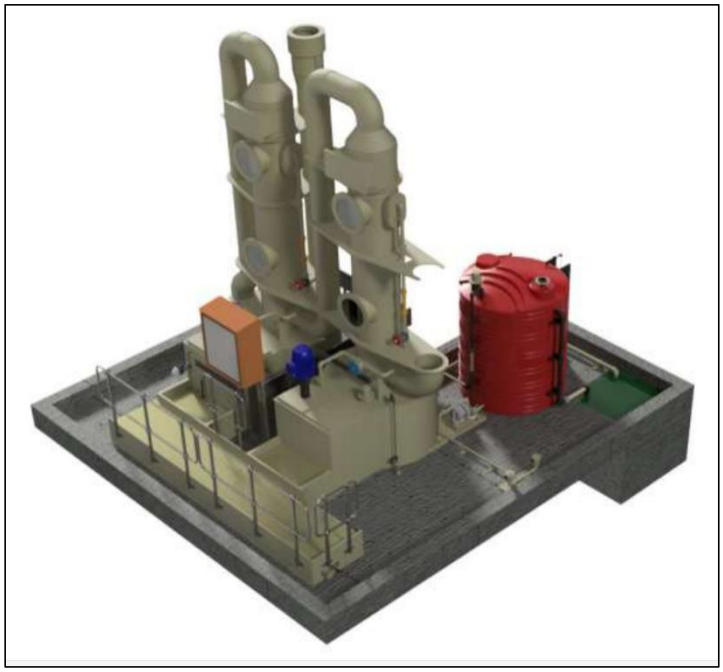

Figure 6: Two stage scrubber system with balancing tank, producing ammonium sulphate solution

Since the scrubbing solution from the second stage is transferred to the first batchwise, the liquid ammonium sulphate varies in quality, thus the system includes a balancing tank. The consistent product from here is then stored in two storage tanks, purely because two smaller tanks are more cost effective than one large one. This liquid ammonium sulphate solution will have a concentration of 35 mass% ammonium sulphate. This is a realistic figure, as vendors claim to be able to reach 40 mass% as well.

The acid needed in the scrubber is commonly bought in Intermediate Bulk Containers (IBCs), which are roughly 1m³ in size. Thus, no acid storage tank is foreseen. The scrubbing process does require water. If the subsequent concentration process is included, the evaporated and condensed water can off-set some of the freshwater demand.

4.7 Ammonium sulphate concentration

Alternative to a liquid ammonium sulphate fertilizer, solid ammonium sulphate crystals can be extracted. The concentration of these crystals is performed in three consecutive process stages,

namely an evaporator-concentrator, followed by a dewatering stage, and the final stage of drying in bags.

Figure 7: An evaporator-concentrator unit

The concentration process starts in an evaporator-concentrator unit and its sole purpose is to remove most of the water in the incoming ammonium sulphate solution. As water is removed the solution becomes concentrated, to a point where solid ammonium sulphate starts to crystallize out of solution. The working principle is to apply heat and create a partial vacuum. By applying a partial vacuum, the temperature at which the solution boils are greatly reduced, thereby reducing the amount of heat needed to evaporate the water. A scraper is used to keep the internal surfaces clean of crystals and to keep the contents homogeneous, which would otherwise hinder heat transfer. The evaporation chamber, scraper, heat exchanger and collection tank for the distillate are all made with AISI 316 austenitic steel. The dimensions of the unit are 3.20 (H) x 2.20 (L) x 2.40 (W) m.

The water vapor from the unit is sent to a heat exchanger to create condensation which is recycled back to the scrubber for reuse. A photograph of the ammonium sulphate slurry produced by the evaporator-concentrator is provided in Figure 9, below.

Figure 8: Ammonium sulphate crystals produced in an evaporator-concentrator

In this process of concentration by evaporation, a slurry of crystalline ammonium sulphate in a saturated solution of ammonium sulphate is produced, with a total concentration of 80 mass%. This slurry enters a dewatering unit, the purpose being to separate the crystals from the liquid. The dewatering unit operates on the principle of settling solids (crystals in this case) of a higher density compared to the liquid. It consists of a settling basin and an inclined screw conveyor; this collects and transports the settled solids to the outlet. Liquid is thereby retained and pumped back to the evaporator-concentrator. The internal, shaftless spiral rotates at low RPM to sustain solids settling out of solution. The units are designed with an outlet weir and has a quick release lid.

Figure 9: Screw conveyor for the dewatering of ammonium sulphate slurry

It is envisaged to have the solid ammonium sulphate crystals drop directly into bulk bags (depicted in Figure 11, below), from the outlet of the dewatering unit. More liquid will drip from the bags and additional water will evaporate. The final concentration of the recovered ammonium sulphate crystallised fertiliser is 92 mass% concentration (8 mass% moisture).

Figure 10: Bulk bags of ammonium sulphate during drying

4.8 Storage tanks

Two 10,000 L tanks are utilized for storage of ammonium sulphate, whereas a single 10,000 L tank is utilized for storing the water required in the process. The tanks are constructed from polyethylene which is chemically resistant towards ammonium sulphate. Each tank consists of an inlet and outlet pipeline fitting which allows for plumbing to be installed. The tank is also fitted with a vent for pressure-build-up prevention. A photograph of the tank is presented in Figure 12 12, below.

Figure 11: Storage tank for ammonium sulphate (35 mass% concentration)

4.9 Space requirements

A layout of the project was beyond the scope of this feasibility study; however, the space requirements are listed below. It is recommended to allocate at least 60 x 30 m in total to the project.

Equipment type	Dimension
Ammonia vaporiser	0.20 x 0.15 m
Scrubber package	10 x 10m
Storage tank (ammonium sulphate)	2 units of 2.50 x 2.50 m
Storage tank (water)	2.50 x 2.50 m
Evaporator-concentrator	2.20 x 2.40 m
Dewatering classifier	2.00 x 5.00 m

4.10 Operability

Since both the scrubber and the evaporator-concentrator packages are automated and controlled by a control system, minimal operator intervention is required. However, the equipment should be inspected daily. In case the solid product is to be produced, operators will need to remove full bags, roughly one per day, and replace it with an empty bag. Operators from different industries (mining, food processing) will be able to operate the process with minimal training on site.

4.11 Scalability

The entire has been set out to process 300kg/day of ammonia in the inlet, and to operate continuously. In other words, there is limited spare capacity in the equipment selected. However, if a larger production scale is required from the onset, larger equipment can be selected. Economies of scale make larger equipment more feasible, for example the evaporator-concentrator used in this study has a capacity of evaporating 2m³/d of water and costs 130.000€ (just the machine), while a unit that can evaporate 5m³/d (thus 2.5 times the capacity) costs 218.000€ (1.68 times the cost).

4.12 Source of Water

Potable water is required to facilitate dilution in the process, and it is estimated that 973 m³/y is needed when making the liquid ammonium sulphate product, while 346 m³/y is needed in case in case solid ammonium sulphate is produced. Water will be pumped from boreholes on site.

4.13 Source of Power

The electricity consumption for the plant is estimated at 142,000 kWh/y for the minimal scope to make liquid ammonium sulphate. The project will produce renewable energy onsite.

4.14 Waste Management

Waste will be generated on site during construction and operations. Waste will be transported off site and disposed of at the nearest approved landfill site in Henties Bay. No waste will be permanently disposed of or burnt on site.

All hazardous waste, chemicals, hydrocarbon contaminated materials, used hydrocarbons etc., will be removed from site and disposed of at a licensed hazardous waste disposal site (Walvis Bay).

4.15 Construction Phase

The construction phase of the project involves various activities for the construction of the surface infrastructure and facilities for the facility.

In addition, the exact technical and design parameters for the proposed project have not yet been developed at this early stage of the ESIA phase. The construction activities are expected and most likely involve the activities mentioned below and could however change once the exact technical and design parameters have been identified.

Construction activities will take place during the establishment and preparation of the sites. Therefore, it is expected that construction will involve the following activities:

- Appoint contractors, labourers, etc.
- Clearing and grubbing and other earth moving activities.
- Stockpiling topsoil and sub-soil.
- Foundation excavations.
- Setting up contractor's laydown areas.
- Digging of foundations.
- Delivery of materials – storage and handling of material such as sand, rock, cement, chemical additives, etc.
- General building/construction activities including, amongst others: mixing of concrete; operation of construction vehicles and machinery; civil, mechanical and electrical works; painting; grinding; welding; etc.
- Painting, grinding and welding
- Earthworks: Clearing and grubbing bulldozing activities, soil excavation, stockpiling of topsoil and other material
- Disposal or treatment of potentially contaminated soil
- Civil works: Foundation excavations
- Storage and handling of material: Sand, rock, cement, chemicals, additives in cement
- Water utilisation
- Mixing of concrete (batch plant) and concrete work (casting)
- Operation and movement of construction vehicles and machinery
- Refueling of equipment
- Using of cranes
- Erection and dismantling of scaffolding
- Building of shutters
- Installing re-enforcement steel
- Handling, storage and disposal of hazardous waste
    - Hydrocarbon wastes
    - Blasting media packing material (If applicable)
    - Empty paint containers
    - Cements bags
    - Chemical additives for cement) containers
    - Contaminated PPE and other wastes
    - Redundant concrete
- Handling, storage and disposal of non-hazardous waste
    - Domestic waste
    - Steel
    - Wood

- Other construction waste
- Transportation of hazardous material
- Transportation of non-hazardous material
- Handling and storage of hazardous material
  - Fuel
  - Lubricants
  - Paints Gas (welding)
  - Cement
  - Chemical additives
- Installation of water pipelines
- Installation of electricity lines
- Installation of sewerage lines

5 PROJECT ALTERNATIVES

5.1 Alternative Site Location

The proposed ammonia production facility is located within the Daures Green Hydrogen boundaries, which they have jurisdiction over. The facility is proposed to be in proximity to renewable energy infrastructure (existing solar photovoltaic (pv) plant and 3 wind turbines) that will supply the facility with electricity to produce ammonia sulphate.

In addition, 3 Welwitschia Mirabillis are found within the Daures Green Hydrogen Village. Therefore, the ammonia sulphate production facility site location has been selected further away from these Welwitschia plant species, in order to limit interference and disturbance as much as possible.

Not implementing the project at these specific locations with favourable conditions will, therefore, cause a limitation on the national employment and Namibia's food security.

5.2 The "no project" option

With reference to section 1.3, ammonium sulphate is used in agriculture in the world over, Namibia is no exception.

The proposed project aims to supply ammonia sulphate fertilizer to Namibia's agricultural sector, to provide nutrients and enhance crop production and contribute to the country's food security. Namibia's "Green Scheme Policy" (MAWF, 2008) states that "[t]he mandate of the Ministry of Agriculture, Water and Forestry is the promotion, development, management and utilisation of agricultural, water and forestry resources. It is, therefore, the objective of the Government to ensure agriculture productivity and food security in line with the Vision 2030 strategy."

Therefore, the challenge facing the project proponent is its contribution towards achieving these goals while at the same time preventing and/or mitigating potential negative social and environmental impacts. The proponent will have to ensure that the identified mitigation measures and commitments to address the potential impacts, will appropriately be implemented and adhered to.

6 IDENTIFICATION OF THE SENSITIVE BASELINE ENVIRONMENT

6.1 Existing Infrastructure

The Daures Green Hydrogen presently boasts an eco-lodge, residences, training facility, greenhouse, solar photovoltaic (PV) plant, and additional operational infrastructure already in place. In accordance with section 1.2, the ammonia sulfate facility is proposed to be situated to the west of the existing solar PV plant and to the north of the planned wind turbinesthat will provide electricity to the facility and electrolyzer. Please refer to Figure 13 for a visual representation.

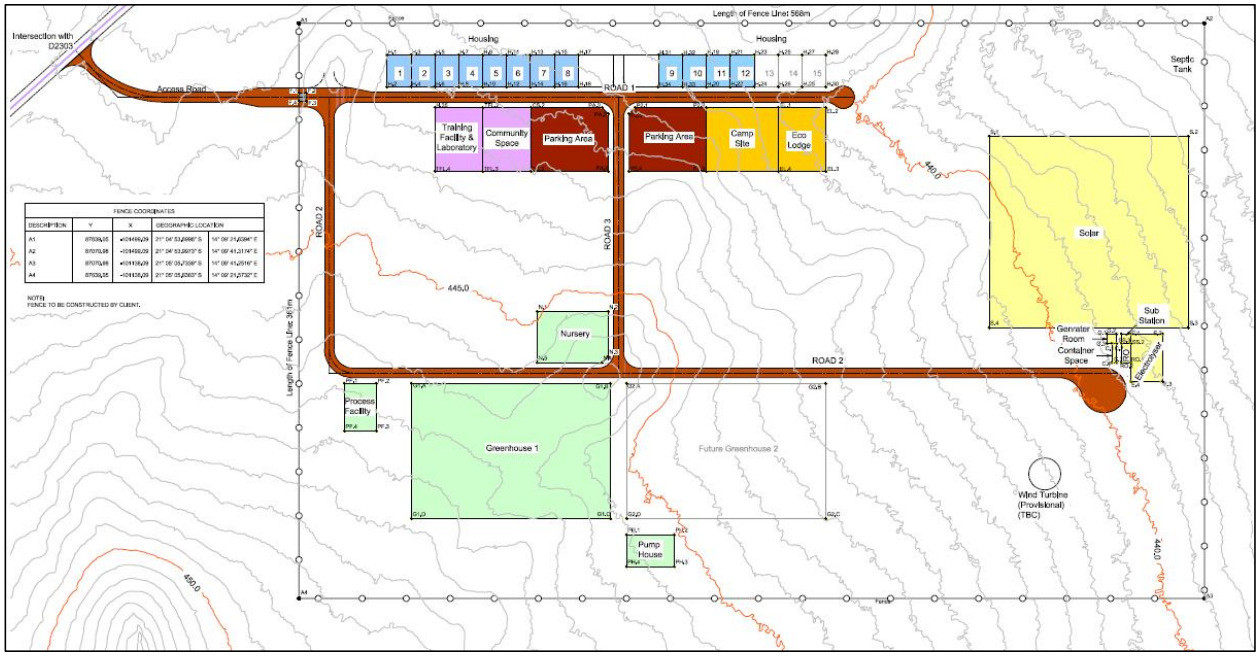

Figure 12: Existing Infrastructure

6.2 Climatic Conditions

6.2.1 Temperature

The climate condition within the vicinity of the proposed project is a local steppe climate. In the proposed development area, the average temperature is at 22°C, with the mean maximum temperature exceeding 34°C per year. December is the warmest month with an average temperature of 30-33°C at noon. July is the coldest month with an average temperature of 8-

10°C at night. Uis, which is in the vicinity of the project area, has distinct temperature seasons, the temperature varies during the year.

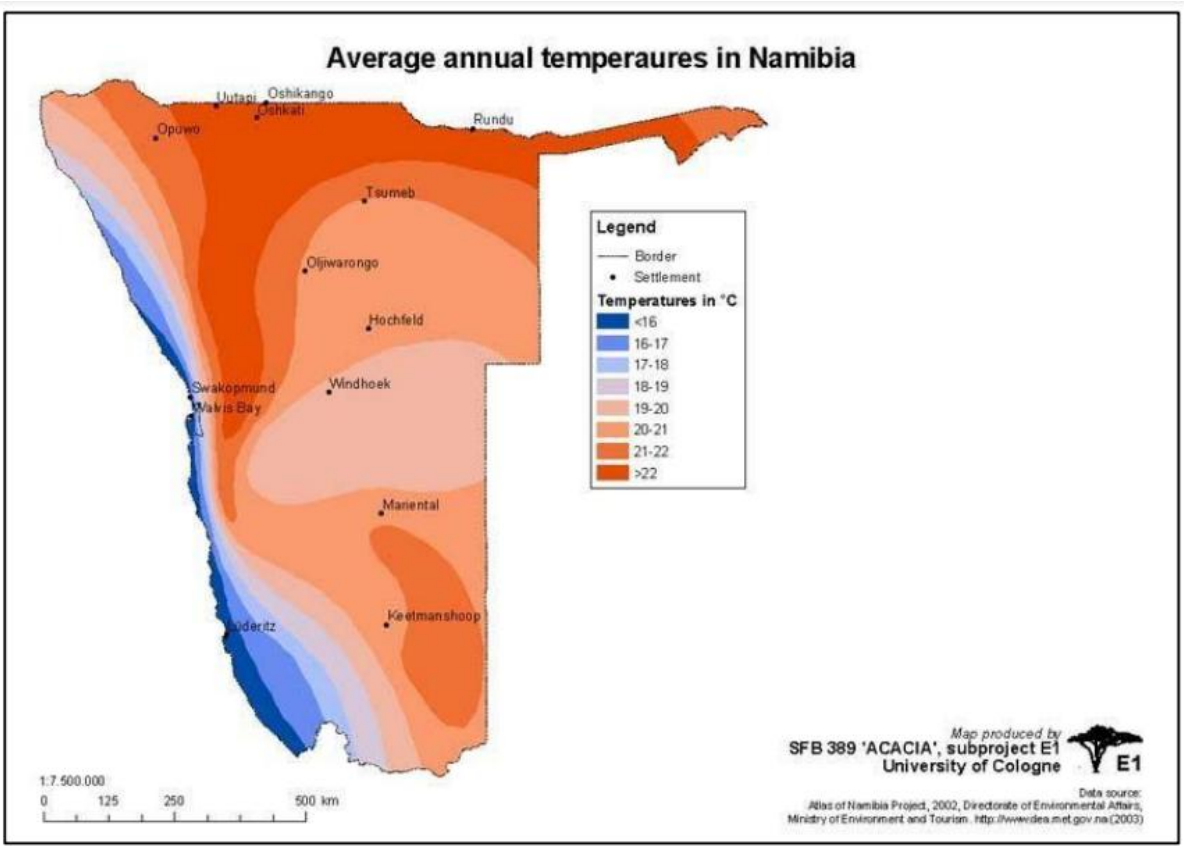

Figure 13: Average Annual Temperature for Namibia (sourced from Atlas of Namibia, 2002).

6.2.2 Precipitation

The annual rainfall in this area is less than 50 mm. Over the years, it has been observed that most of the rain falls as thundershowers in the summer months, for example between October to March. However, there is great variation between years, with unpredictable rainfall. Wind in the vicinity is relatively higher in the afternoon and evening between April and June – with the dominant wind from the east and southwest.

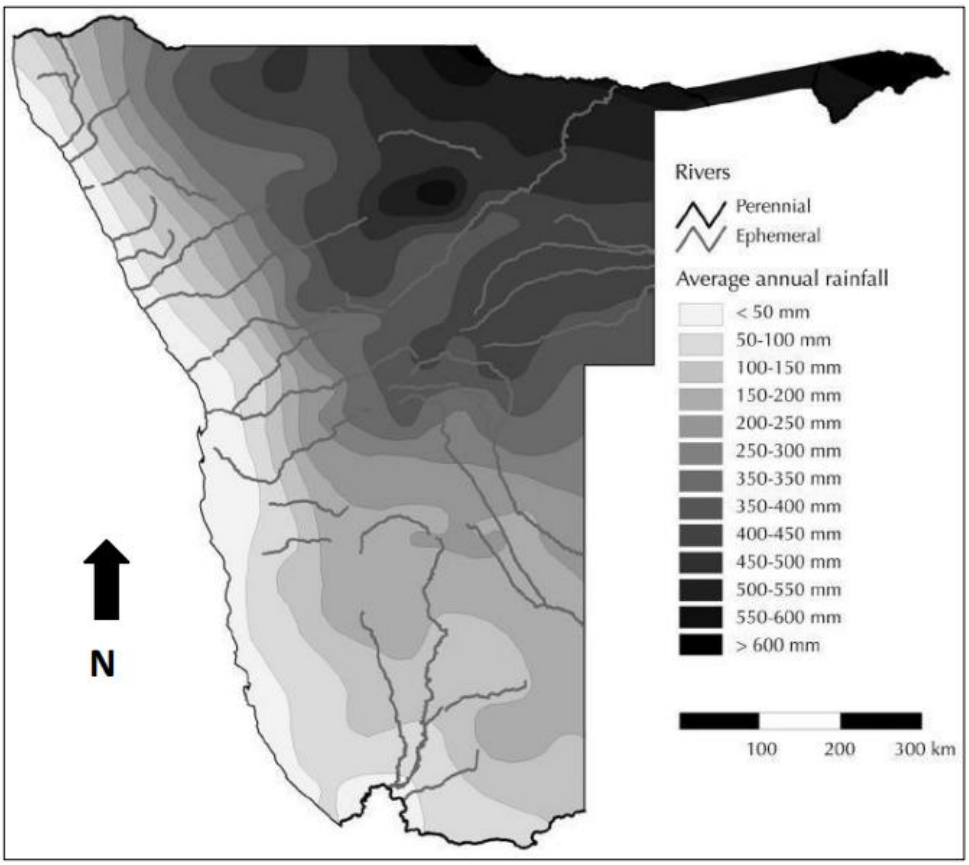

Figure 14: Contoured average annual rainfall rates, showing that arid to hyper-arid conditions prevail

6.2.3 Soil, Landscape and Geology

The nature of the landscape around the proposed project is characterized by a combination of topography, geological processes and drainage network within the Etendeka Plateau and Central Wester Plains, but in the Huab basin. Etendeka Plateau which covers the largest part of the site is a unique and, in its desolation, hauntingly beautiful landscape, which lies in north-western Namibia. It consists of volcanic rocks of the Cretaceous period with a characteristic of table-topped hillocks. The soil fertility around the proposed project is relatively low to medium, which appears to be unlikely suitable for crop production. The dominant soil is a combination of rocky outcrops and lithic leptosols, which is very thin shallow soil.

6.3 Noise

The only source of noise in the area is the natural sounds from wind, the vehicles and trucks and the day-to-day construction and operational activities of the Daures Green Hydrogen Village. However, there are no immediate communities within 10 km to the village.

The sensitivity of noise receptors usually increases at night when conditions are still, and ambient noise levels are at their lowest.

6.4 Built Environment

There are no schools, hospitals, sports fields, places of worship or other areas where people gather within proximity of the Daures green hydrogen Village.

6.5 Social and Economic Environment

The closest settlement to the development project is Uis. Uis is a settlement located in Erongo Region, Namibia. It belongs to the Dâures electoral constituency. Located in the former Damaraland, it is known for the local mineral wealth. The settlement has approximately 3,600 inhabitants and, before being downgraded from "village" to "settlement" in 2010, owned 10 square kilometers.

Uis is located at the foot of the Brandberg, Namibia's highest mountain. The Brandberg is home to the world famous The White Lady rock painting, said by some to be over 20,000 years old. Being also situated on the C36, the main road between the coast and the Damaraland interior, there is a reasonable amount of traffic, by far the main source of economic activity in Uis.

The settlement holds a small supermarket, guesthouses, a bakery and a petrol station, together with a few other small shops. Uis is home to the Brandberg Primary School and Petrus !Ganeb Secondary School, both with about 300 learners. Petrus Ganeb SS was built before Namibian independence; its facilities are old and dilapidated.

Once a small mining town, it is now one of the stops when travelling to the Brandberg and Twyfelfontein or en route between the Namib Coast or the Erongo Region and Damaraland. The town is excellently located for early morning visits to the Brandberg. If not staying at or near Uis, travellers use it as an opportunity to refuel and make minor purchases, including geological samples and Brandberg quartz crystals.

With the potential employment of local people, this means that families will benefit from the project during the on-going phase. The project has great potential to improve livelihoods and contribute to sustainable development within the surrounding community.

Community meetings will be held from time to time by the proponent wherever possible, with the purpose of effectively communicating with the local community and avoiding any unexpected social impacts.

6.6 Biodiversity

6.6.1 Flora

The only flora to be found within the project site is the Welwitshia Mirabilis, whereby 1 is located towards the western boundary and 2 towards the north-eastern boundary of the site. No other flora has been identified within the boundaries of the village. As mentioned in section 1.2, the site has been cleared for the construction of phase 1 pilot activities such as the greenhouse, solar pv plant, houses, eco-lodge, campsite and training facility and laboratory.

The site earmarked for the ammonia sulphate production facility is relatively an open rocky area with no vegetation.

Figure 15: Welwitschia plants found within the Daures Green Hydrogen Village

6.6.2 Fauna

The site area is an ecological region with low-to-medium diversity of reptiles, which are associated with the rocky escarpment. The most important species that are expected to occur in the proposed project include, but are not limited to *Pedioplanis undata* (Sand lizard), *Trachylepis sulcate* (Western Rock Skink), *Chondrodactylus turneri* (Turner's thick toed Gecko),

Bitis arientans (Puff Adder), *Stigmochelys pardalis* (Leopard Tortoise), *Trachylepis binotata* (Ovambo Tree Skink), *Geosceurus inauris* (South African Ground Squirrel), *Madoqua kirkii* (Kirks Dik-Dik), *Caracal caracal* (Caracal), *Achaea catela* (Banded Achaea), *Amadina erythrocephala* (Red Headed finch), *Anthene amarah* (black-striped hairtail), *Scolopendra morsitans* (Red-headed centipede). Other wildlife that is known to be occurring predominantly within beyond the Daures Green Hydrogen Village site is springbok, elephant, kudu, zebra and small mammals such as rabbits.

The proposed project site and vicinity are known to have little to no surface and groundwater, as such wildlife tends to migrate to other areas.

6.7 Geology

The envisioned ammonia sulphate production facility is situated in the Ugab-Huab Basin. Below is the summary of the Geological Settings of the basin.

The Ugab-Huab Basin comprises of the Karoo sedimentary rocks of the Goboboseb Mountain around the Brandberg and the base of the Albin Ridge. The basin thins and pitches out beneath the Etendeka lavas in the north and southward direction. However, the Karoo sedimentary rocks below the Albin Ridge are part of the basin. Distal sediments are found at the coast on the west side, which is the deepest part of the basin. In contrast, the proximal basin margin sediments are located on the eastern side of the basin. The succession of the basin starts with thin and sporadic dwyka beds, which are overlain by the Lower Permian Ecca Group (namely: Verbrandeberg, Tsarabis, Rhinowash Formation, Probeer Formation, Gudaus Formation, Gai-as Formation. The Karoo sediments (fluvial, deltaic, fluviomarine) rest unconformably on Damara basement rocks (deformed meta-sediments and intrusive rocks). An angular unconformity separates the Karoo sediments from the overlying fluvial to aeolian Twyfelfontein Fm (formerly the Etjo Fm) and the Awahab Fm of the Etendeka Group. In general, the Ugab-Huab Basin was formed from a larger fresh, brackish, or slightly alkaline lake that deepened and extended to the west, therefore, the Karoo Succession of the basin was deposited in lacustrine and not marine environment.

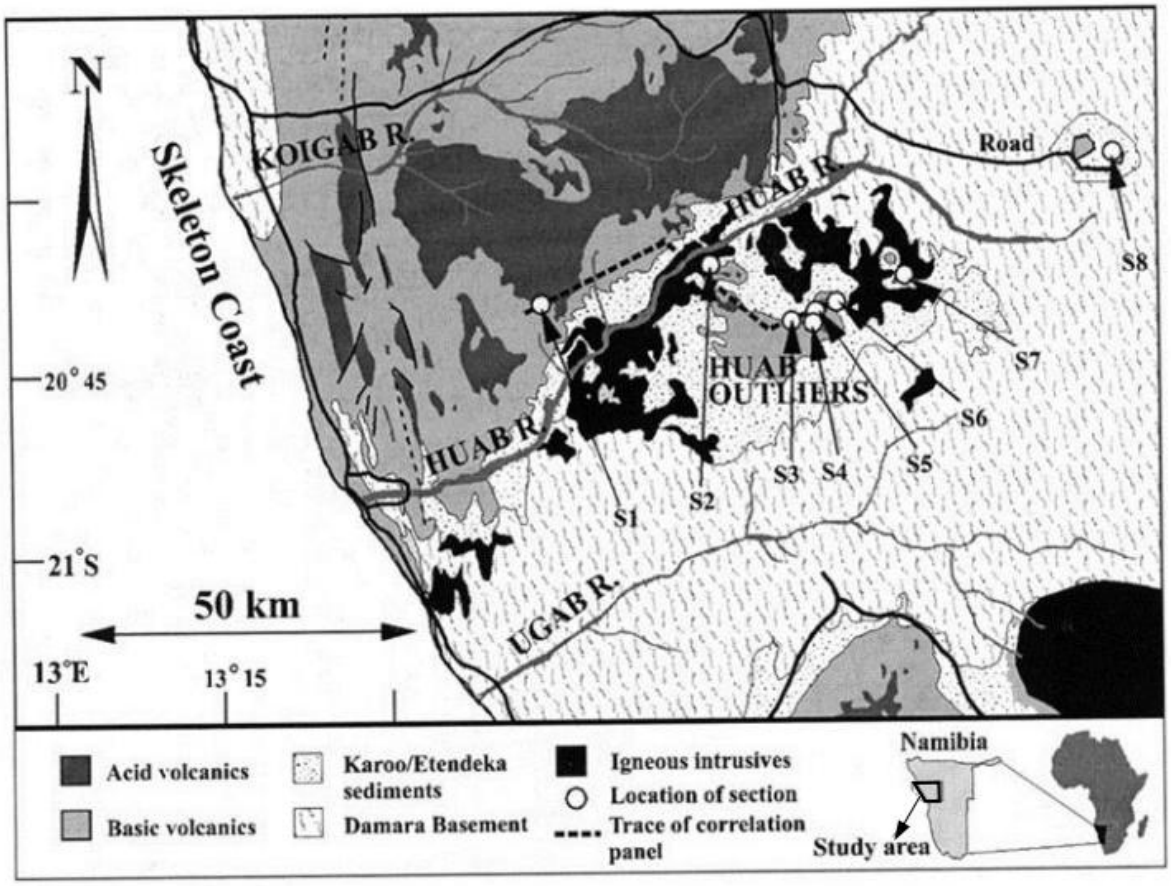

Figure 16: Simplified geological map of the Huab-Ugab Basin (Geological Survey of Namibia, 2006).

6.8 Hydrogeology

The aquifers in the Ugab-Huab Basin can be sub-divided into two main groups, namely the primary (porous) aquifers and secondary (fractured) aquifers. The alluvial aquifers in the basin are directly related to the underlying geology and the nature of the tributaries. These aquifers are very efficient at storing water and reduce the effect of evaporation in comparison to surface water bodies such as rivers and dams. The Alluvial aquifers are located within the ephemeral rivers and their tributaries e.g the Ugab River that is located up north of the project site.

The alluvial deposits that form within the alluvium may include flood plains that result in larger storage volumes. These channels are mainly recharged through infiltration of surface flow along channels that are active. Ephemeral rivers are highly localized with rainfall input that is variable and groundwater input does not contribute significantly to the surface water to maintain the flow.

Furthermore, overland flow is dominant during rainfall in the catchment and is characterized with initiation of run-off that declines downstream because of infiltration. This is different from rivers in regions that are humid where run-off increases downstream. It is only during exceptional rainfall seasons when the rivers in the basin discharge to the ocean.

The alluvial aquifers' storage capacity depends on the nature of the sediments and their thickness. Larger rivers such as the Omaruru River and the Ugab River, located south and north of the proposed Green Hydrogen Pilot Plant sites respectively, have sediment thickness that is larger in their productive sections. Yet, small rivers have small sediment thickness and therefore, do not form viable aquifers but rather act as temporary storage to recharge under laying aquifers. Vertical flow below the channel to the under-laying aquifers, results when infiltration occurs during ephemeral flow conditions

Fractured aquifers with very low to limited groundwater potential are common in the project sites. These fractured aquifers are made of crystalline rocks such as granites, gneisses and volcanic rocks which generally exhibit a very low tendency to store water, hence the low groundwater potential.

6.9 Water and Environment

Water in the Ugab-Huab Basin emanates from groundwater (boreholes), ephemeral rivers, hand- dug wells, springs and several excavations of dams. Two major ephemeral rivers (Ugab and Huab) and smaller west flowing rivers can be found in the basin, these rivers only flow during exceptional rainfall events. The Ugab River is located 15-40 km north of the project sites, while the Huab River is further from the project sites at 70-100 km. According to (IWRM plan, 2010), the basin's major source of water is groundwater. The basin has a potential of approximately 7.5 Mm3 /a of surface water and 19.8 Mm3 /a of groundwater. In addition, 73% of water used annually in the basin is groundwater. There are several Water Supply Schemes in the Ugab-Huab Basin found in areas such as Kalkfeld, Sesfontein, Fransfontein, Khorixas, Omatako Dam, Hochfeld, Opuwo, Kamamanjab etc. There are also some small Water Supply Schemes in the basin situated in the crystalline fractured aquifers in villages such as Anker, Bergsig, Erwee etc.The quality of groundwater in the Ugab-Huab Basin is of good quality water in category B (insignificant risk). However, the quality of groundwater in the Huab has deteriorated from category B (insignificant risk) to C (low risk). Water quality deterioration is partially dependent on how frequent floods occur and the volume of water abstracted each year.

The general surface water and groundwater flow direction in the Ugab-Huab Basin is west and south west towards the Atlantic Ocean. However, surface water has the potential of locally creating linear oases in the middle to downstream of the river during rainfall seasons. Locally, the groundwater upstream of the Ugab River flows via the tributaries towards the Ugab River, contributing to the general flow direction.

6.10 The Archaeology of the Subject land

The archaeology of the area of interest is somewhat connected to the presence of Brandberg Mountain and the landscape. Brandberg is of considerable archaeological interest, with more than thousand rock paintings recorded from its widespread network of gorges, of which the "White Lady" of the Tsisab Gorge is indisputably the most famous. Brandberg, meaning "Fire Mountain", got its name from the reddish, weathered color of the granite which makes up the main intrusion. The proposed development site is about 20 km away from Brandberg Mountain. Archaeologically, this geologic feature is a spiritual site of great significance to the San (Bushman) tribes and national at large. The main tourist attraction is the White Lady rock painting, located on a rock face with other art work, under a small rock overhang, in the Tsisab Ravine at the foot of the mountain. The ravine contains more than 1 000 rock shelters, as well as more than 50 000 rock paintings.

The higher elevations of the mountain contain hundreds of further rock paintings, most of which have been painstakingly documented by Harald Pager, who made tens of thousands of hand copies. Pager's work was posthumously published by the Heinrich Bart Institute, in the six-volume series "Rock Paintings of the Upper Brandberg" edited by Tilman Lenssen-Erz.

Furthermore, there about 150 sites are recorded in the Erongo Region alone, and the Region is also endowed with Iron Age artefacts and contemporary heritage resources. According to the National Heritage Council of Namibia (Declared Sites/Lists of National Heritage), Erongo Region has about 37 heritage sites which are listed as national monuments.

6.11 Air Quality

The only source of dust in the area is generated occasionally during strong winds and by the vehicles on the access gravel roads within the Daures Green Hydrogen Village.

6.12 Traffic

The current traffic numbers on the D2303 road fluctuates, and only high during tourist peak seasons. This is due to the road frequently being used by tourists visiting the Heritage and Archaeological sites in the area.

7 IDENTIFICATION OF ENVIRONMENTAL ASPECTS AND POTENTIAL IMPACTS

The consultation process with key stakeholders that included the Traditional Authorities, Conservancy and I&APs allowed the opportunity to raise the issues associated with the project development.

For context, these discussions should be read with the corresponding descriptions of the current environment in section 6 of this report.

The relevance of the potential impacts ("screening") are also presented in the tables below to determine aspects to be assessed in further detail (Section 8 of this report).

Table 8: Environmental Aspects and Potential Impacts

ASPECT	POTENTIAL ENVIRONMENTAL IMPACT	RELEVANCE (SCREENING) OF POTENTIAL IMPACT
Soil stripping (earthmoving equipment)	Potential impact on biodiversity (physical impacts and general disturbance) ◆ Loss of habitat ◆ Loss of biodiversity	***Construction Phase*** With reference to section 7.6.1, the site earmarked for the ammonia sulphate production facility is relatively an open rocky area with no vegetation. The related management and mitigation measures are stipulated in the ESMP and section 9 of this report, and no detailed assessment is required.
	◆ Potential impact on heritage sites ◆ Destruction and loss of heritage sites	***Planning and Construction Phases*** With reference to section 6.1, the ammonia sulphate production facility site location has been selected further away from these Welwitschia plant species, in order to limit interference and disturbance as much as possible. The related management and mitigation measures are stipulated in the ESMP and section 9 of this report, and no detailed assessment is required.
Oil and diesel spillages from vehicles and other equipment	Impact on groundwater water quality.	***Construction and Operational Phases*** With reference to section 7.8, the site is underlined by the alluvial aquifers in the basin which are very efficient at storing water. Therefore, oil and diesel spillages during construction and operational activities could potentially pollute the aquifer. Due to the potential pollution impact, groundwater pollution has been assessed in detail in section 8. The related management and mitigation measures are stipulated in the ESMP and section 9 of this report
Dust and Noise	Impact on health and safety	***Construction and Operational Phases*** With reference to section 7.3, the only source of noise in the area is the natural sounds from wind, the vehicles and trucks and the day-to-day construction and operational activities of the Daures Green Hydrogen Village. However, there are no immediate communities within 10 km to the village. With reference to section 7.11, the only source of dust in the area is generated occasionally during strong winds and by the vehicles on the access gravel roads within the Daures Green Hydrogen Village. However, there are no immediate communities within 10 km to the village. The related management and mitigation measures are stipulated in the ESMP and section 9 of this report, and no detailed assessment was required.
Economic impacts	Impacts on local economy ◆ Increased Employment opportunities. ◆ Transfer of skills	***Construction and Operational Phases*** With reference to section 7.5, with the potential employment of local people, this means that families will benefit from the project during the on-going phase. The project has great potential to improve livelihoods and contribute to sustainable development within the surrounding community. Due to the potential positive impacts, socio-economic has been assessed in detail section 8. The related management and mitigation measures are stipulated in the

		ESMP and section 9 of this report.
Vehicle and truck movement	Injury to people and animals and health and safety impacts	***Construction and Operational Phases*** With reference to section 6.10, the current traffic numbers on the D2303 road fluctuates, and only high during tourist peak seasons. This is due to the road frequently being used by tourists visiting the Heritage and Archaeological sites in the area. The flow of traffic on the D2303 road is not expected to be disrupted during the construction and operational activities. The related management and mitigation measures are stipulated in the ESMP and section 9 oof this report, and no detailed assessment is required.
Waste disposal Sewerage management	Health and Safety impacts on people. Emissions to land, impact on biodiversity, environmental degradation and nuisance impacts and contamination of surface water and groundwater	***Construction and Operational Phases*** With reference to section 4.14, waste will be generated on site during construction and operations. Waste will be transported off site and disposed of at the nearest approved landfill site in Henties Bay. No waste will be permanently disposed of or burnt on site. All hazardous waste, i.e., chemicals, hydrocarbon contaminated materials, used hydrocarbons etc., have the potential to impact the health of people and contaminate groundwater and surface water if not properly managed. The waste generated will be removed from site and disposed of at a licensed hazardous waste disposal site (Walvis Bay). Due to the significance of the potential impact as a result of hydrocarbons and the ammonia fertilizer, pollution and health and safety impacts have been assessed in detail in section 8. The related management and mitigation measures are stipulated in the ESMP and section 9 of this report
Ground Water Contamination	Impact on groundwater quality	***Construction and Operational Phases*** With reference to section 7.9, the Ugab River is located 15-40 km north of the project sites, while the Huab River is further from the project sites at 70-100 km. The basin's major source of water is groundwater. The basin has a potential of approximately 7.5 Mm3 /a of surface water and 19.8 Mm3 /a of groundwater. In addition, 73% of water used annually in the basin is groundwater. There are several Water Supply Schemes in the Ugab-Huab Basin found in areas such as Kalkfeld, Sesfontein, Fransfontein, Khorixas, Omatako Dam, Hochfeld, Opuwo, Kamamanjab etc. There are also some small Water Supply Schemes in the basin situated in the crystalline fractured aquifers in villages such as Anker, Bergsig, Erwee etc If pollution and potential contaminants such as hydrocarbons and effluent from the ammonia production facility is not managed, these could potentially contaminate the above-mentioned water supply schemes to the surrounding villages and settlements. It is important to note that groundwater vulnerability does not equate pollution, but a possibility of groundwater being exposed to something (pollution), its level and significance when and if it occurs. Due to the potential pollution impact, groundwater pollution has been assessed further in section 8. The related management and mitigation measures are

		stipulated in the ESMP and section 9 of this report
Surface Water Contamination		***Construction and Operational Phases*** Surface water potential pollution is likely to occur in the operational phase, particularly during heavy rain seasons. i.e., between October and March, when there would be a high risk of surface water run-off carrying along fertilizers, accidental spills of hydrocarbons (oils and or fuels) and effluent (wastewater) into the Ugab river. Similarly, the risk of pollution to surface water systems during the operational phase would be high if any major spills or leaks of fuels and fertilizers, land on the ground surface during the rainy seasons compared to dry or months with little to no rainfall (May to September). Due to the potential pollution impact, surface water pollution has been assessed further in section 8. The related management and mitigation measures are stipulated in the ESMP and section 9 of this report

8 ENVIRONMENTAL IMPACT ASSESSMENT

As per the aspects and potetinal impact table in section 7 above, the following aspects have been assessed in detail:

- Socio-Economic Impacts.
- Waste Management (Chemical Spillages)
- Groundwater and Surface Water
- Health and Safety (Ammonia Sulphate)

Table 8 shows the methodology used to conduct the qualitative assessment. Both the criteria used to assess the impacts and the method of determining significance of the impacts is outlined. This method complies with the Environmental Impact Assessment Regulations: Environmental Management Act, 2007 (Government Gazette No. 4878) EIA regulations. Part A provides the approach for determining impact consequence (combining severity, spatial scale and duration) and impact significance (the overall rating of the impact). Impact consequences and significance are determined from Part B and C. The interpretation of the impact significance is given in Part D. Both mitigated and unmitigated scenarios are considered for each impact.

Table 9: Assessment Methodology and Criteria

PART A: DEFINITION AND CRITERIA		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of severity, spatial extent and duration**
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action. Irreplaceable loss of resources.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints. Noticeable loss of resources.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints. Limited loss of resources.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Within 20 km of the site boundary.
	H	Widespread – Far beyond site boundary. Regional/ national

PART B: DETERACTIVITIES CONSEQUENCE					
SEVERITY = L					
DURATION	Long term	**H**	**Medium**	**Medium**	**Medium**
	Medium term	**M**	**Low**	**Low**	**Medium**
	Short term	**L**	**Low**	**Low**	**Medium**
SEVERITY = M					
DURATION	Long term	**H**	**Medium**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**

	Short term	**L**	**Low**	**Medium**	**Medium**
			SEVERITY = H		
DURATION	Long term	**H**	**High**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**
	Short term	**L**	**Medium**	**Medium**	**High**
			L	**M**	**H**
			Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/ national
			SPATIAL SCALE		
PART C: DETERACTIVITIES SIGNIFICANCE					
PROBABILITY (of exposure to impacts)	Definite/ Continuous	**H**	**Medium**	**Medium**	**High**
	Possible/ frequent	**M**	**Medium**	**Medium**	**High**
	Unlikely/ seldom	**L**	**Low**	**Low**	**Medium**
			L	**M**	**H**
			CONSEQUENCE		

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
High	It would influence the decision regardless of any possible mitigation.
Medium	It should have an influence on the decision unless it is mitigated.
Low	It will not have an influence on the decision.

8.1 Third Parties' health and safety

ISSUE: Health (Respiratory, Skin, Eye) and Safety (Fire and Explosion) Risks

Introduction

The likelihood of sporadic occurrences of fire due to heat build-up on machinery/equipment or generation of friction/impact sparks in hazardous storage areas etc. exists. If undetected this could become a serious issue. The ammonia product could be harmful or irritant to eyes and skin and/or the human ingestion and inhalation system. Dust build up could also result in fire/explosion risks.

The risk of fires or explosions during handling and storage of the chemicals is very little as long as the containers are in an undamaged state and the shelf life of the chemical is not expired or when safe working and standard operating procedures are not rigorously followed by maintenance and/or operational personnel at the facility.

The following scenarios were considered, which could lead to hazardous reagents/chemicals being released (spilled), potentially impact on health and safety:

Scenario 1: A bag or container being dropped or damaged during off-loading at the facility.

Scenario 2: A bag, IBC or pallet box being damaged by the forklift or the sun if stored under direct sunlight for long periods at the facility.

Assessment of impact

Severity

Taking all of the above into consideration, the impact severity is considered high in the unmitigated scenario and low to medium in the mitigated scenario.

Duration

The effects of the exposure to some of the chemical/reagents could be long term with regard to the health and safety of site neighbor and residence of Walvis Bay.

Spatial scale

In the unmitigated scenario, the impacts could be beyond the site boundary; therefore the spatial scale is medium. In the mitigated scenario, the impact could be contained and the spatial scale reduced to low to medium.

Consequence

The consequence in the unmitigated scenario will be high and with mitigation medium to high.

Probability

In the unmitigated scenario, it is possible that incidences will occur, chemicals/reagents be exposed and third parties impacted. In the mitigated scenario, these could be prevented.

Significance

The significance of this potential impact is high in the unmitigated and low to medium in the mitigated scenarios. I.N.K's confidence level is moderate with regard to these predictions due to a number of assumptions made regarding spillage scenarios, etc

Tabulated summary of the assessed impact – dangerous excavations

Mitigation	Severity	Duration	Spatial Scale	Consequence	Probability of Occurrence	Significance
Unmitigated	**H**	**H**	**M**	**H**	**M**	**H**
Mitigated	**L-M**	**H**	**L-M**	**M-H**	**L**	**L-M**

8.2 Socio-economic environment

Issue: Economic Contribution (Positive)

Introduction

There would be numerous benefits to the adjacent communities and the Namibian economy during the construction phase and operation phase. The benefits include employment opportunities, skills and development training and indirect capital injection into business. The economic Benefits include the following:

- Contribution to GDP.
- Increase in government tax revenue.
- Additional revenue to the local economy.

Severity

The proposed storage and handling of the chemicals and reagents project will have a small contribution to the GDP and will Increase government tax revenue.

Duration

This will be for the duration of the operations (medium term).

Scale

This impact will extend to a national spatial extent.

Consequence

The consequences can be rated as medium.

Probability

The likelihood of this impact occurring is medium in the unmitigated scenario and medium to high in the mitigated scenario.

.***Significance***

The significance of this potential benefit is medium positive in the unmitigated and mitigated scenarios. I.N.K's confidence level is high with regard to these predictions.

Summary of cumulative positive impacts on Socio-Economic Environment

Mitigation	Severity	Duration	Spatial Scale	Consequence	Probability Of Occurrence	Significance
Unmitigated	L	M	H	M	M	M+
Mitigated	L	M	H	M	M-H	M+

8.3 Groundwater and Surface Water

Issue: Impacts of chemical spillage on surface water quality

Hazardous chemicals could spill during the handling and storage. Contaminants from the site include discharges from the facility, as well as fuel and lubricant spillage, sewage, hazardous waste, general waste and erosion of particles from exposed soils in the form of suspended solids.

Watercourses in Namibia are typically ephemeral, only flowing after rainfall events. In such systems the surface water normally only flows over a short distance before percolating through the soil and recharge the underlying aquifer. In this way, surface water runoff from the site may include contaminants from the various processes that may affect the underlying groundwater but not necessarily the ephemeral rivers and drainage lines in the general area.

With regards to construction activities, excavation could impact on surface water flow and there might be an impact on sediment load transferred. Furthermore, the water quality could be

affected through the construction activities. The main factors which would affect the water quality are the equipment and spillage and leakage of fuel and oils/grease from these.

The potential impacts on groundwater quality as a results of such spillages is assessed in the section below.

Severity

The primary factors that may influence the water quality involve the scenario in which rainfall interacts with the spilled substance. In such a circumstance, the water would be tainted with ammonia sulfate, resulting in the formation of ammonia sulfate-enriched water. Subsequently, this contaminated water could be transported by locally generated storm-water.

Taking the above mentioned into consideration, the severity is medium in the unmitigated case reducing to low in the mitigated case.

Duration

The duration of potential environmental contamination spans the lifespan of the project, resulting in a moderate impact in both the unmitigated and mitigated scenarios.

Spatial Scale

Beyond the site boundary, hence medium influence in both the unmitigated and mitigated cases. .

Consequence

Based on the above assessment the determining consequence is medium in the unmitigated case and low in the mitigated case.

Probability

In the unmitigated scenario, it is possible that incidences (spillages) will occur and the possibility of pollution transported downstream from Manica Facilities or along the transport route, causing possible deterioration especially close to site, exists. Therefore, the probability of occurrence is medium in the unmitigated case and low the mitigated case.

Significance

The significance of this potential impact is medium in the unmitigated scenario and low mitigated scenario.

Summary of cumulative impacts on surface water quality

Mitigation	Severity	Duration	Spatial Scale	Consequence	Probability Of Occurrence	Significance
Unmitigated	M	M	M	M	M	M
Mitigated	L	M	M	L	L	L

Issue: The potential impact of groundwater quality

Groundwater could largely be vulnerable to contamination from seepage. Matters during the construction phase that are considered for the groundwater impact assessment includes the groundwater contamination from general construction activities, including the handling and storage of fuel. Matters during the operational phase that are considered for the groundwater impact assessment include groundwater contamination due to the on-site storage of hazardous productsm(Ammonia Sulphate).

The groundwater quality depends on the chemical spillages and its containment, thereof.

Severity

The fact that the project will make use impermeable surface liners, the severity of the impacts on groundwater will be medium (as opposed to high in the context of uncontrolled use thereof). This can however be reduced to low through further mitigation.

Spatial Scale

The impact would extend beyond the site boundary as contamination transport is expected to follow the groundwater flow patterns, hence medium influence in both the unmitigated and mitigated cases.

Duration

The duration of potential for pollution is longer than the operations, so the impact duration is high in both the unmitigated and the mitigated scenarios.

Consequence

Based on the above assessment the consequence is medium in the unmitigated case and medium in the mitigated case.

Probability

Probability of occurrence is medium in the unmitigated case and low in the mitigated case.

Significance

The significance of groundwater contamination is high in the unmitigated scenario but is low in the mitigated scenario.

Summary of cumulative impacts on groundwater quality

Mitigation	Severity	Duration	Spatial Scale	Consequence	Probability Of Occurrence	Significance
Unmitigated	M	M	M	M	M	M
Mitigated	L	M	M	L	L	L

8.4 Issue/Impact: Waste Management

Introduction

All hazardous waste will be removed from site and disposed of at a licensed hazardous waste disposal site (Walvis Bay).

Assessment of impact

Severity

The potential for waste to be blown beyond the site exists, due to the strong winds and pose a contamination risk. Therefore, the severity of the impact is medium in the unmitigated scenario and low in the mitigated scenario.

Duration

The waste management impact is reversible overtime therefore the duration in the unmitigated scenario is medium and low in the mitigated scenario.

Spatial Scale

The waste management impacts are not localised as it can blow beyond the site boundaries into Therefore, the spatial scale is rated high in the unmitigated scenario and low in the mitigated scenario.

Consequence

The impact of waste on site could have detrimental/cumulative effects, leading to the possible contamination of the surrounding area. Therefore, the consequence of this impact is medium in the unmitigated scenario and low in the mitigated scenario.

Probability

The probability of the waste management impact occurring is medium in the unmitigated scenario and low in the mitigated.

Significance

The perception of the land, in terms of its nature could potentially change in the unmitigated scenario. Therefore, the significance is rated high in the unmitigated scenario and could be reduced to low through mitigation.

Summary of cumulative impacts on groundwater quality

Mitigation	Severity	Duration	Spatial Scale	Consequence	Probability	Significance
Unmitigated	M	M	H	M	M	M
Mitigated	L	L	L	L	L	L

9 SUMMARY OF RECOMMENDED CONTROL AND MITIGATION MASURES

Environmental issues (i.e. potential impacts) were identified by I.N.K. Recommendations to manage, control and mitigate these issues are provided below

9.1 Soils, Groundwater and Surface Water

Project phase in which impact(s) may occur

Construction	Operation
Yes	Yes

9.1.1 Control and Mitigation Measures

The following control and mitigation measures should be implemented:

- Development of a monitoring network is recommended in order to quantify aquifer parameters and potential inflows.
- The location of the ammonia sulphate production facility location should be without drainage lines.
- The facility should be lined to prevent seepage into the subsurface and downstream rivers.
- Routine water quality monitoring of any discharge from the site, and any treated water used for supplying potable requirements, will be required to demonstrate compliance with the relevant water quality standards.
- Compliance with the Water Resources Management Act, 2013 (Act No. 11 of 2013), particularly regarding permitting, abstraction and discharge requirements; and
- Design for avoiding spillages into the environment (i.e. proper bunding, etc.) and to ensure that if a spillage occurs effective management and mitigation measures are implemented to clean-up the spill.
- Pollution will be prevented through basic infrastructure design and through maintenance of equipment.
- Ensure suitable receptacles with lids for waste disposal is available on site at all times.
- If rubbish containers are used, ensure these can be sealed from strong wind
- Regular environmental awareness should include potential risks associated with hydrocarbons.

- Soil contaminated with hydrocarbons shall be excavated and and transported for disposal at the nearest disposal facility (Walvis Bay Hazardous Disposal Facility).
- Adequate separate containers for hazardous and general waste must be provided on site.
- The workforce must be sensitized to dispose of waste in a responsible manner and not to litter.
- Chemicals are prevented from spilling using drip trays or other suitable containers.
- Accidental spills must be cleaned immediately.

9.2 Air Quality

Project phase in which impact(s) may occur

Construction	Operation
Yes	Yes

9.2.1 Control and Mitigation Measures

The following control and mitigation measures should be implemented:

- Application of dust suppression methods.

9.3 Noise

Project phase in which impact(s) may occur

Construction	Operation
Yes	Yes

9.3.1 Control and Mitigation Measures

The following control and mitigation measures should be implemented:

- Following of good design philosophies for vibrating structures that are known to be noisy.
- Development of a mechanism to monitor noise levels, record and respond to complaints and mitigate impacts.
- Acoustic barriers are proven to be effective in reducing environmental noise impacts.

9.4 Socio-Economic

Project phase in which impact(s) may occur

Construction	Operation
Yes	Yes

9.4.1 Control and Mitigation Measures

The following control and mitigation measures should be implemented:

- Plan for residents in Uis to form a significant part of the project hiring policy to give preference to Project Affected People (PAP) through recruitment and training.
- Local people be preferentially selected to encourage social growth and development in the region and Namibia as a country.
- Begin local selection and provide technical training as soon as possible to enable local people to compete for the lower skilled jobs and upskill themselves.

9.5 Traffic

Project phase in which impact(s) may occur

Construction	Operation
Yes	No

9.5.1 Control and Mitigation Measures

The following control and mitigation measures should be implemented:

- Signage must be implemented to warn motorists of merging heavy vehicle traffic. The signs should be installed 200 m on either side of access roads to the site. As per the SADC Road Traffic Signs Manual, it is recommended that sign W344-WA be installed on a Class IV high visibility background, with supplementary plates indicating “heavy vehicle entering” and the distance to the crossing i.e. “200 m”.
- Ensure that an Emergency Response Plan is in place, in event of an accident.
- Ensure the trucks keep their distance from one another, to allow other road users to pass safely.

9.6 Health and Safety

Project phase in which impact(s) may occur

Construction	Operation
Yes	Yes

9.6.1 Control and Mitigation Measures

The following control and mitigation measures should be implemented:

- Full building Inspections will be carried out by Safety Reps as part of a monthly program. Daily walk-rounds must be carried out to identify any potential issues
- The chemicals (fertilizer) shall only be stored in original containers being undamaged and sealed.
- Damaged containers, bags, etc. shall be sealed/repaired immediately with appropriate material.
- Broken/damaged bags must be correctly handled & repaired to avoid contamination
- A Standard Operating Procedure (SOP) must be developed for handling and storage.
- The storage of hazardous substances indoors will be carried out in well ventilated, cool and dry.
- Storage shall be carried out in facilities with appropriate bunding, specifically relating to the liquids.
- Ensure systems are in place to maintain stringent housekeeping standards.
- Ensure an offsite emergency plan is generated with relevant emergency responders.
- No foodstuffs will be stored within the facilities where fertilizer is stored.
- Prepare a strategy to ensure the least possible disruption to traffic and potential safety hazards during operations.
- Proper traffic and safety warning signs must be placed at the facility.
- Adhere to the regulations pertaining to Healthy and Safety, including the provision of personal protective clothing.
- Dust protection masks shall be provided where required.
- The contractor must enforce relevant Health and safety Regulations for these specific activities.
- Use protective hearing equipment for workers conducting noisy activities.

- Maintain high standard in housekeeping on site.
- Provide necessary fire prevention equipment on site in line with applicable regulations.
- Implement incident report access to incidents occurring at the facility as soon as possible and not later than 24 hours after the incident occurred (including short-and long-term response measures). A major incident is a e.g., fatality, injury, major oil spill, social unrest, outbreak of violence, labour strikes etc.
- MSDS of ammonia sulphate should be on display in facility.
- Risk assessment of area where chemicals are stored.
- Training provided for workers who handle the ammonia sulphate.
- Rationalizing chemical storage to ensure: accepting adequate quantities, compatibility of chemicals, adequate storage facilities and space available and all required signage and PPE are available
- Chemical training for workers
- Use personal protective equipment as described in the MSDS
- “Firewatch” staff will be identified and trained.
- Local induction and emergency training
- Emergency procedures in place
- Spill kits available
- First aid kits and trained first aiders/safety representatives

9.7 Waste Management

Project phase in which impact(s) may occur

Construction	Operation
Yes	Yes

9.7.1 Control and Mitigation Measures

The following control and mitigation measures should be implemented:

- Ensure suitable receptacles with lids for waste disposal is available on site at all times.
- If rubbish containers are used, ensure these can be sealed from strong wind
- Regular environmental awareness should include potential risks associated with hydrocarbons.

- Soil contaminated with hydrocarbons shall be excavated and and transported for disposal at the nearest disposal facility (Walvis Bay Hazardous Disposal Facility).
- Adequate separate containers for hazardous and general waste must be provided on site.
- The workforce must be sensitized to dispose of waste in a responsible manner and not to litter.
- Chemicals are prevented from spilling using drip trays or other suitable containers.
- Accidental spills must be cleaned immediately.
- Fire extinguishers must be in close proximity to fuel kept on site. There should be trained personnel to handle this equipment. At least two extinguishers should be placed at every entrance/exit.

10 CONCLUSION

It is I.N.K's opinion that the environmental aspects and potential impacts relating to the proposed ammonia production facility have been successfully identified.

The impact assessment presents the potential for positive and negative environmental and social impacts that can all be mitigated to acceptable levels. The most significant potential impacts (unmitigated) are:

- Fire and Explosion.
- Groundwater and Surface Water.
- Waste Management.
- Socio-Economic.

The assessment found that the proposed project presents the potential for minimal additional risks and related impacts in the mitigated scenario. Relevant mitigation measures have been provided and are included in the EMP that accompanies this scoping report. I.N.K believes that a thorough assessment of the proposed project has been achieved and that an environmental clearance certificate could be issued.

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