ENVIRONMENTAL IMPACT ASSESSMENT

For construction, operation, maintenance, and decommissioning of the proposed Karibib Powdered Activated Carbon (PAC) Plant and Ground Reservoir. Erongo Region.

A PROJECT BY NAMWATER

SCOPING REPORT FOR REVIEW

27 June 2023

LANA ENVIRONMENTAL
ADVANCING DEVELOPMENT SUCCESS

NAMWATER
Namibia Water Corporation Ltd

Document Status

EIA PHASE	Scoping Phase
PROJECT TITLE	Environmental Impact Assessment and compilation of an Environmental Management Plan for the construction, operation, maintenance, and decommissioning of the proposed Karibib Powdered Activated Carbon (PAC) Plant and Ground Reservoir.
PROJECT LOCATION	Karibib, Erongo Region
PROCUREMENT REFERENCE NUMBER	No: SC/RP/NW-011/2023
ECC APPLICATION NUMBER	APP - 230507001435
COMPETENT AUTHORITY	Department of Water Affairs (Ministry of Agriculture, Water and Land Reform) Department of Environmental Affairs (Ministry of Environment, Forestry and Tourism)
PROPONENT & EXECUTING AGENT	Namibia Water Corporation Private Bag 13389 176 Iscor Street Windhoek Department of Applied and Scientific Services
ENVIRONMENTAL ASSESSMENT PRACTITIONER	LANA Environmental Consulting P O Box 4628. Walvis Bay. Namibia Telephone: +264-81-2024059 E-mail: lanaconsultingcc@gmail.com Nangula Amutenya Amatsi (LEAD EAP) Faye Brinkman (2nd EAP)

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List of abbreviations & acronyms

BID:	Background Information Document
DEA:	Directorate of Environmental Affairs
DWA:	Department of Water Affairs
EAP:	Environmental Assessment Practitioner
ECC:	Environmental Clearance Certificate
EIA:	Environmental Impact Assessments
EMA:	Environmental Management Act No. 7 of 2007
EMP:	Environmental Management Plan
EPA:	Environmental Protection Agency
ERC:	Erongo Regional Council
Erongo RED:	Erongo Regional Electricity Distributor
GN:	Government Notice
I&APs:	Interested and Affected Parties
KWSS:	Karibib Water Supply Scheme
KWTP:	Karibib Water Treatment Plant
MAWLR:	Ministry of Agriculture, Water, and Land Reform
MEFT:	Ministry of Environment, Forestry, and Tourism
MSDS:	Material Safety Data Sheet
NHC:	National Heritage Council
PAC:	Powdered Activated Charcoal
PPE:	Personal Protective Equipment
NamWater:	Namibia Water Corporation Ltd
ToR:	Terms of Reference
WHO:	World Health Organisation
WRM:	Water Resources Management

Non - technical summary

Background

The Namibia Water Corporation (NamWater) Ltd, hereinafter referred to as the Proponent owns and operates the Karibib Water Supply Scheme (KWSS) that supplies water to Karibib Town council, NDF Air force Base, the Otjimbingwe Scheme (commissioned in June 2017) and other online customers on the pipelines supplying the Otjimbingwe Scheme and the Namibian Defence Force (NDF) Base.

Raw water is sourced from the Swakoppoort Dam, from where it is pumped to the Okongava Reservoir. From Okongava Reservoir, the raw water is conveyed via gravity to the Karibib Water Treatment Plant (KWTP).

Need and desirability and description of the proposed project

Raw water from Swakoppoort Dam is frequently of low quality due to high levels of blue-green algae. The current treatment plant in Karibib has experienced challenges in removing the blue-green algae and associated taste and odour in the raw water. NamWater has thus decided to install a Powdered Activated Carbon (PAC) pre-treatment plant (for taste & odour control and toxin removal) to support the treatment process done at the KWTP. The PAC will be constructed at a 1010 m^2 plot located opposite Karibib Extension 6, next to C32 road to Otjimbingwe. The PAC plant will be tapping raw water from the main bulk water transfer pipeline from the Swakoppoort Dam, approximately 3.1 Km before the KWTP. The raw water will be mixed with PAC in tanks (a total of 3 tanks). There will be telemetry communication between the PAC plant and KWTP. The PAC dosing will only be initiated when the raw water quality deteriorates, and results of the taste and odour compounds are high.

Moreover, to cater for future water demand for Karibib Town (future housing and development, agricultural plots, NDF Air Force Base and the Otjimbingwe settlement), a clear water ground-level reservoir (2 250 m^3) will be constructed., The new reservoir will thus enable a two-day storage at average annual daily demand, which provides a measure of water security, and should sources fail to serve as a buffer for daily and hourly peaks. The ground reservoir will be constructed within the NamWater premises at the KWTP.

Environmental impact assessment process

The proposed activities will trigger certain activities listed under No. 2 (2.1) and No 8 (8.5) of Schedule 1 of the Environmental Impact Assessment (EIA) Regulations (GN No. 30 of February 2012) and can therefore not be undertaken without an EIA. Considering the above, it is therefore required that an Environmental Clearance Certificate (ECC) be obtained from the Environmental Commissioner in accordance with Section 27 (3) of Namibia's Environmental Management Act (No. 7 of 2007) for the proposed Project, hence it was required to conduct at least the scoping phase of an EIA process.

LANA Environmental Consulting cc has been appointed as an independent Environmental Assessment Practitioner (EAP) by NamWater, to conduct an EIA for the construction, operation, maintenance, and decommissioning of the proposed Karibib PAC Plant and Ground Reservoir.

The main objective of this EIA is to determine the potential environmental impacts emanating from the construction, operation, maintenance, and decommissioning of the proposed infrastructure. The EIA was conducted with a multidisciplinary approach and followed Namibia's Environmental Assessment process. Relevant environmental data have been sourced from primary and secondary sources such as personal observations during site visits, inputs from NamWater's officials, stakeholders, and interested and affected parties (I&APs) as well as through the review of relevant literature and legal instruments.

Public participation

The engagement with the public and authorities commenced on the 30th of March 2023 and the first round concluded on the 21st of April 2023. During the first round of consultation, I&APs and authorities were allowed to register and submit comments and/or concerns on the proposed project. Authority scoping meeting was held with the Karibib Town Council followed by the public meeting at Usab Community Hall in Karibib. The main issue raised during the consultation meetings were the water quality issues being experienced currently in the town of Karibib.

Conclusion

The project is to be implemented in a developed urban land (not pristine land) in Karibib Town lands. There are no significant biophysical impacts expected, as the proposed project components have a small footprint. The impact assessment process also demonstrated that the potentially significant impacts can all be mitigated to acceptable levels. This EIA report provides information to enable the Department of Water Affairs (DWA) and the Directorate of Environmental Affairs (DEA) to make informed decisions about the project. Moreover, an Environmental Management Plan (EMP) has been prepared and it should be read in conjunction with this EIA report. The EMP will be used as a mitigation tool and an onsite reference document during all phases of the proposed project (planning, construction, operations, and decommissioning).

1 INTRODUCTION AND BACKGROUND

This section provides background and motivation to for the project; the study's terms of reference; the purpose of this report; the assumptions and limitations of the study; and an outline of the remainder of the report.

1.1 Introduction

Karibib is a town located in the Erongo Region, situated on the B2 national road (Trans-Kalahari Highway), halfway between Windhoek and Swakopmund. The town covers 97 square kilometres of townland. The town is the administrative capital of the Karibib electoral constituency, and it's known for its aragonite marble quarries and the Navachab Gold Mine. The Karibib Constituency includes the towns of Usakos and Karibib, the settlement of Otjimbingwe and the rural hinterlands that mainly comprise private commercial farms. The location of Karibib is depicted in Figure 1.

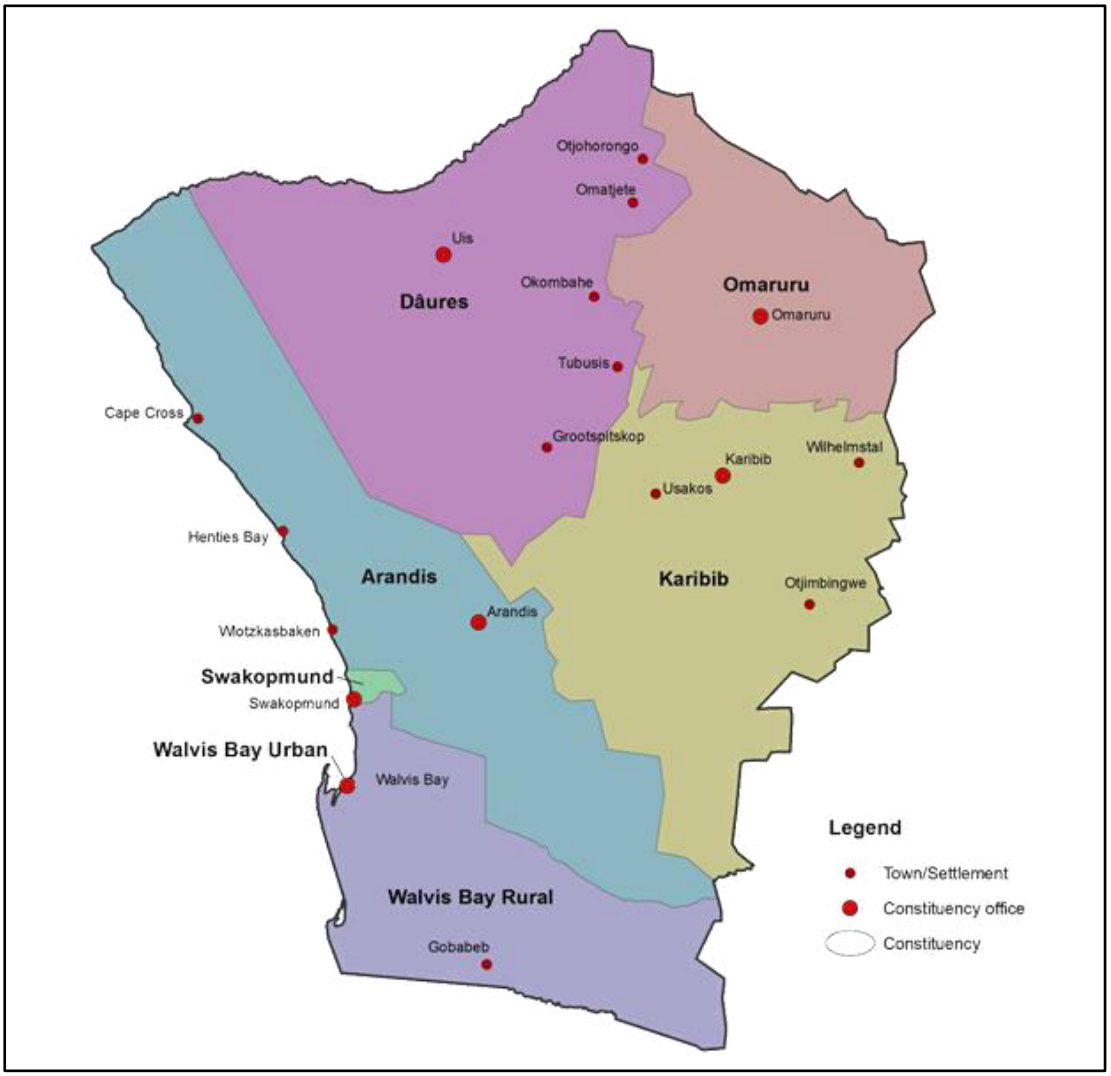


Figure 1: Locality Map for Karibib

1.2 Project Background

NamWater owns and operates the Karibib Water Supply Scheme (KWSS) that supplies water to the Karibib Town Council, NDF Air Force Base, the Otjimbingwe Scheme (commissioned in June 2017) and other online customers on the pipelines supplying the Otjimbingwe Scheme and the Namibian Defence Force (NDF) Base.

Raw water is abstracted from the Swakoppoort Dam and transferred via the Swakoppoort-Okongava and Okongava-Karibib pipelines to the Karibib Water Treatment Plant (KWTP). The Swakoppoort Dam has a full supply capacity of 63 489 Mm^3, with a 95% yield of 4.5 Mm^3. Raw water is sourced from the Swakoppoort Dam, from where it is pumped to the Okongava Reservoir. From Okongava Reservoir, the raw water is conveyed via gravity to the KWTP. The existing Swakoppoort – Okongava Scheme supplies raw water to both the Navachab mine and KWTP and lately also to the Desert Lion Energy Mine. The Swakoppoort – Okongava scheme and the schematic layout of the raw water Swakoppoort Dam Reservoir are shown in **Figure 2** and **Figure 3** respectively.

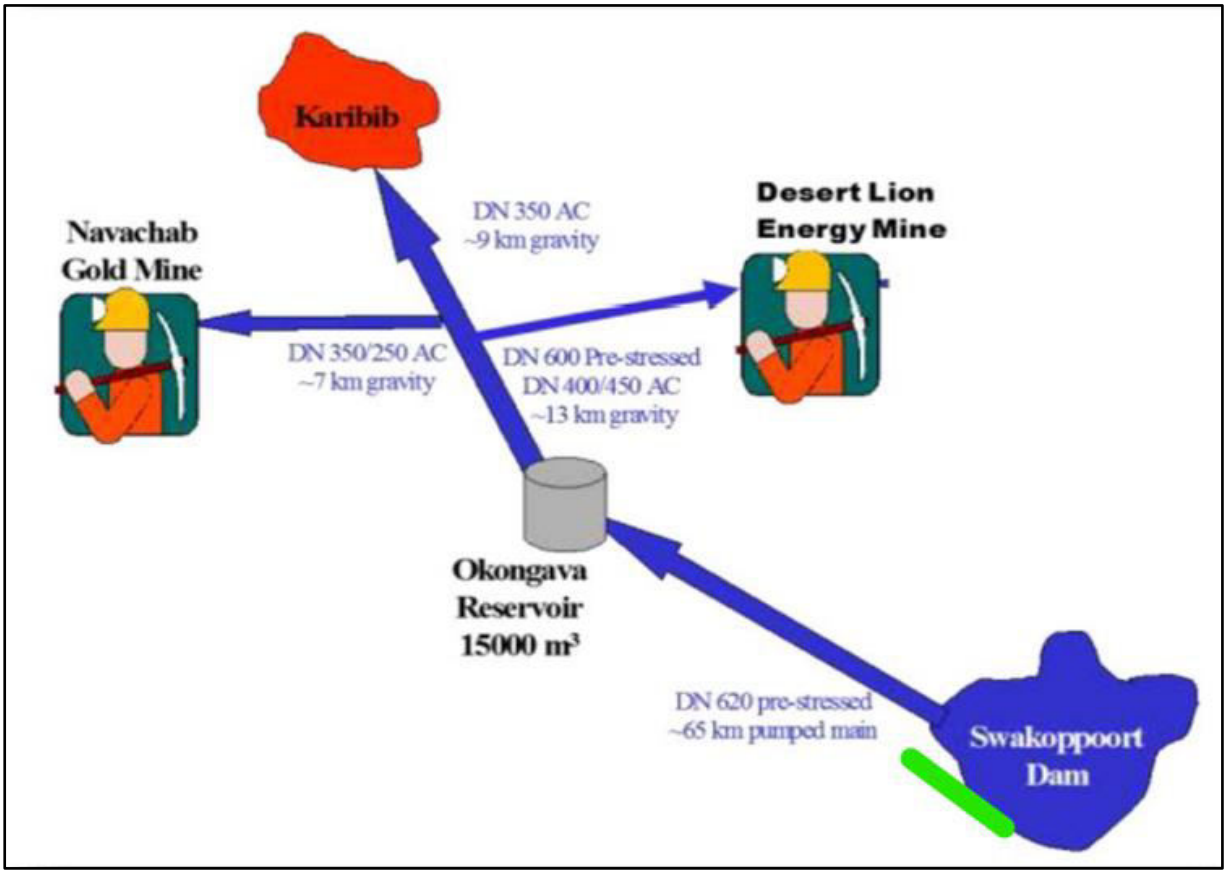


Figure 2: Swakoppoort – Okongava- Karibib scheme

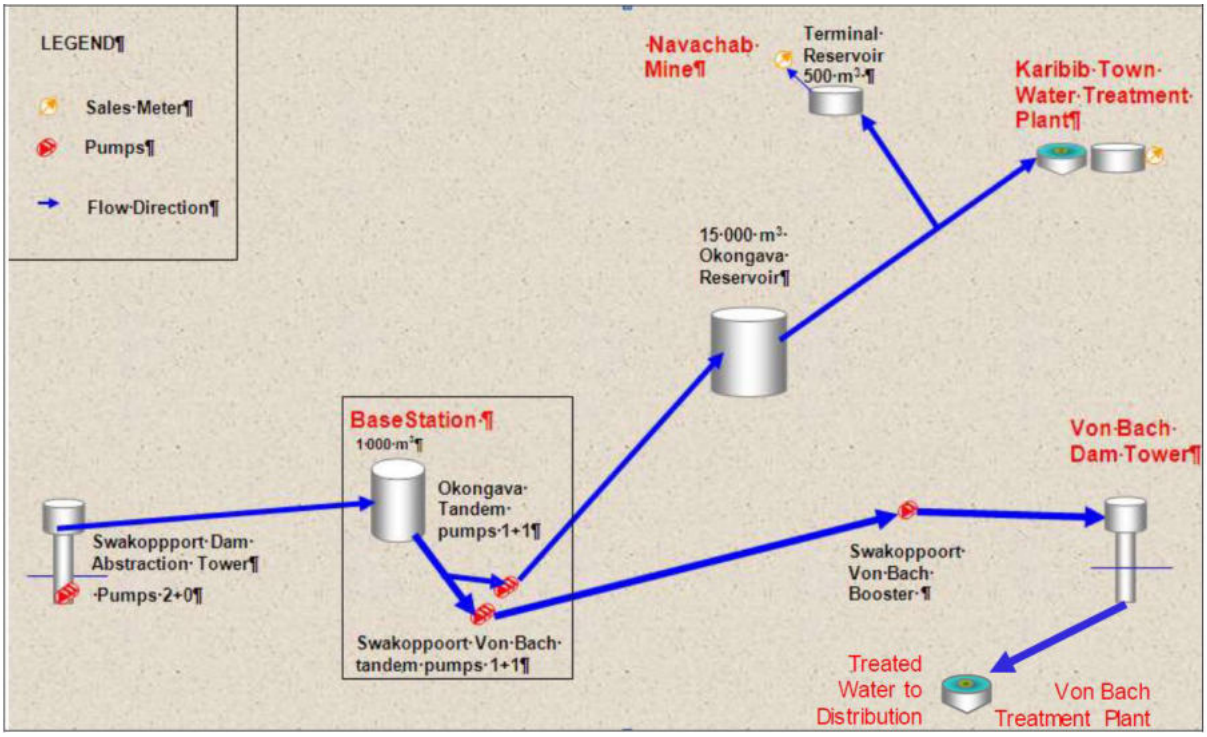


Figure 3: Map illustrating Water Transfers from Swakoppoort Dam

1.3 Need and desirability of the project

Raw water from Swakoppoort Dam is frequently experiencing low water quality due to high nutrient loads that consequently have increased production rates causing blue-green algae species counts to shoot up. These could be attributed to seasonal variations of the hydrological runoff, coupled with salinization, uplift and dynamics of sediments in Swakoppoort Dam.

The KWTP sometimes experiences challenges in removing the blue-green algae and associated taste and odour in the raw water (NamWater, 2018). To eliminate these challenges, NamWater decided to install a PAC pre-treatment plant for taste & odour control and toxin removal (methyl-iso-borneol (MIB) and geosmin) to support the treatment process done at the KWTP.

Moreover, to cater for future water demand for the Karibib Town (future housing and development, agricultural plots, and Namibia Defence Force (NDF) Air Force Base) and the Otjimbingwe settlement, a clear water ground-level reservoir will be constructed. The new reservoir will thus enable a two-day storage at average annual daily demand, which provides a measure of water security, and should sources fail to serve as a buffer for daily and hourly peaks.

1.4 Terms of Reference

Considering the need to undertake the proposed project LANA Environmental Consulting cc (hereafter LANA Environmental or the Environmental Assessment Practitioner (EAP) was appointed by NamWater to undertake an environmental impact assessment (EIA) to apply for an Environmental Clearance Certificate (ECC) for the construction, operation, maintenance,

and decommissioning of the proposed Karibib Powdered Activated Carbon (PAC) Plant and Ground Reservoir (hereafter referred to as the Project).

The scope of work for the EIA to be conducted specified the Request for Consultancy Services to Conduct an Environmental Impact Assessment and Compilation of an Environmental Management Plan for the construction, operation, maintenance and decommissioning of the proposed Karibib PAC Plant and Ground Reservoir Section 9 of the Bid Documentation (Procurement Reference Number: SC/RP/NW-011/2023) provided by the Proponent. The relevant requirements presented in the ToR are as follows:

The study should be undertaken in three linked phases:

- Phase 1: A scoping study.
- Phase 2: DEIA Report (if required) and
- Phase 3: Environmental Management Plan

The proponent and the EAP have agreed that the information provided at the Scoping level is sufficient and no specialist studies are required after the completion of the Scoping process. The EAP will then submit the Scoping Report and the EMP to the Environmental Commissioner. The EAP will provide sufficient information to allow the DEA/MEFT to issue an ECC for the project in the absence of a fatal flaw. However, an EIA should be done should it become clear that there are issues that warrant specialist studies and a detailed EIA.

1.5 Approach and Methodology of the Study

The next step followed as part of this EIA process was the scoping stage. The identification of impacts and their significance as well as public consultation (as prescribed by Regulation 21 to 24 of the EIA Regulations (GN. No. 30 of 2012) are important elements of the scoping stage. Hence, during the scoping stage issues/impacts that are likely to be significant are identified and those that are less significant are evaluated and if warranted, eliminated.
This stage, which began in February 2023 and is currently still underway, set out to -

- Collect baseline information and professional/public opinion concerning the proposed project and the receiving environment (i.e., social, and natural environments).
- Establish the policy, legal and planning framework.
- Determine how and to what extent the proposed project may affect the biophysical and social environment.
- Establish the need and desirability of the proposed project.
- Compare the advantages and disadvantages of feasible alternatives.
- Highlight the potential significant effects that are likely to be of most importance and to develop or recommend mitigation measures.
- Produce reports which will enable decision makers to decide whether to proceed with the project as anticipated and if so, what the implications of mitigation are likely to be.
- Compile an EMP which will indicate how mitigation measures would be implemented to avoid or minimize negative impacts, and to enhance positive impacts while promoting compliance with the principles of environmental management.
- Advise on any further studies to be conducted (if any) and provide appropriate Terms of Reference for these.

The steps followed as part of this EIA process are, the registration of the application and

execution of the Scoping Phase (content of this Report). A flowchart indicating the process being followed is presented in **Figure 4** below.

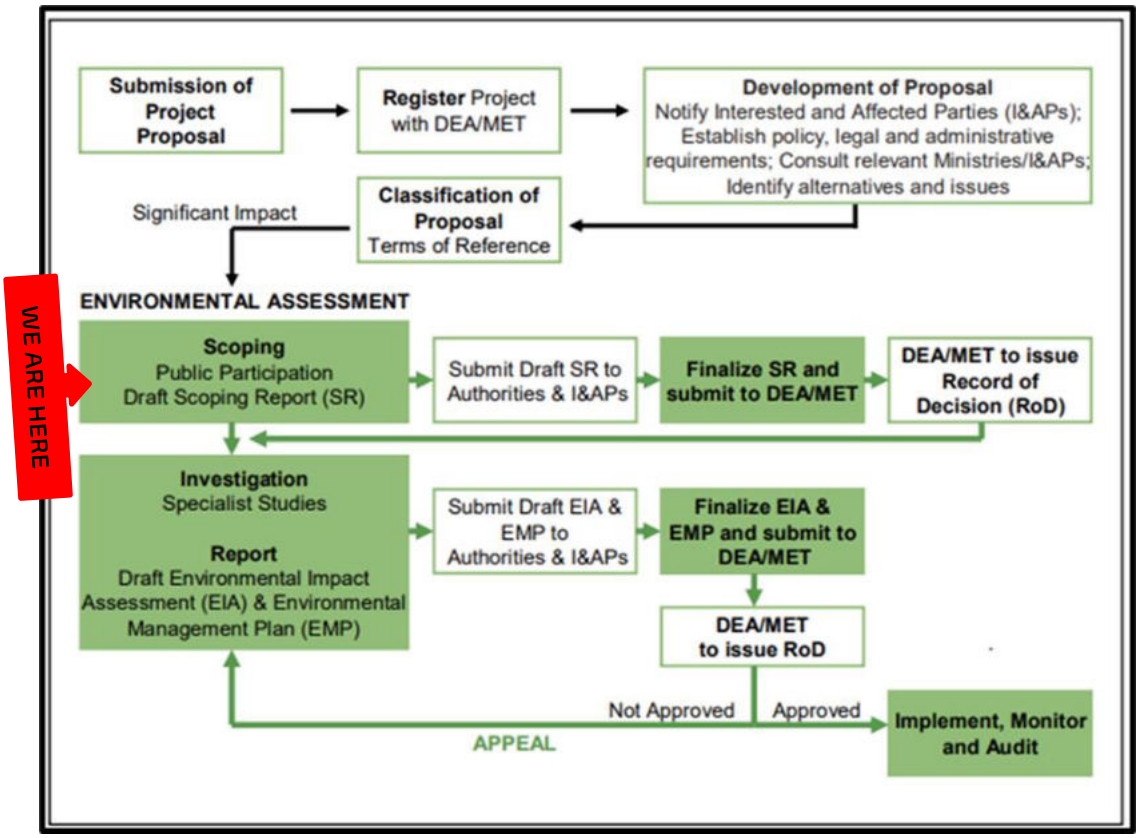


Figure 4: Diagrammatic representation of Namibia's Environmental Assessment process

1.6 Environmental Requirements

The first step followed as part of this EIA process was to identify the listed activities, which the project entails, as stipulated in the 'List of Activities that may not be undertaken without an Environmental Clearance Certificate' (GN. No. 29 of 2012). The proposed project is a listed activity under the EIA Regulations as follows:

Table 1: The listed activities of the project

Proposed project activities	Activities Triggered	
	Categories	**Specific Activity**
• Construction and operation of the PAC Plant • Construction of a groundwater reservoir	No. 2. Waste Management, Treatment, handling, and disposal activities	2.1 The construction of facilities for waste sites, treatment of waste and disposal of waste
	No. 8. Water Resource Developments	No. 8.5 Construction of dams, reservoirs, levees and weirs. No. 8.6 Construction of industrial and domestic wastewater treatment plants and related pipeline systems.

Considering the above, it is therefore required that an ECC be obtained from the Environmental Commissioner under Section 27(3) of Namibia's Environmental Management Act (No. 7 of 2007) (hereafter referred to as the EMA) for the proposed Project, hence it was required to conduct at least the scoping phase of an EIA process.

An application for an ECC was submitted to the Ministry of Environment, Forestry and Tourism (MEFT) EIA portal as prescribed by Regulation 6 of the EIA Regulations (GN. No. 30 of 2012), as provided for under Section 56 of the Environmental Management Act, No 7 of 2007.

This EIA is being undertaken as part of the process/ in support of the ECC application process from MEFT.

1.7 Scoping Phase of the EIA

The method followed during the scoping stage was under the Environmental Impact Assessment Regulations (GN. No. 30 of 2012), which included – Scoping as the initial phase of the EIA, and it refers to the process of determining the spatial and temporal boundaries for the EIA. In broad terms, this involves these important activities:

Giving notice to all potential interested and affected parties of the ECC application;

- Public consultation as per Regulation 21 which included the –
    - Opening and maintaining a register of all Interested and Affected Parties (I&APs); and
    - Receiving and recording all comments and representations received from I&APs following the public consultation processes.
- Preparing a scoping report by subjecting the proposed application to scoping by -
    - Confirming the process to be followed and providing opportunities for stakeholder engagement.
    - Identifying the key issues to be addressed and the approach to be followed in addressing these issues during the impact assessment phase.
    - Identifying any specialist studies which need to be undertaken and the terms of reference to be followed when undertaking them.
    - Informing all I&APs of the way forward.

- Providing all information to the relevant decision-making authority, thus ensuring accountable and transparent decision-making.
- Inviting all registered I&APs to comment on the scoping report.
- Presenting the record of decision to I&APs for objections and comments.

- All registered I&APs will be notified of the availability of the draft scoping report for review and comment.
- A detailed explanation of the activities undertaken to consult potential I&APs is presented in Section 3 of this report.

1.7.1 Collection of baseline information

Baseline information about the proposed development area the receiving environment, and the proposed activities were obtained from personal observations, interviews with the NamWater Business Unit Central staff members, a review of existing information, and contributions from stakeholders, relevant authorities, and I&APs. The process that was followed is explained in detail below:

i) Site visits

The initial site visit was conducted on the 6th of March 2023 with the NamWater Team (Environmentalist and the Artisans at the KWTP). During the site visit, the EAP was taken through the existing water treatment plant process and shown the site of the proposed reservoir and the PAC plant. The EAP collected baseline information on the biophysical environment of the site in terms of locally occurring flora, fauna and adjacent land use. Thereafter, other site visits were conducted on 24th of March and 11 & 14 April 2023, to collect more information.

ii) Review of existing information

The scoping process benefited a great deal from existing relevant information. The following documents were reviewed thus far:

- Karibib Water Quality Phase 1 (PAC Plant) Project – M&E Preliminary Design Report. NamWater-Mechanical and Electrical Engineering. December 2022.
- Karibib Water Quality: Chemical Equipment Sizing for Preliminary Design Input. NamWater-Water Treatment Services. September 2016.
- Development Proposal on Karibib Storage Extension. NamWater-Infrastructure Planning. August 2018.

1.8 Purpose of this scoping report

This report provides details of the assessment process that was followed: to address the key environmental issues and impacts associated with the proposed development; to document and assess issues and concerns of stakeholders and interested and affected parties (I&APs); to set out management and mitigation measures to avoid or reduce these impacts. Furthermore, this report provides a motivational background, the details of the proposed project, describes the public participation process undertaken and provides a list of the applicable legislation.

The objective of this report is:

- To provide the competent authority and the regulatory authority with a comprehensive account of the EIA process, findings, and input from I&APs, stakeholders, and commenting authorities who have participated in this EIA.
- To provide details of the applicable legislative framework to ensure that the proposed work is undertaken in an environmentally responsible manner; and
- To recommend methods to minimise the identified negative impacts (identified throughout the project life cycle) and its associated infrastructure and enhance the positive impacts to acquire the required ECC to proceed with the listed activity.

1.9 Study assumptions and limitations

- It is assumed that all the information provided, apart from the listed exclusions below, by the Proponent, the project team and the authorities consulted is accurate and that those aforementioned have disclosed all necessary information and documents available.
- It is assumed that there will be no significant changes to the proposed Project or the affected environment between the compilation of this report and the implementation of the proposed Project that could substantially influence findings, recommendations concerning mitigation and management, etc.
- It is assumed that no additional developments planned consequently to this study being undertaken.
- The assessment is based on the prevailing environmental (social and biophysical) and legislative context at the time of writing.

1.10 Environmental assessment team

LANA Environmental Consulting is an independent firm of consultants appointed by NamWater to carry out the EIA and to compile an Environmental Management Plan (EMP), which would be used to apply for an ECC for the construction, operation, maintenance, and decommissioning of the proposed PAC Plant and Ground Reservoir.

The EIA project team is outlined in **Table 2.** Nangula Amutenya Amatsi is the lead EAP who conducted this EIA process, assisted by Faye Brinkman. Their CVs are attached in Appendix A.

Table 2: EIA Team

Name	Company and Role	Email address
Fillemon Aupokolo	NamWater Environmentalist	AupokoloF@namwater.com.na
Jolanda Kamburona	NamWater Acting Manager: Environmental Services Sub-division	KamburonaJ@namwater.com.na
Joseph Shigwedha	NamWater Mechanical Engineering	ShigwedhaJN@namwater.com.na
Selma Shilongo	NamWater Civil Engineering and Designs	ShilongoS@namwater.com.na
Lazarus Muhimba	NamWater Project Manager	MuhimbaL@namwater.com.na
Nangula Amutenya – Amatsi	LANA Environmental Consulting Lead EAP	nangula.a@gmail.com
Faye Brinkman	LANA Environmental Consulting EAP	brinkman.faye@gmail.com

1.11 Structure of the EIA Report

Table 3 outlines the EIA Report requirements contained in Section 15 of the EIA Regulations under the Environmental Management Act, 7 of 2007. The table includes references to the relevant sections in the report.

Table 3: EIA Report requirements and reference in the report

Requirements for a Scoping Report in terms of the February 2012 regulations (Section 8)	Reference in the Report
• a description of the site on which the activity is to be undertaken and the location of the activity on the site	Section 0
• a description of the proposed listed activity and how the physical, biological, social, economic, and cultural aspects of the environment may be affected by the proposed activity.	Section 5 and Section 7
• an identification of laws and guidelines that have been considered in the preparation of the scoping report	Section 2
• 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, organizations and organs of state that were registered in terms of regulation 22 as interested and affected parties in relation to the application; and (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.	Section 3
• a description of the need and desirability of the proposed listed activity and identified potential alternatives to the proposed listed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity.	Section 1.3
• 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	Section 8
• an indication of the methodology used in determining the significance of potential effects.	Sections 8.1 & 8.2
• a description and comparative assessment of all alternatives identified during the assessment process.	Section 5.4
• a description of all environmental issues that were identified during the assessment process, an assessment of the significance of each issue and an	Section 8.4

Requirements for a Scoping Report in terms of the February 2012 regulations (Section 8)	Reference in the Report
indication of the extent to which the issue could be addressed by the adoption of mitigation measures.	
• an assessment of each identified potentially significant effect, including - (aa) cumulative effects; (bb) the nature of the effects; (cc) the extent and duration of the effects; (dd) the probability of the effects occurring; (ee) the degree to which the effects can be reversed; (ff) the degree to which the effects may cause irreplaceable loss of resources; and (gg) the degree to which the effects can be mitigated.	Section 8.4 – 8. 7
• a description of any assumptions, uncertainties, and gaps in knowledge;	Section 1.9
• an opinion as to whether the proposed listed activity must or may not be authorised, and if the opinion is that it must be authorised, any conditions that must be made in respect of that authorisation; and	Chapter 9
• a non-technical summary of the information.	Page viii

2 LEGAL AND POLICY FRAMEWORK

To protect the environment and ensure that the development is undertaken in an environmentally and socially responsible manner, several environmental and social legislations need to be adhered to.

Several sectoral laws fall under the general rubric of environmental laws. Sectoral laws are generally specific and apply to sectors such as forestry, water, mining and so forth. Any development, such as the proposed Project, is expected to have certain impacts and would therefore have to comply with some or other legislative requirement/s before commencement.

This section provides an overview of the legislation that applies to both the assessment process and the various activities making up the Project.

2.1 Applicable legislations

To protect the environment and ensure that the development is undertaken in an environmentally and socially responsible manner, several environmental and social legislations need to be adhered to.

Table 4: Applicable legislation

LEGISLATION	PROVISION	PROJECT IMPLICATIONS
Constitution of the Republic of Namibia (1990)	Articles 91 (c) commands the state to actively promote and sustain the environmental welfare of the nation by formulating and institutionalizing policies to accomplish the sustainable objectives which include: • Guarding against overutilization of biological natural resources, • Limiting over-exploitation of non-renewable resources, • Ensuring ecosystem functionality, • Protecting Namibia's sense of place and character. • Maintain biological diversity. • Pursuing sustainable natural resource use. Article 95 (l) recites: "The State shall actively promote… maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future". Furthermore, Artic 95 (l) ensures that workers are paid a living wage adequate for the	The proponent shall be advocating for sound environmental management through the implementation of the environmental management plan, as set out in the constitution.

LEGISLATION	PROVISION	PROJECT IMPLICATIONS
	maintenance of a decent standard of living and the enjoyment of social and cultural opportunities.	
Namibia Water Corporation Act 12 of 1997	To establish the Namibia Water Corporation Limited; to regulate its powers, duties, and functions; to provide for more efficient use and control of water resources, and to provide for incidental matters. Without prejudice to the generality of section 5, the Corporation shall perform the following functions in pursuit of its objects under this Act, namely – (a) Explore, develop, and manage water resources for water supply. (b) Acquire, plan, design, construct, extend, alter, maintain, repair, operate, control, and dispose of waterworks. (c) Subject to section 7 and notwithstanding any provisions of the Water Act to the contrary, supply water to customers within and outside the borders of the Republic of Namibia. (d) Investigate, research, and study matters relating to water resources, waterworks, and the environment. (e) Take such action as the Corporation may consider necessary or as the Minister may direct to conserve or augment water resources in Namibia. (f) Render services, provide facilities, and lease rights, subject to the payment of relevant charges. (g) establish training facilities and train personnel; and (h) Perform any other function as may be necessary or expedient for the achievement of the Corporation's objects.	NamWater is a commercial entity supplying water in bulk to industries, municipalities and the Directorate of Rural Water Supply in the Ministry of Agriculture, Water and Land Reform. NamWater is carrying out its functions as mandated by the Act, which is the provision for the planning & designing, construction, operation, maintenance, and decommissioning of the proposed Karibib Powdered Activated Carbon (PAC) Plant and Ground Reservoir.
Environmental Management Act 7 of 2007	The purpose of this Act is to promote the sustainable management of the environment and the use of natural resources by establishing principles for decision-making on matters affecting the environment; to provide for a process of assessment and control of projects which may have significant effects on the environment, and to provide for incidental matters. The Act gives legislative effect to the Environmental Impact Assessment Policy. Moreover, the act also provides procedures for adequate public	Application for the Environmental Clearance for the activities will be submitted to the competent and regulatory authority.

LEGISLATION	PROVISION	PROJECT IMPLICATIONS
	participation during the environmental assessment process for the interested and affected parties to voice and register their opinions and concern about the proposed project. The Environmental Impact Assessment Regulations Government Notice No. 30, promulgated on 6 February 2012. The regulations listed certain activities that require an ECC from MEFT: DEA before commencing.	
Water Act No. 54 of 1956, as amend	This Act is still the only enforced legislation applicable to water legislation in Namibia. It was promulgated by the previous South African Government when Namibia (then Southwest Africa) was under South African administration. Only certain Articles in the Act relevant to Namibia were made applicable in the Country according to Article 180 of the Act. The Act remains in force in Namibia in terms of Article 140 of the Constitution, until such time as it is repealed or amended by an Act of the Namibian Parliament. This existing Water Act in Namibia is expected to be repealed by the Water Resources Management Act, No. 11 of 2013, promulgated by Parliament in November 2013, but not yet enforced. The Water Act makes provision for a number of functions pertaining to the management, control and use of water resources, water supply and the protection of water resources. A distinction is made between private and public water in terms of ownership, control and use. The Act recognises the natural environment as a water user. The Water Act 54 of 1956 and its requirements in Terms of Water Supplies for drinking water and Wastewater Treatment and Discharge. The Guidelines for the Evaluation of drinking-water quality for human consumption with regards to chemical, physical, and bacteriological quality requires that; water supplied for human consumption must comply with the officially approved guidelines for drinking-water quality. For practical reasons, the approved guidelines have been divided into three basic groups of determinants, namely: • Determinants with aesthetic implications • Inorganic determinants • Bacteriological determinants The water quality for human consumption is classified into three groups. The	This Act, along with the Water Resources Management Act, No 11 of 2013 requires the Proponent and Project team to investigate and implement measures to ensure the sustainable use of water resources and ensure that no pollution of any above or below-ground water takes place. The Applied Scientific Services Division is responsible for conducting microbiological analysis while the physical/ aesthetic and chlorine analyses are done at KWSS on different frequency as follow: • Physical/aesthetic quality: **every two hours, daily** • Chlorine suspension: **every two hours, daily** • microbiological quality: **Monthly** The Water Act 54 of 1956 has been replaced with a new Water Resource Management Act (WRMA) 11 of 2013 along with new water quality standards. The WRMA has not yet come into force legally. However, the DWA has started

LEGISLATION	PROVISION	PROJECT IMPLICATIONS
	concentration of and limits for the aesthetic, physical and inorganic determinants define the group into which water will be classified. • Group A: Water with an excellent quality • Group B: Water with acceptable quality • Group C: Water with low health risk • Group D: Water with a high health risk, or water unsuitable for human consumption Water should ideally be of excellent quality (Group A) or acceptable quality (Group B), however, in practice, many of the determinants may fall outside the limits for these groups. If water is classified as having a low health risk (Group C), attention should be given to this problem, although the situation is not critical yet. If water is classified as having a higher health risk (Group D), urgent and immediate attention should be given to this matter. Since the limits are defined based on average lifelong consumption, short-term exposure to determinants exceeding their limits is not necessarily critical, but in the case of extremely toxic substances, such as cyanide, remedial measures should immediately be taken. The overall quality group into which water is classified is determined by the determinant that complies the least with the guidelines for the quality of drinking water. Moreover, the recommended frequency for bacteriological analysis of drinking water applications in terms of Section 21(5) and 22(2), for compliance with the requirements of Section 21(1) and 21(2) of the Water Act (Act 54 of 1956) that purified water shall comply with General Standard as laid out in Government Gazette Regulation R553 of 5 April 1962.	enforcing the water quality standards of 2013 and NamWater in endeavour to meet these standards.

<table>
<tr><th>LEGISLATION</th><th>PROVISION</th><th>PROJECT IMPLICATIONS</th></tr>
<tr><td>Water Resources Management Act No. 11 of 2013</td><td>Provides for the management, development, protection, conservation,and use of water resources.

Part XIII of the Act requires that efficient water management practises be applied by every person or organisation and organ of state.

The Regulations of the WRMA also outlined the water quality guidelines and standards for potable water specified in Table 1 to Table 3.
The Regulations also specified the frequency of microbiological monitoring for bulk water supply: Table 4.
<table>
<tr><th>SIZE OF POPULATION SERVED</th><th>Turbidity 95%</th><th>MINIMUM FREQUENCY OF SAMPLING</th></tr>
<tr><td>>250 000</td><td>< 0.5 NTU</td><td>Thrice weekly ***</td></tr>
<tr><td>100 001 – 250 000</td><td>< 1.0 NTU</td><td>Twice weekly</td></tr>
<tr><td>50 001 – 100 000</td><td>< 1.0 NTU</td><td>Once weekly</td></tr>
<tr><td>10 001 – 50 000</td><td>< 1.0 NTU</td><td>Three times every month</td></tr>
<tr><td>< 10 000 reticulated</td><td>< 1.0 NTU</td><td>Once every month*</td></tr>
<tr><td>< 10 000 non-reticulated</td><td>1 - 2 NTU</td><td>Once every month*</td></tr>
</table>
</td><td>Provide for the necessary planning and technology to prevent any potential pollution of groundwater. Water should be used in a sustainable way.</td></tr>
<tr><td>Draft Pollution Control and Waste Management Bill (September 2003)</td><td>Promotes sustainable development and relates to preventing and regulating the discharge of pollutants to the air (Part 2),water and land (Part 3); integrated pollution control (Part 4) and to regulating noise, dust, and odour pollution (Part 5); and to establishing a system of waste planning and management (Part 6)</td><td>Pollution in the air and water should be avoided.

Dust pollution should be prevented.

Waste management should be applied.

All waste management activities generated by the Karibib Powdered Activated Carbon Plant and Ground Reservoir project are the responsibility of NamWater and the Contractor.</td></tr>
<tr><td>Atmospheric Pollution Prevention Ordinance No. 11 of 1976 (as amended)</td><td>Provides for the prevention of pollution ofthe atmosphere. Part IV of the Ordinance deals with the control of dust and provides for the proclamation of dust control areas.</td><td>A general obligation is not to contribute to or cause dust pollution.</td></tr>
</table>

LEGISLATION	PROVISION	PROJECT IMPLICATIONS
Public Health and Environmental Act No. 1 of 2015	Section 119 of this Act prohibits the existence of a nuisance on any land owned or occupied by the Proponent. The term nuisance is important for this EIA, as it is specified, where relevant in Section 122 as follows: • Any dung pit, slop tank, ash pit, or manure heap so foul or in such a state or so constructed as to be offensive or to be injurious or dangerous to health. • Any other condition that is offensive, injurious, or dangerous to health. Sanitary conveniences: An employer shall provide water closets which are readily accessible to the employees, in the following ratio to employees having to use such water closets – if the number of employees is less than 75, not less than one water closet for every 15 employees, or part thereof, of each sex; if the number of employees exceeds 75, but is less than 400, not less than one additional water-closet shall be provided for every 25 employees, or part thereof, of each sex, more than 75 employees; or If the number of employees exceeds 400, not less than one additional water closet shall be provided for every 50 employees, or part thereof, of each sex, excess of 400 employees. An employer who employs five or more male employees shall provide not less than one urinal for every 25 male employees, or part thereof. The toilets for each sex, and the entrances to such toilets, shall, to the satisfaction of an inspector, be properly separated and marked.	Nuisance such as dust, noise, bad odours, etc. should be controlled during all project phases. Sanitary conveniences should be provided for as per the minimum requirements prescribed by the law.
National Labour Act 11 of 2007	The objectives of the National Labour Act are: • To establish a comprehensive labour law for all employers and employees; to entrench fundamental labour rights and protections. • Regulate basic terms and conditions of employment. • Ensure the health, safety, and welfare of employees and protect employees from unfair labour practices. • To regulate the registration of trade unions and employers' organization and regulate collective labour relations. • To provide systematic prevention and resolution of labour disputes. Some of the notable Sections under this Act are. Health and Safety Procedures Section 17 (1) The employer shall prepare any health	The Employer needs to comply with health and safety regulations pertaining to the health and safety of employees. The Proponent, Contractors, and Sub-contractor shall all be guided by this Act when recruiting or handling employment-related issues. Contractors must adhere to the minimum workplace safety standards such as all employees must be provided with appropriate Personal Protective

LEGISLATION	PROVISION	PROJECT IMPLICATIONS
	and safety procedure referred to in sub-regulation (1) in consultation with the workplace safety committee concerned. Section 21. (1) Any person who intends to commence any mining operation shall give 30 da notice of such intention to the Minister. Section 22. (1) In the event of an accident or dangerous occurrence in or in connection with a workplace, including a mine, or if an employee dies, or suffers a serious injury because of such an accident or dangerous occurrence, the employer shall notify and report such accident to the Chief Inspector of Labour of the area. Notification of Occupational Diseases (OD), Section 23. If a medical practitioner finds that any person is suffering from an occupational disease listed in Annexure A. 2(1), or of any other disease that he or she believes was caused by that person's current or past employment, he or she shall immediately and in the form of Form OD. 1, report this fact to the Chief Medical Officer of Occupational Health and Safety. It shall be an unfair dismissal, or unfair disciplinary action, in terms of section 45 by an employer if such employer terminates the services of, or takes disciplinary action against, such employee if such employee has contracted an occupational disease listed in Annexure A. 2 (1), or any other disease, because of his or her past or present employment with such employer. Section 210, states that an employer shall ensure that an employee wears or uses, to the satisfaction of an inspector, suitable and adequate personal protective equipment.	Equipment (PPE).
Regulations relating to the health and safety of employees at work are contained in GN 156/1997 (GG 1617)	Annexure E: Schedule 1 (2) lays out theoccupational exposure limits for airborne hazardous substances, including amongothers all forms of asbestos. Annexure E: Schedule 2 (1) details the Asbestos Regulations, providing for the management and control with respect to asbestos in work environments	Any work related to the handling and disposal of the asbestos cement pipeline should adhere to the provisions of these regulations – airborne exposure limits should not be exceeded.
National Heritage Act No. 27 of 2004	The Act is aimed at protecting, conserving, and registering places and objects of heritage significance.	All protected heritage resources (e.g., human remains, etc.) discovered, need to be reported immediately to the National Heritage Council (NHC) and require a permit from the NHC before they may be relocated.

LEGISLATION	PROVISION	PROJECT IMPLICATIONS
Namibia's Second National Biodiversity Strategy and Action Plan (2013-2022)	Namibia's NBSAP2 covers the period 2013-2022, and its vision is for "Namibia's biodiversity to be healthy and resilient to threats, and for the conservation and sustainable use of biodiversity to be key drivers of poverty alleviation and equitable economic growth, particularly in rural areas." The Strategic Goals and Targets of NBSAP2 are: • Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society; • Reduce direct pressures on biodiversity and promote the sustainable use of biological resources; • Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity; • Enhance the benefits to all from biodiversity and ecosystem services; and • Enhance implementation of NBSAP2 through participatory planning, knowledge management and capacity building.	Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society.
MEFT Policy on HIV/AIDS	MEFT has recently developed a policy on HIV/AIDS. In addition, it has also initiated a programme aimed at mainstreaming HIV/AIDS and gender issues into environmental impact assessments.	The proponent and its contractor must adhere to the guidelines provided to manage the aspects of HIV/AIDS. Experience with construction projects has shown that a significant risk is created when migrant construction workers interact with local communities.
Local Authorities Act No. 23 of 1992	The Local Authorities Act prescribes how a town or municipality should be managed by the Town or Municipal Council.	The development has to comply with the provisions of the Local Authorities Act, specifically to all the Karibib Town Council by – laws related to construction and waste management.
White Paper on National Water Policy for Namibia	The Policy focus on resource sustainability, sustainable utilization and accessibility to water. The policy also refers to the right of every citizen to obtain, within a reasonable distance from their place of abode, a quantity of water sufficient to maintain life, health and productive activity.	Obligation to use water resources sustainably and to properly maintain the water supply and distribution system.

3 PUBLIC PARTICIPATION PROCESS FOLLOWED

This section describes in detail the full extent of the public consultation process that was followed and the I&APs and authorities that were notified of the study being undertaken. It also includes the main issues and concerns raised during the public consultation process and comments received on the Background Information Document (BID) (Appendix B) (1st round of public consultation).

The study was subjected to a public participation process as defined in the Environmental Management Act 7 of 2007 and EIA Regulations of February 2012, this is summarized in the next sections.

3.1 First round consultation

The engagement with the public and authorities commenced on the 30th of March 2023 and concluded the first round on the 21st of April 2023. During the first round of consultation, I&APs and authorities were allowed to register and submit comments and/or concerns on the proposed project.

3.1.1 Background Information Document and PowerPoint Presentation

The background information document (BID) was compiled in English and distributed to all registered I&APs and stakeholders. The BID provided a brief introduction of the proposed project, the assessment process, and the public consultation process to be followed. A PowerPoint Presentation (Appendix C1) was prepared and used during consultation meetings.

3.1.2 Authority scoping meeting

The project was formally introduced to the Karibib Town Council, which is one of the key relevant stakeholders and authorities for this project. The BID and a request for the consultation meeting were emailed to the CEO and hand-delivered to the Health Section, Town Planning and Building Control Sections. The consultative meeting was held on 14 April 2023 at the Karibib Town Council office. Issues and responses recorded in this meeting are presented in **Table 5**).

3.1.3 I&APs invitation and consultation

Activities undertaken to date to ensure effective and adequate I&AP involvement, are as follows:

- Notices announcing the commencement of the EIA study and an invitation to register as an I&AP and to attend either one of two the public meetings, were placed in two newspapers Namib Times (31 March & 6 April 2023) and the Namibian (on 30 March & 6 April 2023) (Appendix C2).
- Invitations to attend the public meeting and a BID were hand-delivered to key stakeholders such as the Karibib Constituency Council, Ministry of Agriculture, Water and Land Reform – Directory of Rural Water Supply and Sanitation and the Erongo Regional Electricity Distributor (Erongo RED).

- Invitations to attend the public meeting and a BID were hand-delivered to adjacent land users near the site for the PAC plant – on 11 April 2023. BIDs were handed out to 10 surrounding neighbours.
- Invitations to attend the public meeting and a BID were hand-delivered to adjacent neighbours of the KWTP – on 11 April 2023. BIDs were also given to 21 adjacent neighbours to the KWTP.
- Site notices with details of public meetings were placed at KWTP and the site for the PAC (**Figure 5**).

- Five notices with details of the public meeting were placed within the town of Karibib - Karibib Town Council office, Usab Community Hall, Ok Supermarket and Karibib SME Centre (**Figure 6**).
  - All stakeholders are registered in the database (Appendix C5).

Figure 5: Site Notices (A) Site for the PAC (B) KWTP

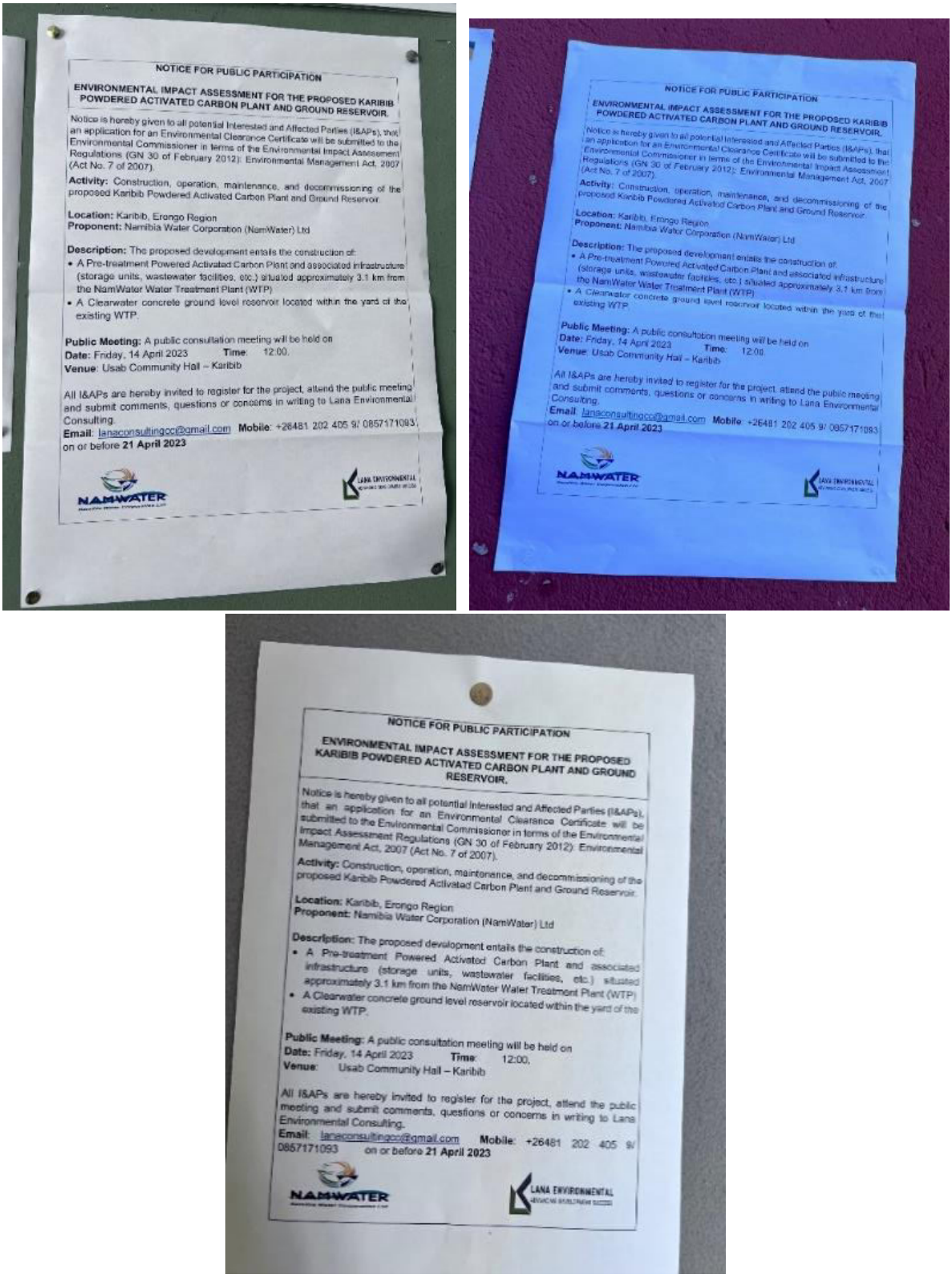


Figure 6: Public meeting invitation notices placed around Karibib

3.1.4 Public consultative meeting

A public meeting was held on 14 April 2023 at the Usab Community Hall. During the meeting, the EAP introduced the project to the attendees and allowed them to ask questions and make

comments. The meeting was attended, by one member of the public, two NamWater employees and two representatives of the Karibib Town Council. Issues and responses from this meeting are presented in Table 6.

The proof of the above consultations is contained in Appendix C, of this report. These include:

- Appendix B – BID
- Appendix C 1 – PowerPoint Presentation for consultation meetings
- Appendix C 2 - Copies of newspaper advertisements x 4
- Appendix C 3 – register for receiving BIDs – neighbours.
- Appendix C 4- Attendance registers for public meetings and authority consultation meetings.
- Appendix C 5 - Stakeholder database.

3.1.5 Concerns raised at consultation meetings and response

Issues that were raised during the public participation process and authority scoping meetings are summarised in **Table 5** below.

Table 5: Issues and response from the authority scoping meeting with Karibib Town Council

Authority Consultation: Karibib Town Council Offices: **Date:** 14.04.2023: **Time:** 09h30 – 13h00 **Number of people attended:** 9			**Institutions/ Authorities Present** • **Karibib Town Council**
No.	**Who raised the issue?**	**Issues/Comments/Questions**	**Response by LANA**
1.	S. Au-Khaob Environmental Health Practitioner	Water quality is poor. The employees of the Karibib Town Council are concerned with the water quality and they believe NamWater is withholding water quality data and information from the Town Council	LANA proposed that the Town Council officially request water quality data and information monthly following the proper channels, i.e. contact the Area Manager and CEO if need be, to request water quality data analysis report regularly. NamWater is unable to deny their customer access to water quality data and information. NamWater is mandated to be open and transparent with their clients / Namibian nation. Moreover, LANA Consulting advised the Town Council to commence with an internal water quality monitoring programme to ensure they supply quality water to their community/customers.
2.	Emily Tjombumbi Manager: Technical Services and Planning	What are the proper disposal methods for PAC?	The waste water (back washed water) from the Powered Activated Carbon is transferred into the septic tank and emptied at the towns sewerage evaporation ponds
3.	S. Au-Khaob Environmental Health Practitioner	How reliable and trustworthy is it when a water supplier does the water testing as well?	LANA explained that NamWater are mandated by the Government of Namibia to provide safe drinking water and related services to the satisfaction of all stakeholders, taking cognizance of the environment, scarcity of and dependency of all on water. Therefore, the NamWater laboratory has been a member of the SABS proficiency testing programme with excellent results and the proficiency testing provider for the SADC region. The standards used by the NamWater Laboratory are traceable to the National Institute for Standards Technology (NIST). NamWater further make use of equipment and chemicals manufactured according to the International Standards Organisation (ISO) requirements.

Authority Consultation: Karibib Town Council Offices: **Date:** 14.04.2023: **Time:** 09h30 – 13h00 **Number of people attended:** 9			**Institutions/ Authorities Present** • **Karibib Town Council**
No.	**Who raised the issue?**	**Issues/Comments/Questions**	**Response by LANA**
4.	L. Goreseb CEO Karibib Town Council	Where does the environmental assessment practitioner (EAP) work end? Does it end with the construction of the project?	The work of the EAP will end once the ECC of this project is issued, that is before the commencement of construction work. Construction work will be according to the EMP which will be produced from this EIA scoping study. The proposed project is a listed activity under the EIA Regulations: Environmental Management Act of 2007 (Act No. 07 of 2007) which may not be undertaken without an environmental clearance certificate (ECC). Public consultation forms an integral part of the EIA process that enables an integrated and transparent approach. This approach will ensure a development that is environmentally friendly, economically viable and socially acceptable. To achieve this goal, communication and feedback channels are used to identify relevant stakeholders such as the Karibib Town Council, who will be invited to submit comments for consideration in the scoping report. The scoping report will consist of an assessment of potential environmental and social issues/ impacts of the project. The scoping report will be circulated to registered stakeholders. The scoping report will include the construction, operation, maintenance, and decommissioning of the proposed Karibib PAC Plant and Ground Reservoir. The ECC application has been approved by MEFT, the Public & IAPs will be informed about the decision and the EAP work will end for the project.
5.	Emily Tjombumbi Manager: Technical Services and Planning	Should the treatment plant not be upgraded as well?	No. The treatment plant need not be upgraded because it is efficient. However, raw water from Swakoppoort Dam is frequently of low quality due to high levels of blue-green algae. The current treatment plant in Karibib has experienced challenges in removing the blue-green algae and associated taste and odour in the raw water because due to many factors. One of them is that the treatment plant process time is short. NamWater has thus decided to install a PAC pre-treatment plant (for taste & odour control and toxin removal) to support the treatment process done at the current treatment plant and thereby extend the treatment process.
6.	S. Au-Khaob Environmental Health Practitioner	Is this a recurrent situation concerning poor water quality?	Yes. Normally, capital projects are long-term, capital-intensive investments to build upon, add to, or improve a capital asset. This project is to address recurrent issues such as this one to improve the water quality treatment process due to the capacity concerns of the current water treatment plant. Moreover, the blue-green algae and worms could be brought about by climate change or other environmental factors.

Authority Consultation: Karibib Town Council Offices: **Date:** 14.04.2023: **Time:** 09h30 – 13h00 **Number of people attended:** 9			**Institutions/ Authorities Present** • **Karibib Town Council**
No.	**Who raised the issue?**	**Issues/Comments/Questions**	**Response by LANA**
7.		Is there a time frame for the project construction to commence?	Construction of the proposed PAC plant and ground reservoir will commence at any time after the ECC has been obtained from MEFT by NamWater.
8.	Emily Tjombumbi Manager: Technical Services and Planning	Karibib Town Council experiences water quality problems at the moment and based on the presentation by the Environmentalists (EAP), it is evident that the water quality of the water provided by NamWater is questionable. In the month of March 2023, the microbial analysis shows that the product water has more health risks than the water in the reservoir.	LANA Consulting recommends that Karibib Town Council consult with NamWater through the proper channels so that NamWater provides water quality data to the Town Council on a regular basis. During the meeting, the EAPs were unsure about the difference between the product water and reservoir water. The uncertainty was clarified during the public meeting session when the NamWater employees explained the differences between product water and reservoir water. Product water means the test is taken from water within the sump of the water treatment plant, whereas reservoir means it is water taken from the reservoir outlet (i.e., water being discharged into the Karibib Town Council pipes). Therefore, the water quality rating for product water could be lower than for the reservoir water quality rating in some instances.
9.	Emily Tjombumbi Manager: Technical Services and Planning	NamWater to provide daily water schedules to Karibib Town Council for the council to monitor and control the water issue within the town. A monthly schedule of the various tests and cleaning of the treatment plant and reservoir needs to be provided to Karibib Town Council or shared with the end users.	LANA Consulting recommends that Karibib Town Council place an official request to NamWater for water quality data to be provided to the Town Council on a regular basis. Furthermore, this concern will be communicated with NamWater to provide their input.

Table 6: Issues and response from the public meeting

Public Meeting: Usab Community Hall, Karibib **Date:** 14.04.2023: **Time:** 13h30 – 14h00 **Number of people who attended**: 5			**Institutions/ Authorities Present** • **Karibib Town Council** • **KWTP -NamWater –Josephina Nambala and Lea Johannes**
No.	**Who raised the issue**	**Issues or concerns raised**	**Responses from NamWater and LANA**
10.	S. Au-Khaob Environmental Health Practitioner	Explain the difference between raw water, product water and reservoir water from the laboratory analysis results presented during the meeting.	Product Water: is the water which has undergone the treatment process. Reservoir Water: is the water pumped into Town Council valves from the reservoir. Raw water: raw water from Swakoppoort Dam flows through the inlet valve of the water treatment plant before any filtration the water is tested/analysed for microbial. The treatment process at the KWTP is explained in Section 4.1
11.	Amena Hailaula Karibib Town Council	Are they using PAC at the current treatment plant?	Yes, they are using fine PAC at the current treatment plant to remove blue-green algae.
12.	S. Au-Khaob Environmental Health Practitioner	Does NamWater compare the results from the Laboratory with the 22-hour testing?	The current water treatment staff test for free chlorine and turbidity (NTU) on a 2-hourly basis. Whereby, the laboratory samples are done twice a month where the laboratory test for pH, colour, conductivity, turbidity (NTU), coliforms, free coliforms and faecal E. coli in the samples. The staff of the treatment plant does not compare their results with the laboratory results as the parameters of testing is different.
13.	Member of public	How big will the construction be? How many labourers will be required	The PAC and the reservoir are a medium-sized building that will not require too many labourers. Moreover, NamWater's procurement policy recommends the main contractor to employ qualified locals. It should however be noted that it will not be possible to employ only locals as they might not have all the required skills and experience.
14.	S. Au-Khaob Environmental Health Practitioner	There has been a misunderstanding between NamWater and Karibib Town Council on the issue of water quality and the process of monitoring water quality but after NamWater was able to explain their internal process the process is much better understandable.	LANA recommends that Karibib Town Council should improve their water quality monitoring process to ensure quality water to their customers and to consult with NamWater through the proper channels when they are concerned with the quality of water. Ms Nambala informed the Karibib Town Council that their door is open, and they are welcome anytime to observe the treatment process.

3.2 Second round consultation

This EIA report will be distributed to all registered I&APs as well as to relevant stakeholders for seven days comment period as per the EIA regulations.

Engagement with the public and authorities commenced on 19 June 2023 and conclude in 26 June 2023. During the second round of consultation, I&APs and Authorities were allowed to submit comments on the Draft Scoping Report.

3.2.1 Comments received and response provided.

No comments were received from I&APs and Authorities during the second round consultation.

Upon review by I&APs and stakeholders, the final report will be submitted to the competent authority and the regulatory authority for record of the decision.

4 EXISTING INFRASTRUCTURE

This section describes the existing infrastructure at the Karibib Water Treatment Plant. The content of this chapter is based on and derived from site observations and secondary information provided by the Proponent.

4.1 Karibib Water Treatment Plant (KWTP)

Raw water is sourced from the Swakoppoort Dam, from where it is pumped to the Okongava Reservoir. From Okongava Reservoir, the raw water is conveyed via gravity to the KWTP.

The KWTP was completed in 1993 and has a design capacity of 216 m3/hour or 4 700 m3/d (60 l/s) at a 22-hour operation. However, a performance test of the treatment plant revealed that the product water quality does not always comply with the Water Quality Standards (acceptable standard). depending on the quality of the raw water from the Swakoppoort Dam (NamWater, 2018).

To eliminate the pathogens that are responsible for waterborne diseases, the water supplied to the public undergoes a thorough a purification process. Water purification is the process of removing undesirable chemicals, biological contaminants, suspended solids, and gases from contaminated water. The goal of this process is to produce water fit for a specific purpose. Most water is disinfected for human consumption (drinking water). In general the methods used include physical processes such as filtration, sedimentation, and distillation, biological processes such as slow sand filters or biologically active carbon, chemical processes such as flocculation and chlorination and the use of electromagnetic radiation such as ultraviolet light.

The purification process of water reduces the concentration of particulate matter including suspended particles, parasites, bacteria, algae, viruses, fungi; and a range of dissolved and particulate material derived from the surfaces that water may have made contact with after falling as rain.

The standards for drinking water quality are typically set by governments or by international standards. These standards will typically set minimum and maximum concentrations of contaminants for the use that is to be made of the water. For Namibia, the new Water Resource Management Act (WRMA) 11 of 2013 along with new water quality standards of 2013 which are being enforced by the Directorate of Water Affairs and NamWater is required to meet these standards.

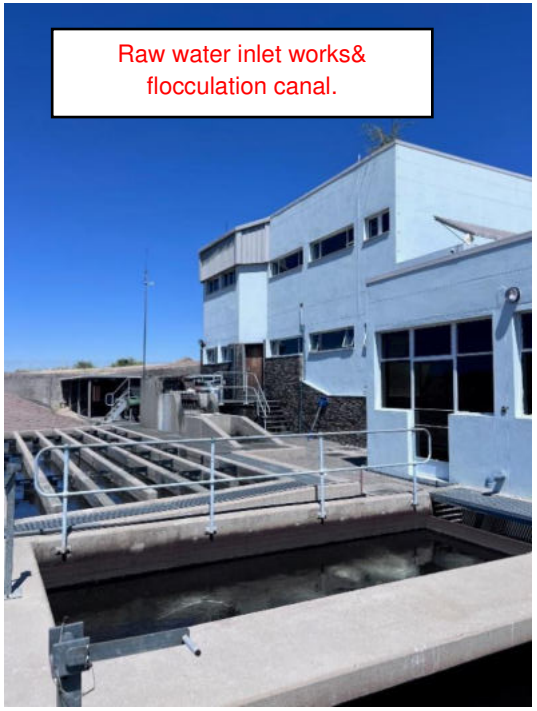
The treatment process at the KWTP is summarised as follows:

- Coagulant dosing at the raw water inlet and dosing of PAC at 10 mg/L at the inlet works as well as dosing of lime to stabilise the water;
- Flocculation and settling: The flocculated water flows through a flocculation canal to a horizontal settling tank. After settling, the clear water is collected in two launders and conveyed to three sand filters in parallel;
- Intermediate chlorination
- Sand filtration: There are three rapid sand filters reported to have a single media bed depth of only 400 mm and a loading rate of 5 m/h.
- Clearwater well (110 m^3) and final chlorination: The filtered water flows into a clear water sump which also serves as a chlorine contact tank for disinfection;

- After disinfection, the water is pumped to the Karibib reservoir (size of 1250 m^3) for storage and distribution to Karibib, via a pipeline with tee-off to the NDF and the Otjimbingwe Water Supply Scheme.

Other infrastructures at the plant are (shown in **Figure 7**):

- Offices, Chlorine dosing room and a pump station housing various raw water and clear water pump sets.
- Sludge lagoons/drying beds



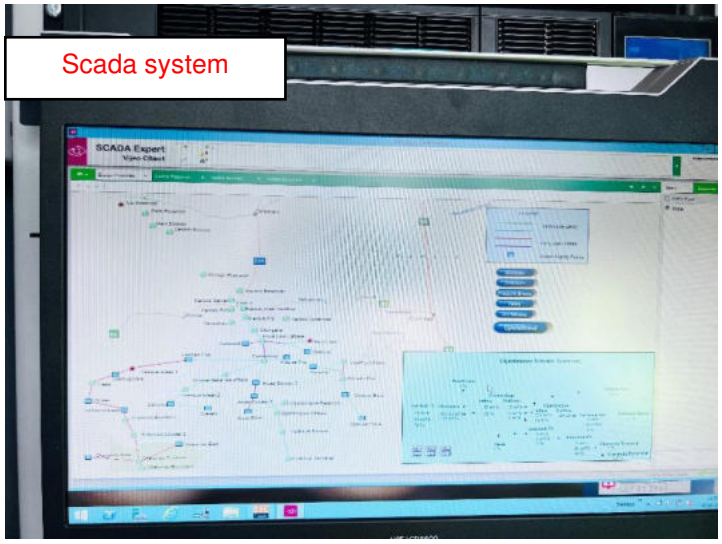


Figure 7: Infrastructure at the KWTP

4.2 Locality

The existing KWTP is located in 2nd Street, of Karibib town. The plant area covers approximately 4ha of the land surface and is enclosed with a barbed wire mesh fence, approximately 2.8 m high with lockable gates. There is a guard house within the plant yard, which enables 24hrs control of the plant. The site is surrounded by several residential properties.

:

Figure 8: Locality for KWTP

4.3 Quality of water supplied

4.3.1 Water quality analyses

The Water Act 54 of 1956 states that water supplied for human consumption must comply with the officially approved guidelines for drinking-water. The guidelines have been divided into three basic groups of determinants, namely: determinants with aesthetic implications,

inorganic determinants, and bacteriological determinants. The guidelines also stipulate the frequencies of bacteriological analysis and defines the group into which water can be classified.

The Water Act 54 of 1956 has since been replaced with the Water Resource Management (WRM) Act 11 of 2013. This Act has been passed by Parliament, but it has not yet been brought into force. It will come into force on a date set by the Minister in the Government Gazette. The Regulations of the WRM Act 11 of 2013 also outline the water quality guidelines and standards for potable water and stipulate the frequency of microbiological monitoring for bulk water supply.

Currently, the analysis of treated water at the KWTP is accomplished in three areas, namely, physical/aesthetic analysis, chlorine (free) level and bacteriological or microbiological analysis. The water quality analyses is completed in-house at the KWTP.

Water analyses is completed in two-hour intervals daily as follows:

- **Raw water** – nephelometric turbidity units (NTU), Chlorine, temperature, Magnesium and Iron
- Settler outlet – NTU and Free Chlorine
- Filter outlet 1 -3 - NTU
- Product Water – NTU, free Chlorine, Magnesium (Mn) and Iron (Fe)

The microbiological quality is completed by NamWater Laboratory Section under the Department Applied Scientific Services Division at the NamWater head office in Windhoek.

4.3.2 Water quality results for KWTP

4.3.2.1 Physical/aesthetic quality

The water quality results in terms of the average nephelometric turbidity units (NTU) pH and colour levels for the KWTP for the past two years (March 2021-March 2023) are presented in **Table 7** below.

Table 7: Water quality results for KWP (Source: Applied Scientific Services Division)

Description	Date sample taken	pH	Colour	Turbidity in NTU
Product Water	01/03/2023	8	**13**	**0.711**
Raw Water	01/03/2023	7.8	39	2.11
Product Water	17/01/2023	8.1	**6**	**0.931**
Raw Water	17/01/2023	7.9	12	8.05
Product Water	05/07/2022	7.5	10	0.936
Raw Water	05/07/2022	7.4	22	1.11
Product Water	17/09/2021	8.4	**<1**	**0.436**
Raw Water	17/09/2021	8.3	12	0.45
Product Water	07/08/2021	8.2	4	0.438
Raw Water	07/08/2021	8.2	18	2.13
Product Water	26/06/2021	7.7	**1**	**0.255**

Raw Water	26/06/2021	7.7	20	4.84
Product Water	21/05/2021	7.6	**3**	**0.333**
Raw Water	21/05/2021	7.7	19	2.41
Product Water	16/04/2021	7.8	**5**	**0.302**
Raw Water	16/04/2021	7.9	32	0.749
Product Water	16/03/2021	7.6	**11**	**0.51**
Raw Water	16/03/2021	7.7	41	6.02
Product Water	17/03/2021	7.7	**10**	**0.725**
Raw Water	17/03/2021	8	50	3.67

The results provided in **Table 7** above show that from 2021 to 2022 the monthly average turbidity of the treated water (Product water) varied from 0.255 NTU to 0.436 NTU. And in 2023 the turbidity was 0.931 and 0.711. In terms of the new standards as contained in the draft regulations of the Water Resources Management Act 11 of 2013, the turbidity for the treated water (Product water) for 2023 was above the recommended threshold for the acceptable standard (<0.5 NTU).

The pH and colour were within acceptable limits.

Table 8: Recommended thresholds (as per the draft Water Resources Management Act 11 of 2013 regulations)

		Limit per group			
Determinants	**Units**	**A**	**B**	**C**	**D**
Colour	mg/l Pt	20			
Turbidity	NTU	1	5	5	10
PH	pH-Unit	6.0 - 9.0	5.5 - 9.5	4.0 - 11.0	4.0 - 11.0
	*The pH limits of each group exclude the limits of the previous group				
	Platinum units (Pt)				

4.3.2.2 Microbial Data

The average microbiological quality results for the past two years (March 2021-March 2023) are presented in **Table 9** below.

Table 9: Karibib Microbial Data (Water quality results for KWPT (Source: Dep. of Applied Scientific Services)

Date Taken	Description	Coliforms	Faecal Coliforms	E. coli	Quality
16/3/2021	Product Water	Not detected	Not detected		A
16/3/2021	Reservoir	Not detected	Not detected		B
16/3/2021	Raw Water	>2420	2	2	D
16/4/2021	Raw Water	>2420	Not detected		D
16/4/2021	Product Water	Not detected	Not detected		A
16/4/2021	Reservoir	Not detected	Not detected		A
21/5/2021	Raw Water	343	Not detected		D
21/5/2021	Product Water	Not detected	Not detected		A
21/5/2021	Reservoir	Not detected	Not detected		A
26/6/2021	Raw Water	91	Not detected		C
26/6/2021	Product Water	Not detected	Not detected		A
26/6/2021	Reservoir	Not detected	Not detected		A
7/8/2021	Raw Water	2420	Not detected		D
7/8/2021	Product Water	Not detected	Not detected		A
7/8/2021	Reservoir	Not detected	Not detected		A
17/9/2021	Raw Water	>2420	Not detected		D
17/9/2021	Product Water	Not detected	Not detected		A
17/9/2021	Reservoir	Not detected	Not detected		A
5/7/2022	Raw Water	7270	3	3	D
5/7/2022	Product Water	Not detected	Not detected		A
5/7/2022	Reservoir	Not detected	Not detected		A
17/1/2023	Raw Water	>2420	4	Not detected	D
17/1/2023	Product Water	Not detected	Not detected		A
17/1/2023	Reservoir	36	Not detected		D
1/3/2023	Raw Water	>2420	3	3	D
1/3/2023	Product Water	Not detected	Not detected		C
1/3/2023	Reservoir	1	Not detected		B

The results indicate that the water found in the reservoir was always in group A water, with good water quality with no detections of coliforms, faecal forms, or E-coli.

Table 10: Recommended thresholds (as per the draft Water Resources Management Act 11 of 2013 regulations)

Determinants	Limit for Groups			
	A**	B**	C	D*
Total coliform counts per 100 ml	0	10	100	100
Faecal coliform counts per 100 ml	0	5	50	50
E. coli counts per 100 ml	0	0	10	10
All values are greater than the figure indicated.** In 95% of the samples				

4.4 Current challenges of the KWTP

In the past, the KWTP has experienced challenges in removing 2-Methylisoborneol (MIB) and Geosmin, which are organic odour compounds, released by blue green algae from the raw water (NamWater, 2018). The new PAC plant will assist in addressing these raw water treatment challenges.

4.4.1 What is Geosmin and 2MIB?

Geosmin and 2MIB are naturally occurring compounds that have an earthy/musty taste and odour. Some kinds of algae present in our source waters naturally produce Geosmin and MIB (Columbia SC, 2023). An increase in this production typically happens during the summer. When there's an increase in algae growth and in the water, they excrete small amounts of harmless chemicals, Geosmin and MIB, into the water that cause the musty taste and odour (Columbia SC, 2023).

4.4.2 What are the effects of Geosmin and 2MIB?

Geosmin and MIB does not pose a public health risk, but their presence can cause concern about the quality of drinking water (Columbia SC, 2023). Water utilities may receive high numbers of customer complaints whenever a Geosmin or 2MIB outbreak occurs in their water supply. Although these chemicals are harmless, the human senses of taste and smell are extremely sensitive to them and can detect them in the water at concentrations as low as five parts per trillion (nanograms per litre) (Columbia SC, 2023).

4.4.3 What can be done about Geosmin and MIB?

Activated carbon is effective in reducing taste and odour issues and is usually added to the treatment process when elevated levels of Geosmin and MIB are detected at water source (Columbia SC, 2023).

5 PROPOSED DEVELOPMENT

This section describes the proposed project including alternative designs that were considered as part of this EIA.

The content of this chapter is based on and derived from secondary information provided by the Proponent.

The proposed development entails the construction of:

- A Pre-treatment PAC Plant and associated infrastructure (storage units, wastewater facilities, etc.) are situated approximately (3.1 km) from the KWTP (PAC is fully defined in Section 6).
- A clear water concrete ground-level reservoir is to be constructed within the NamWater premises at the existing KWTP.

5.1 Pre-treatment PAC Plant

According to the Environmental Protection Agency (EPA) of the United States of America (2016), the PAC application point should allow for an adequate contact time between the PAC and organics.

The PAC dosages can range between 1 to 100 mg/L depending on the type and concentrations of organic compounds present and dosages of 1 to 20 mg/L are typical for nominal taste and odour control (EPA, 2016). The EPA also states that a minimum contact time of about 15 minutes is required for most taste and odour compounds, however, significantly longer contact times may be required for methyl-iso-borneol (MIB) and geosmin removal. More details on PAC are found in Chapter 6 of this report.

5.1.1 Locality

The PAC plant is proposed to be constructed on a 1010 m^3 piece of land (a Portion of Rem. Of Portion B) Karibib Town Land and Townlands No. 57, located opposite Karibib Extension 6 next to the C32 road (**Figure 9**). The portion is currently zoned as undetermined. The site currently has no building structures and is located within business-zoned properties (across the C32 road) which includes brickmaking, marble processing plants, offices, Kodo Drilling etc.

Figure 9: Locality for the pre- treatment PAC plant

5.1.2 Scope of work

The construction of the PAC pre-treatment dosing plant required will assist to control the raw water taste and odour problems 216 m^3pumped from Swakoppoort Dam to the KWTP. The PAC plant will be tapping raw water from the main bulk water transfer pipeline from the Swakoppoort Dam, approximately 3.1 km before the KWTP. The raw water will be mixed with the PAC in the 3 tanks (a total of 3 tanks). The mixture will be constantly stirred to ensure sufficient mixing and then pumped back into the main pipeline of the KWTP, using positive displacement dosing pumps. There will be telemetry communication between the PAC plant and KWTP. The lay out of the PAC is illustrated in **Figure 10** & **Figure 12**.

The PAC plant will consist of the following operational mechanisms:

- Automatic operation of the PAC plant.
- Remote operation and monitoring via Telemetry.

5.1.3 Proposed PAC Plant Building plan

The proposed PAC plant will be sized at an area of 170 m^2 . The building plan is presented in **Figure 12,** and the PAC building will include the following sections:

- Operations rooms
- PAC bag and air filters storage room
- Safety room/ablution facilities
- Telecommunications room

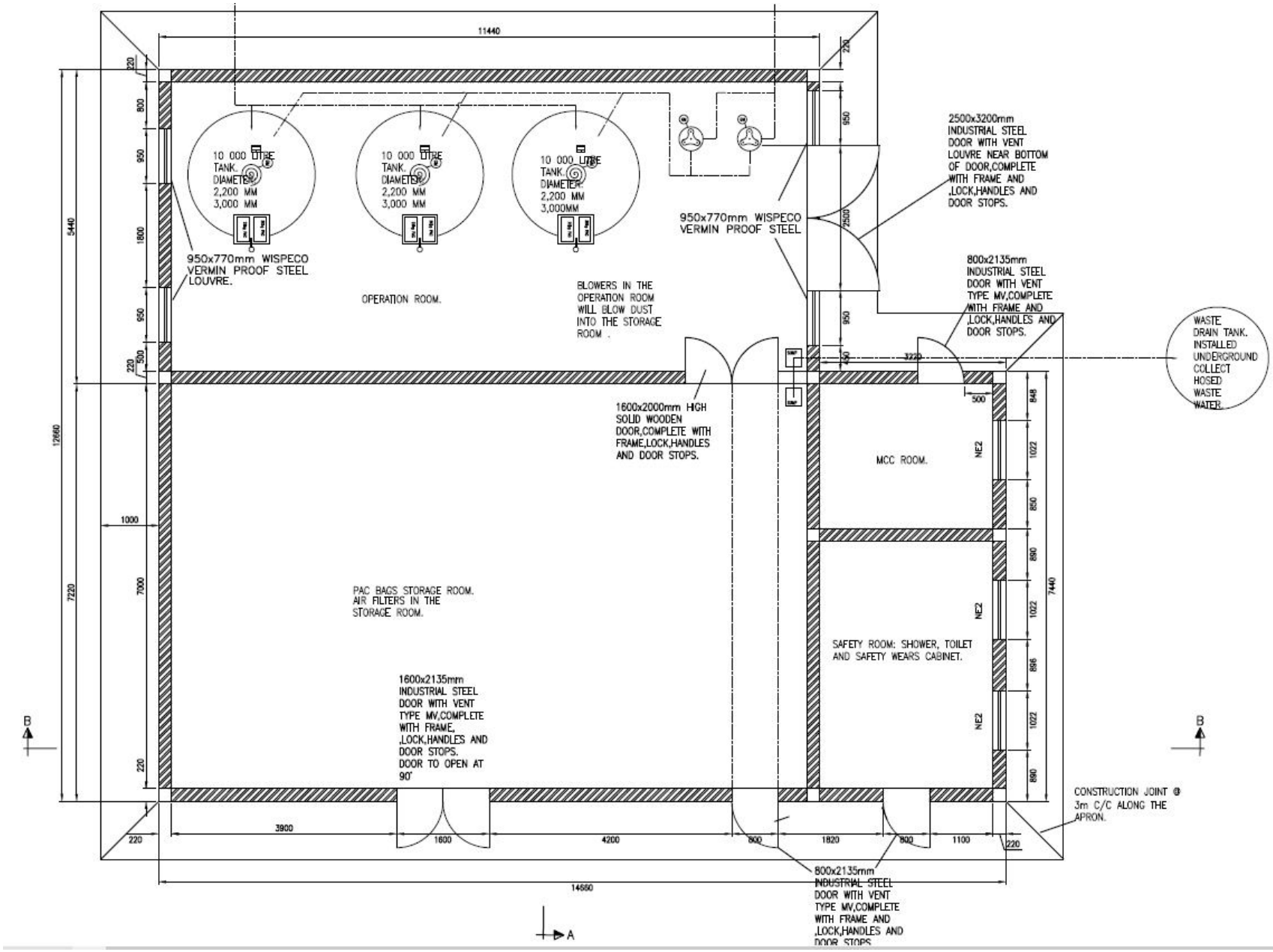


Figure 10: PAC building lay-out

5.1.4 Design Parameters

5.1.4.1 Dosing Rate

The PAC dosages can range between 1 to 100 mg/L depending on the type and concentrations of organic compounds present and dosages of 1 to 20 mg/L are typical for nominal taste and odour control (EPA, 2016). The EPA also states that a minimum contact time of about 15 minutes is required for most taste and odour compounds, however, significantly longer contact times may be required for methyl-iso-borneol (MIB) and geosmin removal. **Table 11** shows the theoretical amount of PAC required to reduce the Geosmin from 187ppt (95th percentile value) to an acceptable standard of 30 ppt. The amount of PAC required ranges between 8-21 mg/L for the different types of PACs (**Table 11**).

Table 11: PAC Dose

PAC Sample	Log K	K	1/n	n	Acceptable standard, New Ce	Log Ce	log (Co-Ce)	log m	Carbon Dose needed, M (mg/L)
LQ325	0.17	1.49	0.47	2.11	30.00	1.48	2.20	1.32	**21.11**
CAD 900	0.83	6.74	0.16	6.45	30.00	1.48	2.20	1.14	**13.81**
Aqua Sorb	-0.83	0.15	1.42	0.70	30.00	1.48	2.20	0.93	**8.49**
GL 35	-0.07	0.86	0.80	1.26	30.00	1.48	2.20	1.09	**12.27**

With a maximum flowrate of 216 m^3/h, the pump should have a range of 1- 187 l/h (with 10 000 m^3 tanks and slurry concentration used). Plant dosing rate and capacity is shown in **Table** 12. The tanks have an agitator to ensure carbon slurry is always effectively mixed and in suspension.

Table 12: PAC Plant Dosing Rate & Capacity

PAC Plant Dosing Rate & Capacity			
Maximum concentration required for PAC solution at Karibib WTP	C_{max}	20	mg/L
Mixing tank size		10,000	L
Weight of PAC bags		20	kg
Number of bags required for mixing tank		5	
Make up tank solution concentration		10,000	mg/L
Percent concentration		1.0	%
Maximum raw water flow rate	Q	216	m^3/h
Maximum PAC mixture dosing rate (Incl. 10%)		484	L/h

5.1.4.2 Flowmeter, Inlet Pressure Reducing & Isolating Valves

An electromagnetic flow meter will be installed in the main pipeline from the Okongava reservoirs to the KWTP downstream of the tap-off point, to monitor the flow for the calculation of the PAC dosing rate. Two high-quality pressure control -globe-type valves, one operating plus one standby, will be installed after the point of tap-off from the main pipeline to reduce the pressure to the PAC plant.

Table 13: Valves

Valves			
Description	**Qty**	**Characteristics**	**Control**
Flowmeter	1	• 16 bar, 350 NB Electromagnetic	24 Vdc
Isolating valves	2	• 350 NB • 16 bar Isolating gate valves • Installed before the tapping point and after the dosing point	Manual
Pressure reducing valves	2	• 16 bar pressure reducing globe valves • Actuated	400 V

5.1.4.3 Handling of PAC Bags

The PAC will be handled by the PAC plant operators who will be using the following procedure:

- Loading the PAC bags onto a pallet in the storage room, which will then be conveyed with a hand fork trolley to a fixed hydraulic lifting platform (See pictures in **Figure 11**) that will be constructed next to each mixing tank in the dosing room.
- The pallet will then be loaded onto the platform and lifted to the top of each tank.
- The operator will climb via a ladder onto an elevated galvanized platform that will be constructed next to the tanks to offload one bag at a time.
- The operator will load the bag into a loading bucket, after which he/she can cut it open.
- For each mixing tank, there will be a loading bucket mounted directly on top of the accessing hole of each mixing tank.

Figure 11: Hydraulic lifting platform and a Hand fork trolley

5.1.4.4 Mixing Tanks with Agitators

The mixing tanks will be fitted with agitators to continuously mix the concentration. The tanks will each be fitted with a scour valve and needs to be routinely flashed with raw water for cleaning.

Table 14: Mixing tanks and agitators

Mixing Tanks			
Description	**Qty**	**Characteristics**	**Power ; Control**
Isolating ball valves	6	• 16 bar • 3 x 80NB – Inlet • 3 x 50NB -outlet	
Tank	3	• Polyethylene Tanks • 10 000 Liters	
Level Transducer	3	• 24V DC	DC ; PLC via 4 – 20 mA Signal
Agitators			
Description	**Qty**	**Characteristics**	**Power ; Control**
Agitator	3	• Power Rating: 1.5 kW • Speed: 141 rpm • Impeller Diameter = 1.2 m • Top Installation • Couple to Geared Motor	Controlled by Motor
Geared Motor	3	• 1.5 kW • n1= 1410 rpm • 400 V • n2 = 44 rpm • 10 Gear Ratio	3 Phase ; PLC

5.1.4.5 Dosing Pump System

A pair of peristaltic pumps coupled with geared VSD-driven motors will dose the concentration back into the main pipe.

Table 15: Dosing pump system

Pumping System			
Description	**Qty**	**Characteristics**	**Power ; Control**
Pump	2	• Peristaltic Pump • 0.7 kW Pump Power • Flow = 540 L/h • n2= 88 rpm • Discharge Pressure = 12 bar	
Geared Motor	2	• 0.90 kW • n1= 1410 rpm • 400 V • n2 = 88 rpm • 16 Gear Ratio	3 phase; 400 V
Variable Speed Drives	2	• 5 kW	400 V

5.1.5 Proposed Layout & Piping and Instrumentation Diagram (P&ID)

The proposed layout and instrumentation diagram is presented in **Figure 12.**

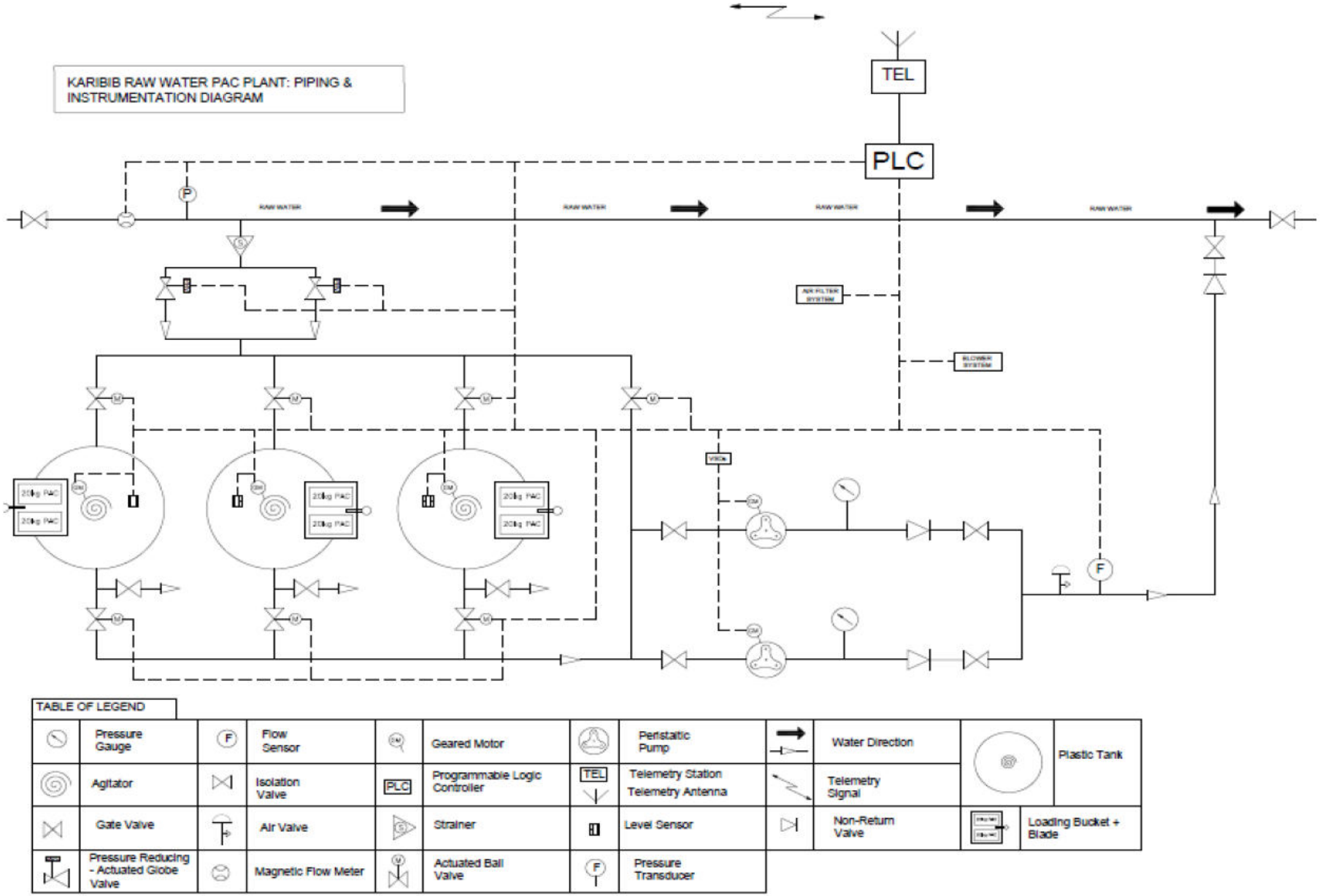


Figure 12: Proposed P&ID for PAC Plant

5.1.6 PAC Plant Control Philosophy

The PAC dosing will only be initiated when the raw water quality deteriorates, and results of the taste and odour compounds are high. The flow is detected via the electromagnetic flow meter, installed in the main raw water gravity feed pipeline between the Okongava Reservoirs and the KWTP at the PAC plant see **Figure 12** for process flow diagram.

The raw water will be drawn from the raw water pipeline and the pressure will be reduced with high-quality pressure control globe-type valves, one-operating plus one standby configuration.

The dosing of the PAC solution into the raw water feed pipeline to the KWTP will be done automatically. A manual operational mode will be available but should only be used if the auto mode is not available. Dosing will be done from all three tanks simultaneously and will last for 3 days with a 20-hour operation period per day.

A single dewatering pump controlled by a float will be used to transfer the PAC wastewater back into the mixing tank. And using the peristaltic pumps, the mix will be pumped into the main pipe.

All three mixing 10 m^3 tanks will be installed with a scouring pipe and manually operated valve to allow for the scouring of a tank when required. Each tank will have its own scour pipeline to the outside of the building.

5.1.7 Ablution facilities & Waste Production

There is currently no sewage reticulation system installed in the area. The effluent from the PAC plant includes waste from the PAC mixing tank (non-toxic) and sewage wastewater (toxic waste) from the ablution facilities. They will be accumulated and stored in a septic tank, and regular collection of the effluent will be arranged, for disposal at the Karibib Town Council sewerage evaporation ponds.

5.2 New Concrete Ground Water Reservoir

The proposed location for the new reservoir is identified to be within the NamWater yard at the KWTP. The reservoir will be 2 250 m^3 in size (as shown in **Figure 13**). The size was determined based on the calculated future water demand taking into consideration NamWater's storage philosophy. The new reservoir will thus enable a two-day storage at an average annual daily demand, which provides a measure of water security, and should sources fail, serve as a buffer for daily and hourly peaks.

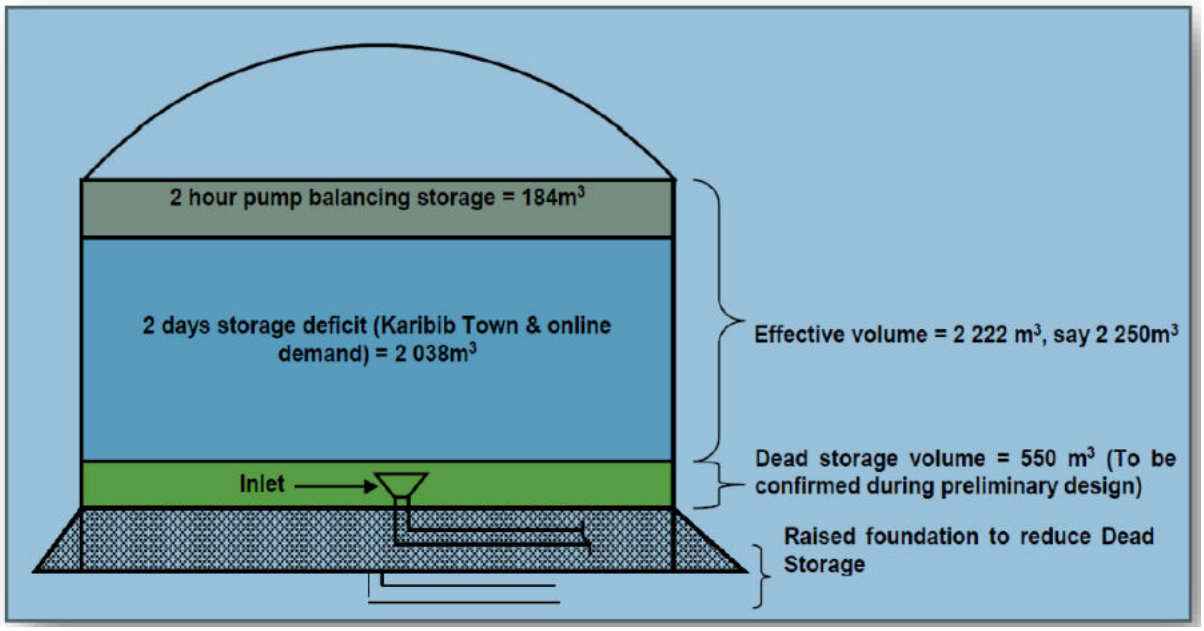


Figure 13: Concrete 2 250 m³ ground reservoir cross-sectional sketch

5.3 Resource requirements for the construction of the PAC and the Ground Water Reservoir

5.3.1 Souring materials

Most of the construction materials i.e., sand, cement, gravel, stones, etc are available locally and in Namibia. PAC bags are also available from local suppliers such as Aqua Services and Engineering, a Namibian supplier and service partner for reagents, chemicals and equipment for water and wastewater treatment.

5.3.2 Land requirements

The site for the PAC is currently owned by NamWater, and the water from the PAC will be fed into the existing pipelines. The KWTP where the ground reservoir will be constructed is also owned by NamWater.

5.3.3 Electricity requirement

The new PAC plant will need to be connected to the existing Erongo RED power grid within the town of Karibib.

5.3.4 Workforce requirements during construction

The construction of the PAC plant and the ground-level reservoir will be outsourced to contractors in line with the Public Procurement Act 15 of 2015 and the Public Procurement Regulations of 1 April 2017 (GN 47/2017). Temporary jobs during this phase will be created in the form of contract labourers. The actual number of jobs to be created during the construction phase is not known yet.

5.4 Project Alternatives

In terms of Section 3.5 [1] (g) of the EIA Regulations, the baseline assessment should include an investigation of feasible alternative options to any proposed development. Alternatives to the project refer to the different means of meeting the general purpose and requirements of the project. Alternatives considered under this scoping study are such as:

- Site and design alternatives (the property on which or location where it is proposed to undertake the activity).

This alternative is discussed from the environmental and socio-economic perspectives, here below.

5.4.1 Location and design alternatives: PAC Plant

The proposed PAC plant is proposed to be constructed on a piece of land owned by NamWater. The site is located next to the existing water pipeline, which is supplying water from Okongava Reservoir to the KWTP. Thus, no installation of a new pipeline is required.

The location of the PAC plant makes it ideal to meet the minimum distance (a minimum of 1.5 km) from the plant needed to achieve a retention time (minimum of 15 minutes or longer for methyl-iso-borneol (MIB2) and geosmin removal)). Based on a maximum flowrate of 216 m^3/h and a pipe diameter of 350 mm, the current location is ideal to meet those minimum requirements and conditions, as it is placed at 3.1 km from the KWTP and will give a minimum retention/contact time of 40 minutes.

5.4.2 Location alternatives: Ground Reservoir

The proposed ground reservoir is expected to be constructed within the existing KWTP yard and no additional development site or encroachment beyond the boundaries is necessary, thereby limiting the development footprint. As such, no off-site or other site-specific alternatives have been investigated.

6 POWDERED ACTIVATED CARBON

6.1 What is Activated Carbon

Activated carbon or activated charcoal is a porous element that traps compounds, mainly organic, present in a gas or liquid. It does so with such effectiveness that it is the most widely used purifying agent by humans (Oladejo et. al., 2020).

6.2 Raw materials used to make activated carbon

The most used raw materials to make activated carbon are softwoods (such as pine), mineral carbons “coal” (lignite, bituminous and anthracite) and vegetable shells or bones (coconut shells, olive or peach pits, walnut shells) (Oladejo et. al., 2020).

Activated carbons made from soft woods, form large diameter pores and are particularly suitable for discolouring liquids.

Carbon can be produced in the form of powder, granules or cylindrical pellets.

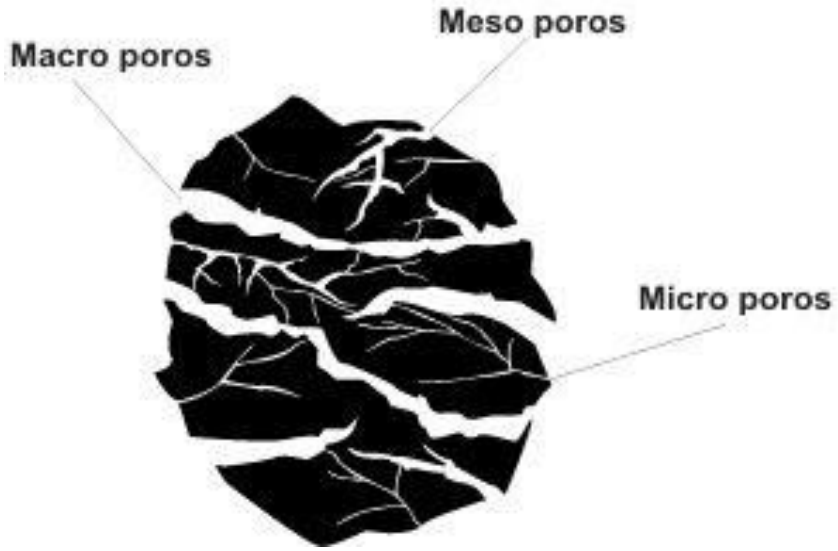


Figure 14: Physical form of an activated form (Oladejo et. al., 2020).

6.3 How does activated carbon work and what are its benefits?

Activated carbon is an adsorption medium, its function is to adsorb organic molecules in its micropores (Columbia SC, 2023). Activated carbon grab onto passing organic molecules and hold them in pores within the carbon granule (EPA, 1992). When added onto the water containing organic contaminants, a large portion of the contaminant becomes trapped in the pores (EPA, 1992).

It is activated using thermal or chemical processes to extend its adsorption capacity.

Graphical explanation of how activated carbon works, the image also shows that activated carbon is not an absorbent (**Figure 15**).

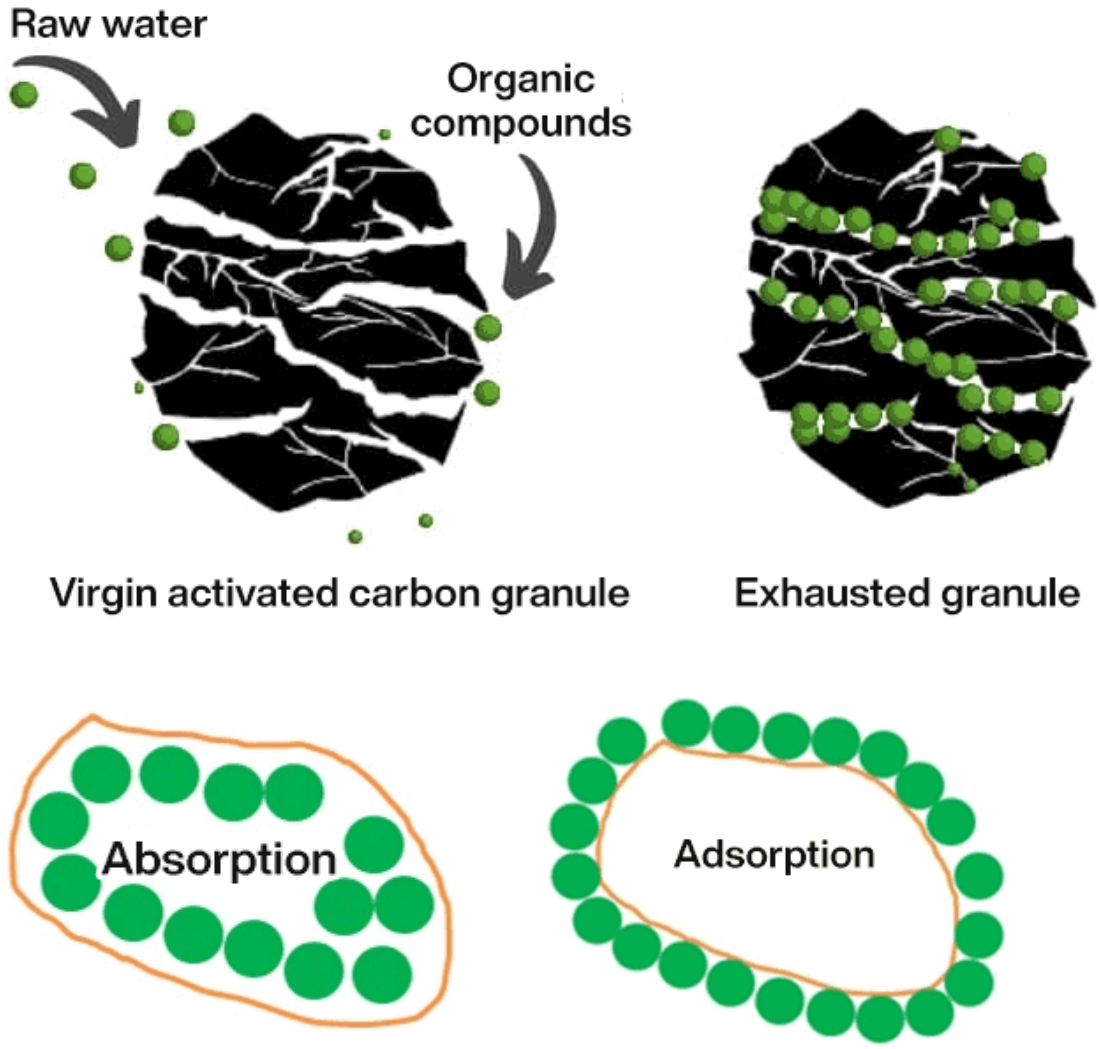


Figure 15: How activated carbon works (Columbia SC, 2023).

Adsorption is the adherence (ability to stick to) of one substance to the surface of another by physical or chemical processes. The treatment of water raw water using the adsorption process is essentially a method of transferring and concentrating the contaminants from the water to another material.

6.4 Uses of activated carbon in water treatment

Activated carbon adsorbs organic matter of a certain molecular weight on its surface. It is used to retain and remove contaminants that add colour, odour, and taste to drinking water. Any carbon particle can adsorb, when added to water, it removes colour, taste and odour (Columbia SC, 2023).

The surface of activated carbon allows it to effectively adsorb the organic compounds that give the water colour, odour, and taste. First, the carbon is thermally increased its surface area in a furnace to reach very high temperatures, this is a steam-assisted activation. This process then increases the surface area to absorb odours and tastes from the water. The odour

produced by an organic and undesirable substance enters through the pores and is absorbed by the activated carbon (Columbia SC, 2023).

The capacity of activated carbon to retain a given substance is not only given by its surface area but also by the proportion of pores that are the right size, i.e., a suitable carbon has a diameter of between one and five times the molecule to be adsorbed (Columbia SC, 2023).

6.5 PAC for liquids

Pinewood activated carbon, smaller than 200 mesh, activated with phosphoric acid, and packed in 20 kg bags is used in the pre–treatment of water.

Figure 16: PAC image for demonstration only

6.6 Health and Safety

Activated carbon is not toxic (Oladejo et. al., 2020). Many types meet U.S. FDA Codex requirements for food grade applications and many are also approved by the American Water Works Association and NSF for drinking water treatment (EPA, 1992). In addition, some grades of activated carbon are U.S. Pharmacopeia certified and are taken internally for various medicinal treatments (EPA, 1992). Dust exposure is a concern with some activated carbons and normal dust handling procedures should be used such as eye protection and dust masks for personnel handling the carbon, as well as room dust filters to keep dust level under control.

Depending on the volume of substances being processed, active carbon can become exhausted within days or weeks (EPA, 1992). Most spent activated carbon can be properly disposed of at a reactivation facility or approved landfill (EPA, 1992).

7 DESCRIPTION OF AFFECTED BIOPHYSICAL AND SOCIO-ECONOMIC ENVIRONMENTS

This chapter provides an overview of the current baseline conditions of the project area. The information presented in the section below was derived from the following sources:

- Visual observations during site visits to the areas by the author.
- Literature research.

It describes the details pertaining to the larger study area concerning, biophysical characteristics and socio-economic characteristics. It provides the basis for assessing the likely negative and positive impacts that the Project might have on the receiving environment (e.g., natural, and social), as well as the significance thereof. This chapter also identifies sensitivities pertaining to key environmental features as well as potential impacts resulting from the proposed project concerning these sensitivities. This again will inform the applicable mitigating measures and the need for any further detailed assessments.

7.1 Locality

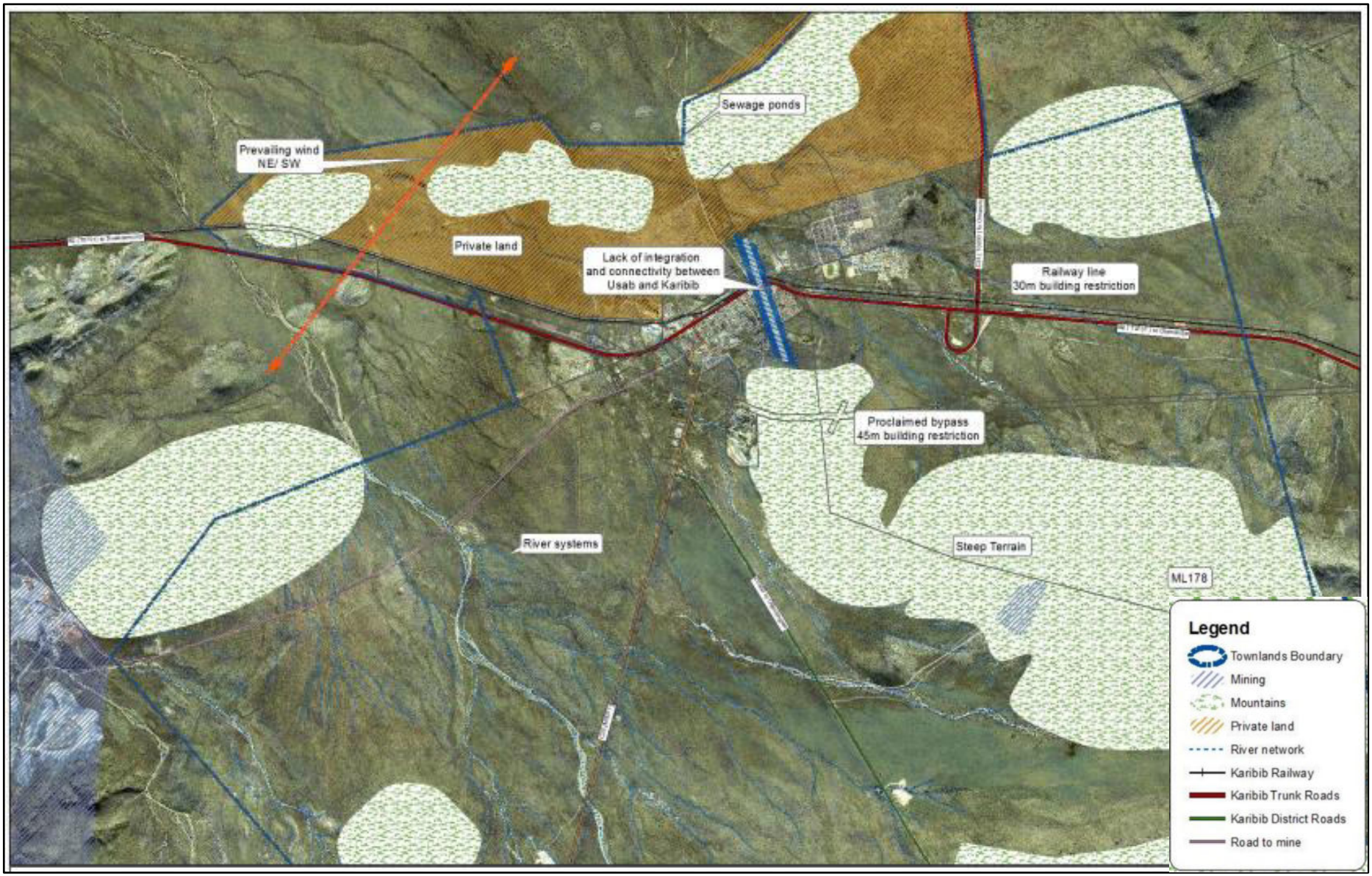


Figure 17: Site context for Karibib (Stubenrauch Planning Consultants (SPC) 2016).

7.2 Biophysical Environment

7.2.1 Climate

According to Mendelsohn et al., (2009), Karibib has a semi-desert climate which is characterized by low rainfall, high evaporation, and a high range of temperatures. Hot summers and mild winters are typical in Karibib, during summer the temperature rises as high as 32 ºC while minimum temperatures drop as low as 8 ºC as shown in **Figure 19**. Frost in Karibib is rare. Karibib is a relatively dry town with an annual average rainfall of 180 mm.

The prevailing wind direction is south-west and the minimum speeds recorded are 15 km per hour, with the windier part of the year is from May to November. The windiest month of the year in Karibib is July, with an average hourly wind speed of up to 16.64 km per hour. The calmer time of the year is from October to June. The calmest month of the year in Karibib is March, with an average hourly wind speed of 11.36 km per hour. The annual wind speeds are shown in **Figure 19**.

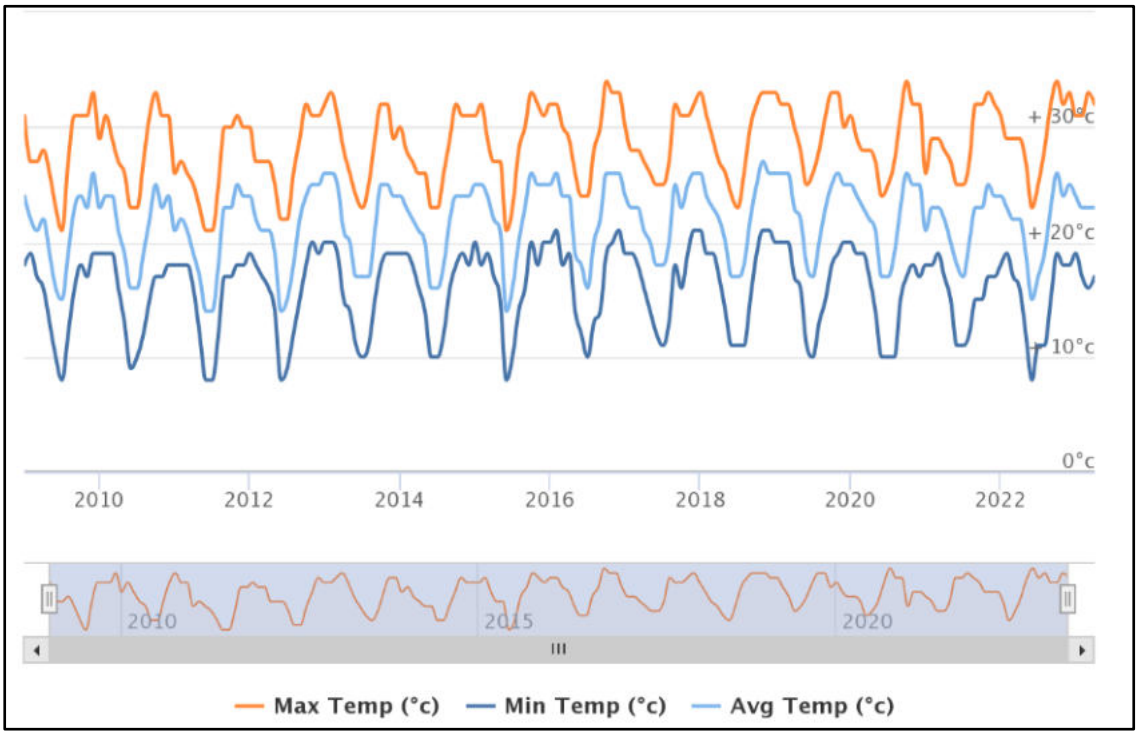


Figure 18: Yearly Max, Min and Average Temperature

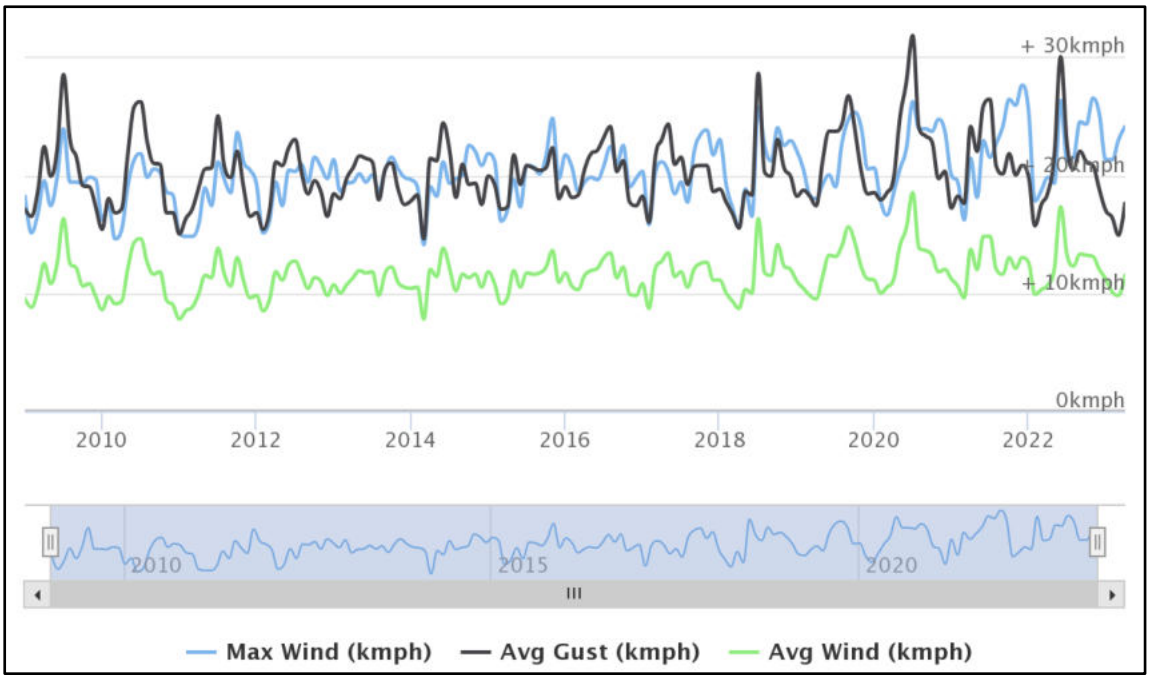


Figure 19 Annual Wind Speed and Wind Gust Averages

7.2.2 Topography, Geology and Hydrogeology

Karibib falls within the landscape of the Central – Western Plains, which stretches back from the coast and extends inland for up to about 450 km. The plains were largely formed by erosion cutting back into higher ground and carving out the catchment areas of several major rivers. The Khan, Omaruru, Swakop and Ugab rivers are the most prominent of these. Much of the area lies between 500 and 1000 m above sea level and consists of metamorphic rocks that were forced up out of the sea during the formation of the Gondwana continent, some 550 million years (Mendelsohn et al., 2002).

Like most parts of the country, Karibib and the Erongo Region area have no surface water and rely on underground water. The town of Karibib, and a large part of the Erongo Region, falls within the Erongo water basin. The Erongo basin has two important water catchment areas, that is the Omaruru catchment and the Swakop catchment area into which the three major rivers of the Omaruru, the Khan and the Swakop Rivers are major ephemeral rivers that only flow in high rainy seasons for a short duration. Karibib town falls within the Swakop catchment area (Mendelsohn et al., 2002).

7.2.3 Soils and land capability

There are two types of dominant soil types in the Karibib area is the Petric Calcisols and the Rock outcrops. Petric soils have a solid layer a shallow depth that remains hard even when wet (an `indurated` layer). Calcisols are found in depression or low-lying areas of the landscape and typically contain an accumulation of calcium carbonate, often in a cemented form called calcrete. Large white blocks of calcrete are visible on the surface but generally formed beneath the surface in a soft powdery form. These soils are potentially fertile but have

much higher calcium which makes iron and zinic unavailable to plants (Mendelsohn et. al., 2002).

7.2.4 Terrestrial vegetation

Karibib lies within the Tree-and-shrub Savanna Biome, the largest biome in Namibia characterised by large, open expanses of grasslands dotted with Acacia trees. It is specifically located in the Acacia Tree-and-shrub Savanna sub-biome. The vegetation structure in the sub-biome consists of 'large, open expanses of grasslands dotted with Acacia trees. The trees are tallest in areas of deeper sands in the east, with plant growth becoming progressively shrubby further west where the soils are shallower, and the landscape is more "hilly and rocky". The vegetation structure of the area is sparse shrubland that stretches from the southeast to the north-west of Namibia (Mendelsohn et. al., 2002). The vegetation in the proposed development area consists mainly of Acacia species and grasslands.

The following vegetation were observed at the site for the PAC plant, shown in **Figure 20** and **Figure 21**:

- Sherpered tree – *Boscia albitrunca*
- Bitter bush – Pechuel – loeschea leubnitziae
- Cheleneon Mesquite – *Prosopis chilenis*
- Water thorn – Vachellia nebrownii

Figure 20: Local occurring flora

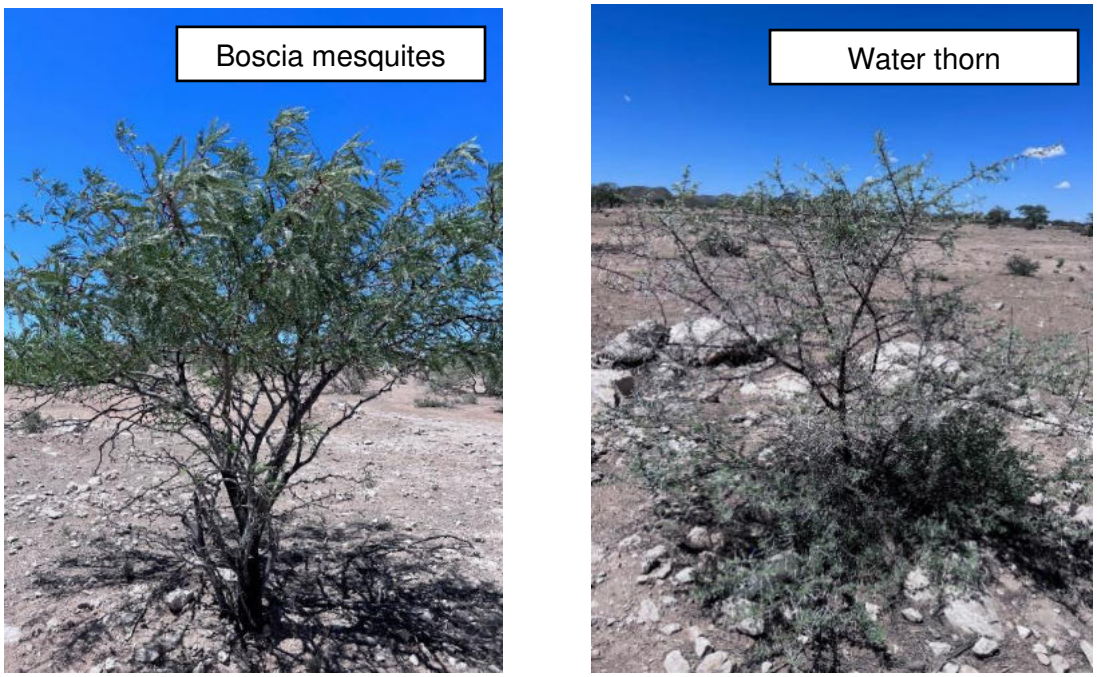


Figure 21: Local occurring flora

Implications to the project

The site will be cleared to make room for the construction of a 170 m^2 PAC plant building. The plants directly affected will be removed. This impact is negligible since these are protected trees and are within an urban area (earmarked for development). The footprint of this project is relatively small.

7.2.5 Terrestrial fauna

Animal species diversity of the Karibib area is shown in **Table 16**:

Table 16: Species diversity (Mendelsohn et al., 2003)

Fauna	No of species (Country Total)	No of species (Karibib Area)
Bird	658	171 - 200
Frog	50	8 – 11 (during a rainy season)
Mammals	217	61 – 75
Reptile	258	71 – 80
Scorpion	56	18 – 21

Implications to project

The reservoir and the PAC plant will be constructed in a disturbed build-up area within Karibib Town Lands. There are beetles and reptiles in the vicinity of the project sites and these impacts is negligible and not significant.

7.2.6 Surface and groundwater resources

Historical data indicate that a total of 18 boreholes were drilled in the vicinity of Karibib and that includes the Weihnachtsbrunn and Hälbichsbrunn boreholes, however, only two of these boreholes are usable, although not currently connected as there is no electrical supply yet.

7.3 Socio-study and Socio-economic structure

Karibib is situated in an important strategic position and is the gateway linking several Southern Africa Development Community (SADC) countries with the Namibian port of Walvis through Windhoek to Botswana and South Africa and Trans-Cunene rail and road corridor that will link the port of Walvis Bay to Lubango in Angola runs through the town of Karibib.

Based on the latest census results (Namibia Statistics Agency (NSA), 2012) the total population of Karibib is approximately 5 132. The population of Karibib has increased by approximately 38%, from 3 726 in 2001.

The statistics shown in Table 17 below are derived from the 2012 Namibia Population and Housing Census (NSA, 2012) and are presented from a constituency perspective:

The town of Karibib is characterised by low-density residential development. The business component of the town is located on both sides of the B1 main road. Institutional, public open spaces, business, industrial and government offices can be found within the town (SPC, 2016).

Karibib has four schools, a police station, a fire station, a clinic, and a magistrate's office. Employment is provided for by the Navachab Gold Mine (10 km south-west of Karibib) quarries (marbles, granites, dimension stones etc.) restaurants and supermarkets. The Informal sectors also provide employment.

Table 17: Statistics of Karibib Constituency

Population	13,320
Females	6,412
Males	6,908
Private Households	3,471
Population under 5 years	13%
Population aged 5 to 14 years	20%
Population aged 15 to 59 years	60%
Population aged 60 years and above	7%
Female: male ratio	100:108
Literacy rate of 15 years old and above	92%
Head of household - Females	42%
Head of household - Males	58%

People above 15 years who have never attended school	12%
People above 15 years who are currently attending school	10%
People above 15 years who have left school	76%
People with disability	4%
People aged 15 years and up who belong to the labour force	76%
Population employed	59%

7.4 Archaeological and Heritage

Karibib has a rich history and thereby a rich architectural heritage linked to the development of the town. There are seven known historical buildings and sites within Karibib.

Table 18: List of historical buildings and sites in Karibib (SPC, 2016)

Name of building	Significance	Declared as monument
The Kaiserbrunnen	Well, a water reservoir	16 June 1986.
The Halbich Branch	Historical building	1 April 1986.
The Rosemann Building	Historical building	20 December 1979
The Woll House	Colonial architectural style, built from local granite and Karibib marble	15 May 1986
The Supplies Post	Buildings erected by Schutztruppe in 1911 to serve as supply posts for their operations	15 May 1986
The Hotel “Zum Grunen Kranze”	One of the hotels	15 May 1986
The old cemetery		

8 DESCRIPTION AND ASSESSMENT OF ANTICIPATED IMPACTS

This section provides anticipated environmental impacts (short-term and long-term) associated with the planning & design, construction, operation, maintenance, and decommissioning of the proposed Karibib PAC Plant and Ground Reservoir. All development changes are destructive to the local fauna and flora to some or other degree. Assessing potential impacts is occasionally obvious, but more often difficult to predict accurately. Such predictions may change depending on the scope of the development – i.e., development, once initiated and may have a different effect on the fauna as originally predicted. Thus, continuous monitoring of such impacts during the development phase(s) is imperative.

According to the EIA Regulations, the term "environment" is referred to the complex of natural and anthropogenic factors and elements which include both the natural environment and the human environment. Hence, the assessment considered the potential impacts on the existing socio-economic and biophysical settings of the receiving environment as well as the future land use and development in the area.

8.1 Prediction of Impacts

Potential sensitivities of the biophysical, and socio-economic environment were screened according to the impacts identified by the desktop literature study, on-site field assessments, Consultation with the Karibib Town Council and the public meeting. However, the potential sensitivities identified from the consultation meetings are provided here:

- Improved water quality
- Employment opportunity
- Waste management during construction and operation
- Health and Safety

The sensitivities identified were screened to identify those that require further assessment and those that can be dealt with in an EMP without further assessment. The potential impacts were evaluated in terms of the impact assessment criteria (Section 8.2) (duration/time, extent/scale, intensity/ magnitude, probability, status and significance ratings) as described in **Table 19.** In Section 8.4, aspects that required further detail were evaluated by using existing baseline information, management and mitigation measures required to minimise or prevent the potential impacts.

8.2 Impact Criteria and Scales

As per the NamWater ToR, the following impact assessment for each project phase will be used:

- Positive, negative;
- Nature of impact;
- Magnitude and scale – sphere of influence/impact;
- Duration – once-off, construction, the life of the project, persistent;
- Probability of occurrence;

- Significance;
- Confidence limits;
- Comparative evaluation of alternatives;
- Cumulative impacts; and
- Relate to stakeholder concerns.

The following Impact Assessment Criteria (**Table 19**), determining consequence and significance are used:

Table 19: Impact assessment criteria

Description/nature of the impact	The type of effect that a proposed activity will have on the environment. A narrative of the impact "What is affected and how?"
Status of the impact	**Positive** – benefit from the impact **Negative** – environment will be adversely affected by the impact **Neutral** – environment overall will not be affected
Project Phase	At what stage will the impact occur Planning and design; Construction; During the operation and usage of the pipeline; During maintenance of the pipeline; During decommissioning of the pipeline
Magnitude and scale	**Geographic area.** Whether the impact will be within a limited area **Site-specific** (on-site where construction is to take place) **Sub-local** (limited to within 0.5 km to 1 km of the site) **Local** (limited to within 15 km of the site) **Regional** (*limited* to within the borders of Erongo Region) **National** (limited to within the borders of Namibia) **International** (extending beyond Namibia's borders)
Duration	**Once off** - During Construction Phase only **Temporary/short term**. Quickly reversible. (Less than the life of the project). **Medium Term**. The impact can be reversed over time. (Life of the project). **Long Term**. The impact will only cease after the life of the project. **Persistent** / **Permanent**
Intensity	**No lasting effect** (No environmental functions and processes are affected) **Minor effects** (The environmental functions, but in a modified manner) **Moderate effects** (Environmental functions and processes are altered to such extent that they temporarily cease) **Serious effects** (where environmental functions and processes are altered such that they permanently cease and/or exceed legal standards/requirements)
Probability of occurrence	Refers to the probability that a specific impact will happen following a risk event. **Improbable** (low likelihood) **Probable** (a distinct possibility) **Highly probable** (most likely) **Definite** (impact will occur regardless of prevention measures)

Description/nature of the impact	The type of effect that a proposed activity will have on the environment. A narrative of the impact "What is affected and how?"
Significance (no mitigation)	**None** (A concern or potential impact that, upon evaluation, is found to have no significant impact at all.) **Low** (Any magnitude, impacts will be localised and temporary. Accordingly, the impact is not expected to require an amendment to the project design.) **Medium** (Impacts of moderate magnitude locally to regionally in the short term. Accordingly, the impact is expected to require modification of the project design or alternative mitigation.) **High** (Impacts of high magnitude locally and in the long term and/or regionally and beyond. Accordingly, the impact could have a 'no go' implication for the project unless mitigation or re-design is practically achievable.)
Recommended mitigation measures	Description of possible mitigation measures
Significance (with mitigation)	**None** (A concern or potential impact that, upon evaluation, is found to have no significant impact at all.) **Low** (Any magnitude, impacts will be localised and temporary. Accordingly, the impact is not expected to require an amendment to the project design.) **Medium** (Impact of moderate magnitude locally to regionally in the short term. Accordingly, the impact is expected to require modification of the project design or alternative mitigation.) **High** (Impacts of high magnitude locally and in the long term and/or regionally and beyond. Accordingly, the impact could have a 'no go' implication for the project unless mitigation or re-design is practically achievable.)
Related to stakeholder concerns	**Yes** – Raised by stakeholders **No** – Not raised by stakeholders

8.3 Assessment of potential impacts

The purpose of this section is to assess and identify the most pertinent environmental and socio-economic impacts by describing certain quantifiable aspects of these impacts and to provide possible mitigation measures to minimise the magnitude of the impacts that would be expected from the construction, operations and decommissioning of the proposed new water pipeline.

The following aspects and impacts are grouped according to the main project phases, i.e., the planning and design phase, construction phase, operational phase and decommissioning and closure phase. The numerous aspects of each will be discussed under each impact.

8.3.1 The methodology used for mitigation measures

There is a hierarchy of actions which can be undertaken to respond to any proposed project or activity. These cover avoidance, minimisation and compensation. It is possible and considered sought after to enhance the environment by ensuring that positive gains are included in the proposed activity or project. If negative impacts occur, then the hierarchy indicates the following steps:

- Impact avoidance: This step is the most effective when applied at an early stage of project planning. It can be achieved by:
    - not undertaking certain actions or elements that could result in adverse impacts;
    - avoiding environmentally sensitive areas; and
    - putting in place preventative measures to stop adverse impacts from occurring.
- Impact minimisation: This step is usually taken during impact identification and prediction to limit or reduce the degree, extent, magnitude, or duration of adverse impacts. It can be achieved by:
    - scaling down or relocating the proposed activities/project;
    - redesigning elements of the project; and
    - implementing mitigation measures to manage the impacts.
- Impact compensation: This step is usually applied to remedy unavoidable residual adverse impacts. It can be achieved by:
    - rehabilitation of the affected site or environment, for example, by habitat enhancement;
    - restoration of the affected site or environment to its previous state or better; and
    - replacement of the same resource values at another location (offset),

8.4 Potential Impacts Identified for Each Phase

For this assessment's purpose, the issues and impacts identified are grouped according to the main project phases – i.e., the construction phase, the operational phase and decommissioning and closure phase. Sections 8.4.1, 8.4.2 and 8.4.3 give a broad overview of each potential impact expected during the three phases, while a comprehensive assessment outcome with mitigations is presented for each potential impact.

8.4.1 Planning and Design Phase

The first step in avoiding and preventing any possible negative impacts during the construction, operation, maintenance, and decommissioning phase, should start with the planning and designing phase. The planning and design phase includes the drafting of PAC plant and ground reservoir designs, and approval of construction plans before construction commences.

8.4.1.1 Building plans

The final building plans for the PAC plant and the ground reservoir will need to be submitted for approval by the Karibib Town Council.

8.4.2 Anticipated negative impacts: construction phase

The anticipated potential negative impacts during the construction phase of the PAC plant and the ground reservoir on both the biophysical and socio-economic environments as follows:

- Risks of fuel spills or leaks
- Waste generation

- Sanitation
- Health and safety hazards
- Nuisance
- Increase in traffic.

8.4.2.1 Fuel and lubricants spill or leaks at construction

Table 20: Impact assessment for fuel and lubricants spill or leaks at construction

Description/nature of impact	The poor handling and spillage of fuel, lubricants, and chemicals i.e., oil, grease from construction equipment and vehicles could contaminate the soil.
Status of the impact	**Negative** – environment will be adversely affected by the impact
Project Phase	**Construction**
Magnitude and scale	**Site-specific**
Duration	**Once off -** During Construction Phase only
Intensity	**Moderate effects**
Probability of occurrence	**Probable**
Significance (no or before mitigation	**Medium**
Recommended Mitigation measures	• Drip trays should be provided for vehicles and machines with leakages. • All construction vehicles must be serviced at the maintenance workshop and no offsite maintenance should be allowed. • If refuelling is to be done onsite, fuel tanks should be left in vehicles only and not be offloaded on the ground. • All leakages and spillages of oil and grease should be contained, cleaned up, stored in sealed containers and then be disposed of at the Walvis Bay Hazardous Waste disposal site. • Follow the spillage procedures as outlined in the EMP.
Significance (with/after mitigation)	**Low**
Related to stakeholder concerns	**No** – Not raised by stakeholders

8.4.2.2 Waste generation during the construction

Table 21: Impact assessment for waste generation, construction phase

Description/nature of the impact	The following types of waste will be generated during the construction phase, in relatively small volumes: • Domestic waste (non-hazardous). • Building rubble (bricks, cement bags, straps and so on) • Industrial waste – non-hazardous (offcuts, scrap metal, empty containers, plastics and packaging and building rubble) • Industrial waste – hazardous (i.e., hydrocarbon-contaminated material/soil) All these types of waste will have a negative impact on surrounding areas if not disposed of properly and regularly. In addition, the process of transporting all construction debris may also result in windblown litter from the vehicles transporting waste.
Status of the impact	**Negative**
Project Phase	**Construction**
Magnitude and scale	**Sub-local**
Duration	**Temporary/short term**
Intensity	**No lasting effect**
Probability of occurrence	**Highly probable**
Significance (no or before mitigation	**Medium**
Recommended Mitigation measures	Description of possible mitigation measures • Waste bins must be provided at the construction sites. • Waste bins should be secured (i.e., enclosed cages) to prevent windblown litter. • All general waste generated at the site must be contained and removed from the site regularly for disposal at the Karibib waste disposal site. • Hazardous waste will be disposed of at the Walvis Bay hazardous waste dump site. • After construction, the entire area will be rehabilitated as set out in the EMP. • Vehicles transporting waste should be sealed with a tarpaulin to avoid waste from being blown away by the wind.
Significance (with/after mitigation)	**Medium**
Related to stakeholder concerns	**Yes**

8.4.2.3 Sanitation

Table 22: Impact assessment for sanitation, pipeline construction phase

Description/nature of the impact	Liquid waste from construction workers will be generated. All these types of waste will harm surrounding areas if not disposed of properly and regularly.
Status of the impact	**Negative**
Project Phase	**Construction**
Magnitude and scale	**Site-specific**
Duration	**Temporary/short term.**
Intensity	**No lasting effect**
Probability of occurrence	**Highly probable**
Significance (no or before mitigation	**Medium**
Recommended Mitigation measures	• Provision must be made for sufficient portable ablution facilities during the construction period. • In terms of the general health Regulations (GN 121. 1969), it is recommended to have at least 1 toilet within 500 m along the pipeline route and 2 toilets for every 25 people (separate water closet for males and females) at the construction site. Two mobile toilets Female and Male should be provided. • Sewage from ablution facilities should be contained in a tank and disposed of at the Municipality wastewater sewerage evaporation ponds.
Significance (with/after mitigation)	**Medium**
Related to stakeholder concerns	**No**

8.4.2.4 Occupational health and safety hazards

Table 23: Impact assessment for occupational Health and safety hazards, construction phase

Description/nature of the impact	Occupational health hazards are expected particularly for the construction workers who will be present at the site. Workers will be exposed to dust, vibrations, high noise levels, sun exposure (sunstroke), and dehydration during the summer months.
Status of the impact	**Negative**
Project Phase	**Construction**
Magnitude and scale	**Site-specific**
Duration	**Once off –** During Construction Phase only
Intensity	**Minor effects**

Probability of occurrence	**Probable**
Significance (no or before mitigation	**Medium**
Recommended Mitigation measures	• Employees must be provided with PPE. • Employees must also be trained on the nature of their jobs and made aware of potential hazards at their workplace. • Shade and enough water should be provided. • The construction team should have trained first aider and the first aid kit should always be present.
Significance (with/after mitigation)	**Low**
Related to stakeholder concerns	**No**

8.4.2.5 Nuisance

According to the National Labour Act 11 of 1992, a nuisance is described as noise, dust, vibration, and odour. This impact is subjective based on the public perceived views. It will also depend on the concerned person's perception of what constitutes a nuisance.

Table 24: Impact assessment for noise and dust, construction phase

Description/nature of the impact	Noise pollution is a negative impact that will surely result from operating construction equipment such as cranes, trucks, drilling, concrete mixer, etc. The major negative impact that could result is the noise generated during the working hours or the day.
Status of the impact	Negative
Project Phase	Construction
Magnitude and scale	Site specific
Duration	Temporary/short term.
Intensity	No lasting effect
Probability of occurrence	Highly probable
Significance (no or before mitigation	Medium
Recommended Mitigation measures	• The occurrence of noise impacts will only be temporary. • All construction activities must be limited to normal working hours (08:00-17:00) and avoid operating during odd hours. • All equipment should be regularly maintained to maintain good working conditions
Significance (with/after mitigation)	**Medium**
Related to stakeholder concerns	**No**

8.4.2.6 Increase in traffic

Table 25: Impact assessment for increased traffic movement, construction phase

Description/nature of the impact	Construction activities will result increased movement of construction vehicles in and out of the sites. Therefore, normal traffic movement, especially in streets in the vicinity of the construction site may be slightly disrupted during the construction period.
Status of the impact	**Negative**
Project Phase	**Construction**
Magnitude and scale	**Site specific**
Duration	**Temporary/short term.**
Intensity	**No lasting effect**
Probability of occurrence	**Highly probable**
Significance (no or before mitigation	**Medium**
Recommended Mitigation measures	• The contractor must erect a construction signage at the construction site. • Construction vehicles must be driven by authorized drivers only and stick to the maximum speed limits. • Heavy-duty vehicles and machinery must be tagged with reflective signs or tapes to maximize visibility and avoid accidents.
Significance (with/after mitigation)	**Medium**
Related to stakeholder concerns	**No**

8.4.3 Anticipated negative impacts: operational and maintenance phase

The operation and maintenance phase of the proposed pipeline replacement will equally result in several negative impacts to the biophysical and socio-economic environment. The identified potential negative impacts during the operation phase are as follows:

- Waste generation
- Occupational health and safety

8.4.3.1 Waste generation

Table 26: Impact assessment for waste generation, operational phase

Description/nature of the impact	The operation of the PAC plant will result in the generation different types of waste such as general household waste and wear-off parts from maintenance services
Status of the impact	**Negative** – environment will be adversely affected by the impact.
Project Phase	**Operational Phase**
Magnitude and scale	**Sub-local**
Duration	**Permanent**
Intensity	**Moderate**
Probability of occurrence	**Probable** (a distinct possibility)
Significance (no mitigation)	**Low**
Recommended Mitigation measures	• General household waste should be contained in the municipal refuse bins for disposal at the Karibib Town Council disposal site. • Alternatively, general household waste can be sorted into separate categories and sent to the local recycling plants (if available). • Wear-off metal parts can be collected and sent to the local scrap yard. • Other items such as PAC bags should also be disposed of at the waste disposal site.
Significance (with mitigation)	**Low** (Any magnitude, impacts will be localised and temporary. Accordingly, the impact is not expected to require an amendment to the project design.)
Related to stakeholder concerns	**Yes**

8.4.3.2 Ablution facilities and waste production at the PAC plant

Table 27: Impact assessment for ablution facilities and waste production at the PAC plant

Description/nature of the impact	There is currently no sewage reticulation system installed in the PAC plant. The effluent from the PAC plant which includes waste from the PAC mixing tank (non-toxic) and sewage wastewater (toxic waste) from the ablution facilities, will be accumulated and stored in a septic tank.
Status of the impact	**Negative** – environment will be adversely affected by the impact
Project Phase	**Operational phase**
Magnitude and scale	**Site-specific**
Duration	**Medium Term**

Intensity	**Moderate effects**
Probability of occurrence	**Probable**
Significance (no or before mitigation	**Low**
Recommended Mitigation measures	Waste from the PAC mixing tank (non-toxic) and sewage wastewater (toxic waste) from the ablution facilities should be regularly collected for disposal at the Karibib Town Council oxidation ponds.
Significance (with/after mitigation)	**Low**
Related to stakeholder concerns	**No**

8.4.3.3 Occupational Health and Safety

Table 28: Impact assessment for occupational health and safety, operational phase

Description/nature of the impact	Potential health and safety risks that are associated with the plant operation are such as the risk of falling and drowning by both operation and maintenance staff
Status of the impact	**Negative** – environment will be adversely affected by the impact
Project Phase	**Operational phase**
Magnitude and scale	**Site-specific**
Duration	**Medium Term**
Intensity	**Moderate effects**
Probability of occurrence	**Probable**
Significance (no or before mitigation	**Low**
Recommended Mitigation measures	• The PAC plant area must be fenced off and out of bounds to the public. Operators and maintenance staff must be trained and made aware of potential occupation risks associated with their job and always equipped with the appropriate PPE.
Significance (with/after mitigation)	**Low**
Related to stakeholder concerns	**No**

8.4.4 Anticipated Positive Impacts

The proposed development will also result in several positive impacts during the construction and operation phases. However, certain enhancement measures must be implemented to fully realize such positive impacts. These impacts are as follows.

Table 29: Assessment of positive impacts during the construction and operation phase

Description/nature of the impact	Magnitude and scale	Duration	Enhancement measures
Job opportunities The proposed project will create job opportunities both direct and indirect for local people during the construction phase.	Local	Temporary	As part of the tender requirements, Contractors must be encouraged to give priority to locally qualified people.
Gender roles Equal opportunities for men and women.	Local	Temporary	Equal opportunities for men and women.
Business opportunities The construction works will create business opportunities for consultants, building contractors, and local suppliers of building materials. Other local businesses such as hotels, guest houses, and street vendors will also benefit indirectly from the construction works.	Regional	Temporary	Building materials must be sourced from local businesses as far as possible. Qualified Namibian construction companies should be given a fair chance to compete in the bidding process
Economic prosperity During the construction phase, it is expected that the local economy will be beneficially impacted by increased temporary employment opportunities and business opportunities.	Regional	Temporary	• Local people and businesses must be given a fair chance to benefit from the project. • There must be a water demand management plan for the area and all major economic activities proposed in the area should be subjected to the water demand management plan.
Improved water quality (free of odour and green algae)	Regional	Permanent	• Construction of the PAC plant to be done accordingly.

Description/nature of the impact	Magnitude and scale	Duration	Enhancement measures
Provision of water supply One of the significant positive impacts that will result from the proposed project is the improved water supply to the area. Hence, the increased supply capacity will ensure a reliable supply of safe drinking water to Karibib.	Regional	Long Term	• Ensure timely fixing of leaks and breaks on the pipeline to minimise water supply interruptions. • Residents must be sensitised to use water sparingly.

8.5 Decommissioning Phase

The decommissioning of the proposed PAC plant and the ground reservoir is not foreseen during the validity of the environmental clearance certificate. Should decommissioning occur at any stage, an Environmental Impact Assessment for the decommissioning process should be commissioned by the proponent.

The decommissioning will entail the complete removal of all associated infrastructures. Any pollution present on the site must be remediated. The impacts associated with this phase include noise and waste production as structures are dismantled. All waste materials from the decommissioning activities should be contained and disposed of at a Karibib waste disposal site. The EMP for the facility will have to be reviewed at the time of decommissioning to cater for changes made to the site and implement guidelines and mitigation measures. Furthermore, the Proponent should thus consult with the relevant authority before any proposed demolition and removal of site infrastructure to best mitigate any potential impacts.

9 CONCLUSION AND ENVIRONMENTAL IMPACT RECOMMENDATIONS

9.1 Conclusion

The objective of the Scoping phase of the EIA study was to define the range of the impact assessment and determine the need to conduct any specialist study. It is believed that this objective has been achieved and adequately documented in the Scoping Report. All possible environmental aspects have been adequately assessed and necessary control measures have been formulated to meet statutory requirements, thus implementing this project will have little appreciable negative impacts.

The EMP should be used as an on-site reference document for the operations of the facility. Parties responsible for transgressing the EMP should be held responsible for any rehabilitation that may need to be undertaken. The Proponent could use an in-house Health, Safety, Security Policy in conjunction with the EMP. All operational personnel must be taught the contents of these documents.

LANA Environmental Consulting cc believes that a thorough environmental assessment of the proposed project has been achieved.

9.2 Recommendation to DWA and DEA

Should the competent authority; the Department of Water Affairs and the regulatory authority; the Directorate of Environmental Affairs (DEA) find that the identified impacts and related mitigation measures, which have been proposed in this report, are acceptable, the following is recommended:

- Approve the findings of the Scoping process and mitigation measures contained in the Scoping report (this report).
- When deemed necessary, attach any condition/s to ensure environmental compliance and for the proposed project to meet statutory requirements.
- Issue the ECC to NamWater Pty Ltd., for the construction, operation, maintenance, and decommissioning of the proposed Karibib PAC Plant and Ground Reservoir, Erongo Region.
- The ECC should be issued on condition that the management and mitigation measures in the EMP are always adhered to.

10 SUPPORTING INFORMATION

10.1 References

Columbia SC, 2023. Geosmin and 2-Methylisoborneol (MIB) https://columbiascwater.net/geosmin-and-mib/#:~:text=What%20are%20geosmin%20and%20MIB,typically%20happens%20during%20the%20summer. Accessed on 21 May 2023.

Directorate of Environmental Affairs, 2008. Procedures and Guidelines for Environmental Impact Assessment (EIA) and Environmental Management Plans (EMP), Directorate of Environmental Affairs, Ministry of Environment and Tourism, Windhoek.

Environmental Protection Agency (EPA). 1992. EPA Facts About Activated Carbon Treatment. United States of America.

Oladejo, J., Chen, J., Luo, X., Gang, Y and Wu. Tao. 2020. Closing the active carbon cycle: Regeneration of spent activated carbon from a wastewater treatment facility for resource optimization. https://www.sciencedirect.com/science/article/pii/S0255270119315089

National Statistics Agency (NSA), 2012. Namibia 2011 Population and Housing Census Main Report. Available at : http://nsa.org.na/page/publications .

Namibia Statistic Agency, 2016. Namibia Inter-censal Demographic Survey.

National Herbarium of Namibia. Undated. Plant specimen database (SPMNDB). National Botanical Research Institute, Windhoek.

NamWater, 2022. Karibib Water Quality Phase 1 (PAC Plant) Project - M&E Preliminary Design Report. NamWater-Civil Engineering. December 2022.

NamWater, 2018. Development Proposal on Karibib Storage Extension. Infrastructure Planning. August 2018.

NamWater, 2016. Karibib Water Quality: Chemical Equipment Sizing for Preliminary Design Input. NamWater-Water Treatment Services. September 2016.

Mendelsohn, j., et al., 2003. Atlas of Namibia. A portrait of the land and its People. David Phillip. Cape Town.

Mendelsohn, J., Jarvis, A., Roberts, C., & Robertson, T. (2002). Atlas of Namibia: a Portrait of the Lands and its People. Cape Town: David Philip Publishers.

Stubenrauch Planning Consultants (SPC). 2016. Karibib Urban Structure Plan 2016 to 2030. Draft February 2016.

10.2 Appendices

Appendix A – CV of the EAPs

Nangula Amutenya Amatsi (LEAD EAP)

Faye Brinkman (2nd EAP)

Appendix B – BID

Appendix C - Proof of consultation process

- Appendix C1 - PowerPoint Presentation for consultation meetings
- Appendix C2 - Copies of newspaper advertisements x 4
- Appendix C3 – Register for receiving BIDs – neighbours.
- Appendix C4- Attendance registers for public meetings and authority consultation meetings
- Appendix C5 - Stakeholder database

Appendix D - Environmental Management Plan