PROPOSED BULK INFRASTRUCTURE PROJECTS IN URBAN AREAS IN NAMIBIA: OKAHAO, OMUSATI REGION

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT SCOPING (INCLUDING ASSESSMENT) REPORT

Prepared for: Development Workshop Namibia

July 2025

DOCUMENT CONTROL

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EXECUTIVE SUMMARY

1. GENERAL INTRODUCTION

The Development Workshop Namibia (DWN) is implementing the overall Project "Poverty-Oriented Development of Infrastructure in urban areas of Namibia" with financial support from KfW Development Bank (KfW). The project seeks to contribute to more sustainable and inclusive urban development in Namibia by supporting DWN to plan and develop low-cost residential land with titles in 15 towns across Namibia.

The overall objective is to transform current informal settlement growth into more formal urban growth and to initiate and contribute to changing the way urban planning is done towards a more holistic and participatory planning approach to create socially and economically conducive living environments.

The overall project is being implemented by three distinct components:

Component one: Planning and developing low-cost residential land with title.

Component two: Providing "pro-poor" infrastructure investments in four selected towns (*which relates to this report*).

Component three: Improving public hygiene and access to appropriate sanitation.

The infrastructure requirements subject of Component two was identified in some of the project towns through a Bulk Infrastructure Assessment (BIA) exercise conducted by various consulting firms engaged by DWN. Thereafter, priority infrastructure projects were jointly drawn up by the DWN and the Town Council authorities.

DWN subsequently planned to deploy part of the KfW grant through Component two of the overall Project and hired Lund Consulting Engineers (LCE) to design and supervise the construction of various pro-poor infrastructure components in (amongst others) the town of Okahao, in the Omusati Region (refer to Figure 1), i.e. "the proposed Okahao Project".

The proposed Okahao Bulk Infrastructure Project includes the following:

- The construction of an underground power supply line.
- Construction of a pump station and rising main for the sewerage system.
- Gravelling of the main roads.
- Construction of water storage facilities.

The proposed Okahao Project forms the subject of this Environmental and Social Impact Assessment (ESIA) Scoping (including Impact Assessment) Report. This report has been compiled as part of the Environmental Clearance Certificate (ECC) application and associated Environmental and Social Impact Assessment (ESIA) process for the proposed Bulk Infrastructure Project. It includes an assessment of the environmental impacts that the proposed Project activities are likely to have. The proposed management and mitigation measures relating to the proposed Bulk Infrastructure Project are documented in an Environmental and Social Management Plan (ESMP) attached as Appendix F.

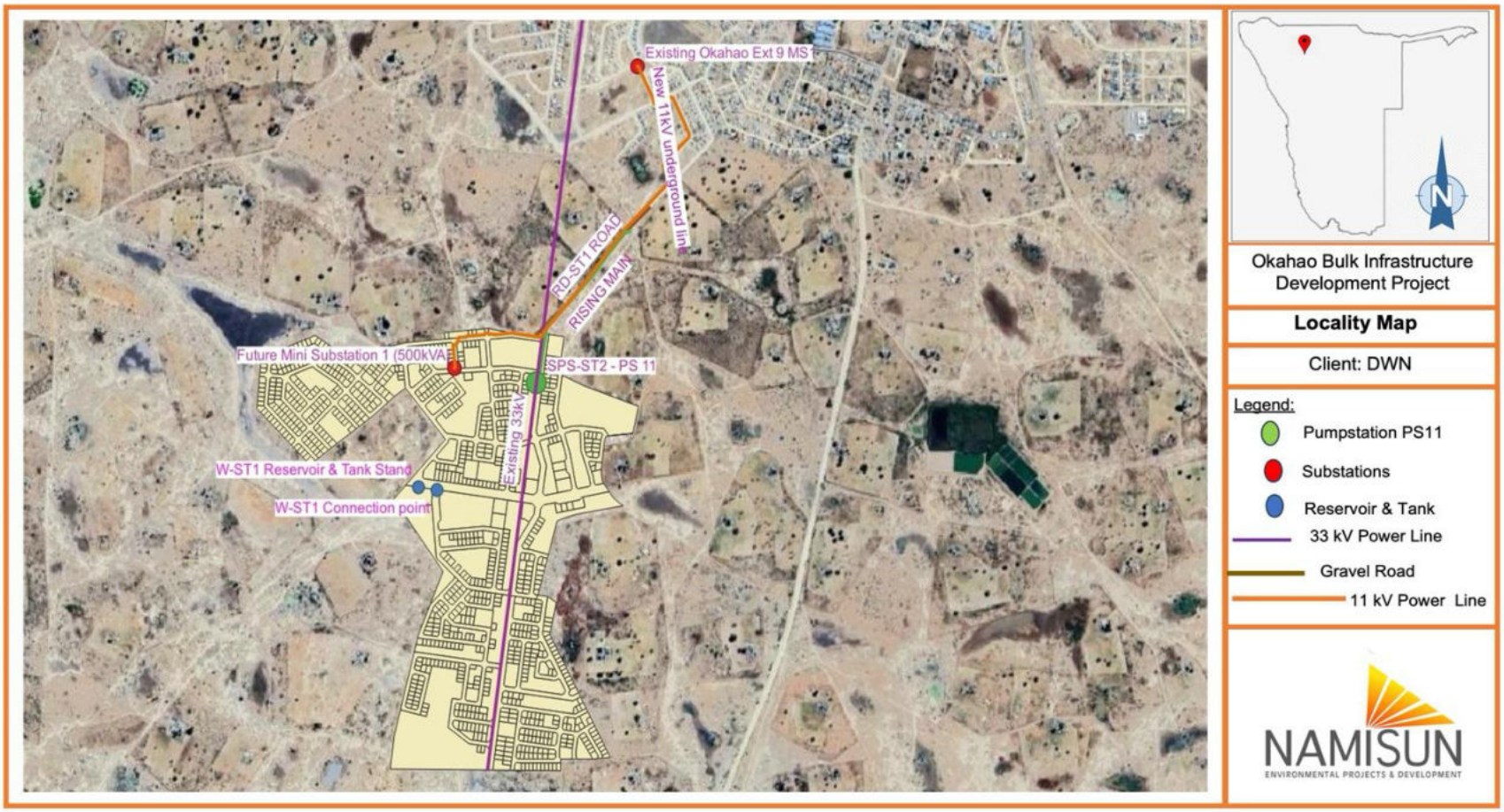

FIGURE 1: MAP OF PROPOSED OKAHAO BULK INFRASTRUCTURE PROJECT *(REF. LCE)*

2. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PROCESS

Environmental Impact Assessments (EIAs – which typically include 'social aspects') are regulated by the Directorate of Environmental Affairs (DEA) of the MEFT in terms of the Environmental Management Act, No. 7 of 2007. This Act was gazetted on 27 December 2007 (Government Gazette No. 3966) and its associated Regulations were promulgated in January 2012 (Government Gazette No. 4878) in terms of the above-mentioned Act.

Prior to the commencement of the proposed Okahao bulk infrastructure project activities, an application for an environmental clearance certificate (ECC) will be submitted in terms of this Act and the associated EIA Regulations to the MURD, as the competent authority. MURD will review the application and relevant reports and submit their comments and recommendations to the MEFT for their final review and decision.

The specific objective is to conduct an ESIA and develop an Environmental and Social Management Plan (ESMP) to enable the MEFT (DEA) to make an informed decision regarding the application for an ECC. Due to the nature and scale of the proposed activities, and the fact that it will be undertaken in areas which have largely been disturbed (i.e. within townlands), it is Namisun's opinion that a Combined Scoping and Impact Assessment Process be undertaken.

The ESIA will comply with Namibian legislation and EIA regulations. As KfW is the donor, additional best practice standards must also be considered. However, given the nature and scale of the activities, not all KfW requirements and standards will be implemented within this ESIA process. Instead, these standards will be reviewed and incorporated into the ESIA (and ESMP) where relevant.

The ESIA process and corresponding activities include the following:

- Project initiation and screening phase (February – March 2025):
    - Project initiation meetings and site visits with the DWN and LCE teams to discuss the proposed Okahao Bulk Infrastructure Project and ESIA / ECC Application process.
    - Early identification of environmental aspects and potential impacts associated with the proposed project and determine legal requirements.
    - Decision on ESIA process to be followed.
    - Identify key stakeholders and compose Interested and / or Affected Parties (I&APs) database.

- Scoping (including assessment) phase (March – July 2025):
    - Notify authorities and I&APs of the proposed ESIA process (distribute background information document (BID), e-mails, telephone calls, newspaper advertisements, radio announcements and site notices).
    - I&APs registration and initial comments.
    - Key stakeholder (focus group) meetings and include I&APs issues and concerns in the assessments.
    - Compilation of ESIA Scoping (including Impact Assessment) Report and ESMP.
    - Distribute ESIA Report and ESMP to relevant authorities and I&APs for review.
    - Update and finalise ESIA Report with ESMP, considering comments received.
    - Online submission of the final report onto the MEFT's portal.
    - Submit Application and finalised ESIA Scoping Report with ESMP and I&APs comments to MURD and MEFT for decision-making.

2.1 ESIA Team

Namisun is independent Environmental Assessment Practitioners appointed by LCE to undertake the ESIA process. Werner Petrick, the EIA Project Manager, has more than twenty-four years of relevant experience in conducting / managing ESIAs, compiling ESMPs and implementing EMPs and Environmental and Social Management Systems (ESMSs). Werner has a B. Eng (Civil) degree and a master's degree in environmental management and is certified as lead environmental assessment practitioner (EAP) and reviewer under the Environmental Assessment Professionals Association of Namibia (EAPAN). Dr Pierré Smit, the ESIA Project Assistant, holds a PhD in Landscape Ecology and has more than twenty-eight years of experience in environmental management, managing environmental assessment, the implementation of ESMPs and ESMSs in Namibia. Karin Maletzky, the Junior ESIA Project Assistant, holds a BSc in Geology & Economics and has more than twenty years of experience in the mining industry. She joined Namisun as a junior ESIA Project Assistant in 2024.

The environmental project team and proponent details for the ESIA process relating to the Bulk Infrastructure Project is outlined in Table 1.

TABLE 1: ESIA TEAM AND PROPONENT DETAILS

Team	Name	Designation	Tasks and roles	Company
Project proponent	Salmi Neshila	Programme Manager	Implementation of the Bulk Infrastructure Project	DWN
	Younes Seghrouchni	Junior Professional Officer		
ESIA Project Management Team	Werner Petrick	Lead ESIA Practitioner	Management of the ESIA process and reporting	Namisun
	Pierré Smit	ESIA Project Assistant Ecology input		
	Karin Maletzky	Junior ESIA Project Assistant		
Technical Team	Stefan Grögli	Civil Engineer	Technical input Implementation of the ESMP	LCE
	Aneska Swart	Engineer		

2.2 Steps in the public participation process

All comments, questions and issues that have been raised throughout the process by authorities and I&APs are provided in Appendices D and E of the ESIA Scoping (including Impact Assessment) Report. A summary Issues and Response Report (I&RR) is also attached in Appendix E. Various I&APs provided positive comments relating to the proposed project.

The steps that were followed as part of the consultation process are summarised below:

- Notification - regulatory authorities and I&APs:
    - The stakeholder database was developed. This database is updated as and when required.
    - Compiled a Background Information Document (BID). Copies of the BID were distributed via email to relevant authorities and I&APs on the stakeholder database and copies were made available on request. The purpose of the BID was to inform I&APs and authorities about the proposed activities, the assessment process being followed, possible environmental and social impacts and ways in which I&APs could provide input / comments to Namisun. A copy of the notifications and BID are attached in Appendix C.
    - Site Notices (A2 & A3 sizes) were placed at the entrance of the Okahao Town Council building, on the notice boards inside the building and at open public spaces to notify I&APs of the proposed project, and the ESIA process being followed.
    - Block advertisements were placed in the Market Watch (on 26 February, 4 June and 11 June 2025) as part of the following newspapers:

    - The Namibian Sun; Die Republikein; and Allgemeine Zeitung.

- Key stakeholder and focus group meetings:
    - The above-mentioned notifications and adverts stated the following: “Open Public and Focus Group meetings will be arranged and BIDs are available for a review and comment period from 26 February – 14 March 2025. If you would like your comments to be addressed in the ESIA Scoping (including Impact Assessment Report, please submit them to Namisun no later than 14 March 2025.”
    - ESIA Open Public and Focus group meetings were held as follows:
        - Open Public Meeting: Local Community and Beneficiaries on 11 March 2025 at the Okahao Town Council Fire Station.
        - Focus Group Meeting: Local authorities and parastatals on 11 March at the Okahao Town Council Chamber.
- Various emails were sent and telephone discussions and WhatsApp messages conducted with numerous I&APs to share further information, the BID and to offer Focus Group meetings.
- Review of ESIA Scoping (including Impact Assessment) Report by I&APs and authorities and submission of Application to MURD and MEFT.

2.3 Opportunity to Comment

The ESIA Scoping (including Impact Assessment) Report was distributed for public / authority review. I&APs were invited to comment on these documents, which were available for a review and comment period from **16 June 2025 to 7 July 2025**. Comments were to be sent to Namisun at the telephone numbers, or e-mail addresses shown below by no later than **7 July 2025**.

Namisun

Attention: Karin Maletzky / Werner Petrick

E-mail address: karin.maletzky2021@gmail.com / wpetrick@namisun.com

Cell number: +264 (0)81 149 0473 / +264 (0)81 140 5969

3. PROJECT DESCRIPTION

As stated in Section 1, DWN is implementing the Project "Poverty-Oriented Development of Infrastructure in urban areas of Namibia" with financial support from KfW. The project seeks to contribute to more sustainable and inclusive urban development in Namibia by supporting DWN to plan and develop low-cost residential land with titles in 15 towns across Namibia.

The objective is to transform current informal settlement growth into formal urban growth and to initiate and contribute to changing the way urban planning is done towards a more holistic and participatory planning approach to create socially and economically conducive living environments.

The project is implemented by three distinct components:

Component one: Planning and developing low-cost residential land with title.

Component two: Providing "pro-poor" infrastructure investments in four selected towns.

Component three: Improving public hygiene and access to appropriate sanitation.

The infrastructure requirements subject of Component two is identified in some of the project towns through a Bulk Infrastructure Assessment (BIA) exercise conducted by Consulting firms engaged by DWN. Thereafter, priority infrastructure projects are jointly drawn up by the DWN and the Town Council authorities.

DWN has planned to deploy part of the KfW grant through Component two of the project to hire Lund Consulting Engineers (LCE) to design and supervise the construction of various pro-poor infrastructure components in (amongst others) the town of Okahao, in the Omusati Region.

DWN has selected four infrastructure projects in Okahao which include one electricity project, one sanitation, one road and one water project. All four projects directly benefit DWN project area which comprises Kashenda Proper, Kashenda Extension 1, Kashenda Extension 2, and the new adjacent DWN project area under Component 1.

The funds of Component two will assist to provide bulk electricity, sewer lines, water storage facilities and gravelling of the main access roads to current and future DWN project area as well as support other bulk infrastructure that will benefit Okahao informal settlement areas.

The proposed Bulk Infrastructure Project includes the following key activities, which are further explained in the Sections below:

1. Construction of a 1.65 km 11 kV underground electricity supply line from an existing 315 kVA mini substation namely Okahao Ext 9 MS, north of Kashenda Proper. This will provide access to bulk electricity to the existing DWN project area, as well as the new DWN extension.
2. Construction of a pump station and a 0.61 km rising main. This will provide access to bulk sewer to DWN existing project area Kashenda Proper. Kashenda Extension 1 and Extension 2 will also benefit in future.
3. Construction of 178 m^3 ground reservoir and 20 m^3 elevated tank. This will provide water storage facilities and boost the water pressure at the new and existing DWN project area.
4. Gravelling of 0.6 km access road to DWN project area connecting to Okahao Ext 9. This will provide access to the existing DWN project area, as well as the new DWN extension.

The following Sections provide further details of the proposed Bulk Infrastructure Project and associated facilities and activities.

3.1 Project ID EE-ST2 11 kV Powerline

A new underground 11 kV power line will be installed from an existing 315 kVA mini substation namely Okahao Ext 9 MS1 to the north of Kashenda Proper. The underground power cable will follow the existing roads and the new proposed road that will be constructed to link Kashenda Proper to the existing Okahao town infrastructure. The underground cable will thereafter follow the new proposed extension roads to the new proposed position of a 500 kVA mini substation between Kashenda Proper and DWN Extension. The new cable route will avoid any existing properties.

- NORED is the supply authority for the region and all electrical infrastructure is the property of NORED. All day-to-day operation and maintenance are completed by NORED. The consultant has informed NORED of the required bulk electrical infrastructure and awaits their reply. All connections, routes and new infrastructure will have to be approved by NORED.EE-ST2 Construction of 1.65 km 11 kV underground electrical supply line to supply DWN Extension
- This will provide access to bulk electricity to the existing DWN project area. This project will allow the provision of bulk 11 kV overhead to the new area allocated to DWN.

- The project will motivate the low-income targeted population in DWN project areas to buy into the project area once DWN advertises the cost of plots with electrification under component 1.
- The project will motivate low-income residents to open up and operate small-scale businesses later into the night since the informal street is a place of economic activity.
- It will also provide safe mobility for women and children and the entire community at large during the night as authorities and communities will be able to surveillance at night.
- OTC has confirmed that they have a budget for internal reticulation once bulk lines are constructed.

See Figure 2 below showing the proposed route for the 11 kV underground power line and positions of the two substations.

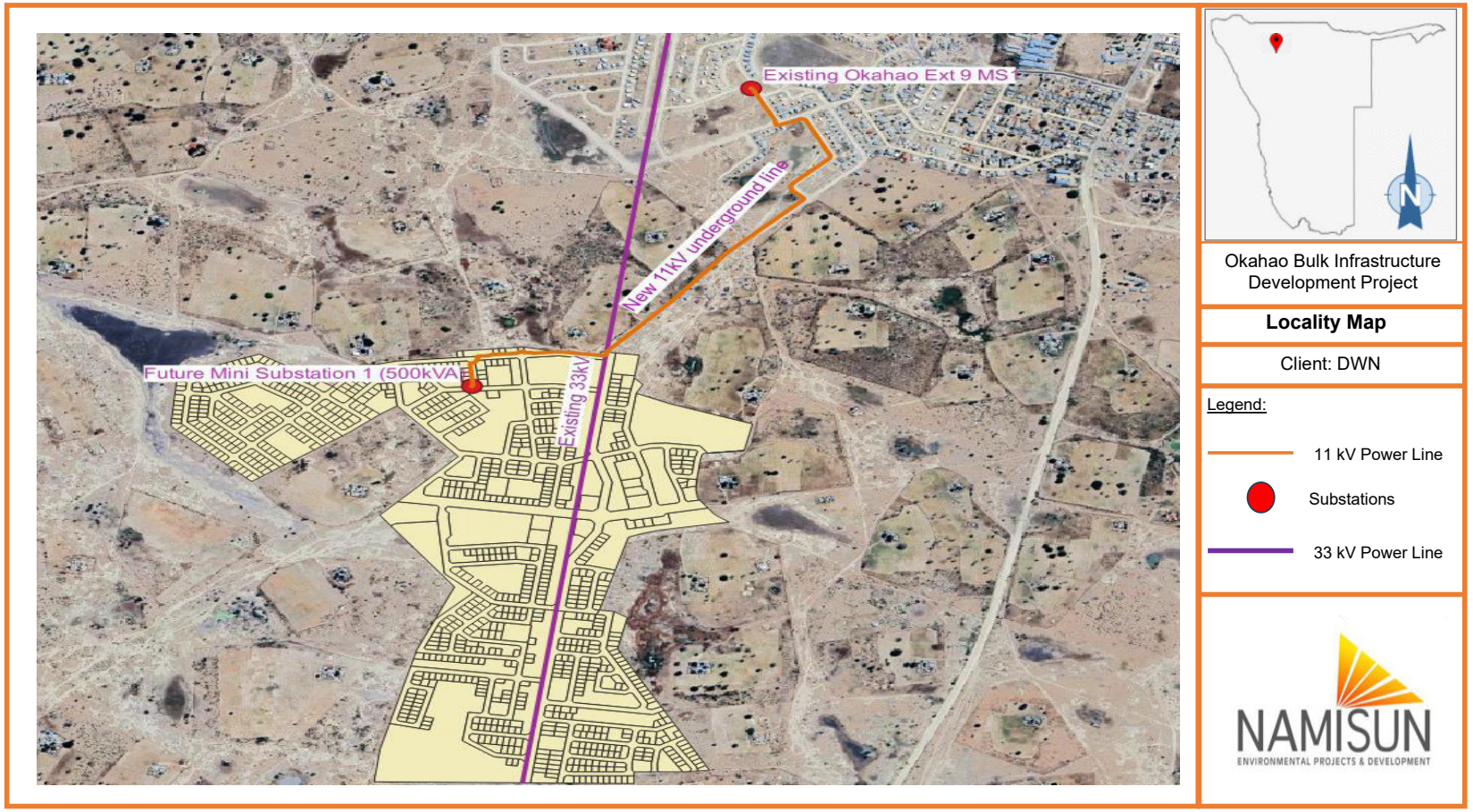

FIGURE 2: EE-ST2 THE ORANGE LINE SHOWS THE 1.65 KM 11 KV UNDERGROUND POWER LINE AND TWO SUBSTATIONS IN THE KASHENDA PROPER AREA. THE VIOLET LINE INDICATES THE EXISTING 33 KV LINE IN THE AREA *(REF. LCE)*

3.2 Project ID SPS-ST2 Pumpstation 11 & Rising Main

A new Pumpstation No. 11 will be constructed to the north of Kashenda Proper with a rising main connecting to the existing sewer network to the north-east.

Due to the topographic nature of the area being relatively flat, the sewer network requires additional pump capacity to convey the sewer to the treatment work.

SPS-ST2 Construction of Pump Station 11 and 0.61 km rising main. This will provide access to bulk sewer to DWN existing project area Kashenda Proper. Kashenda Extension 1 and Extension 2 will also benefit in future.

- The new pump station will be the last point to receive wastewater from DWN project area before pumping it to the new Junction Box 4.
- The proposed project complements the DWN land program under Component 1, enabling Kashenda Proper to be serviced with bulk sewer line and pump station network that will allow OTC to provide future internal sewer reticulation network for the project area.
- The project ensures that sewage generated from Kashenda Proper and future extensions is transported to the existing oxidation ponds and, in the future, to the wastewater treatment plants (WWTW).

See Figure 3 below showing the location of Pumpstation 11 and the rising main.

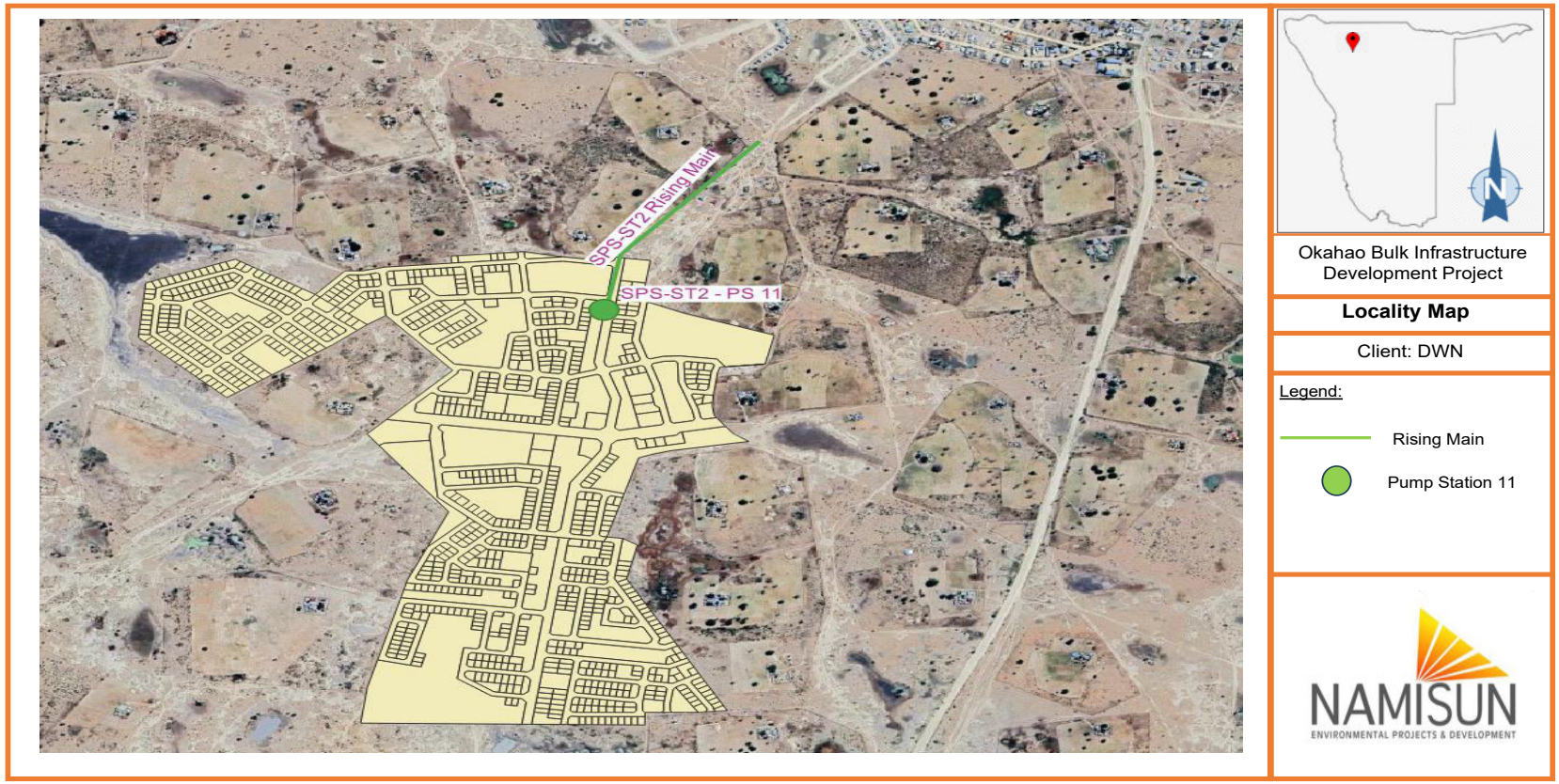

FIGURE 3: SPS-ST2 THE GREEN DOT SHOWS THE PUMPSTATION 11 AND THE GREEN LINE SHOWS THE RISING MAIN *(REF. LCE)*

3.3 Project ID W-ST1 Construction of ground level Reservoir and elevated Tank

The evaluation of the bulk storage reservoir and elevated water tank confirmed that the existing capacity is sufficient for the current demand but will not be able to accommodate the future development scenarios.

W-ST1 Construction of a 178 m³ ground steel reservoir and 20 m³ elevated tank. This will provide water storage facilities and boost the water pressure at the new and existing DWN project areas.

- The proposed project complements the DWN land program under component 1, as the current water for DWN project area comes directly from NamWater main supplier line. Thus, the reservoirs are required to store water to be used in case of emergency.
- The elevated tank will boost the water pressure for the project area and also enable DWN new extension to be serviced with water reticulation networks under Component 1.

See Figure 4 below showing the proposed position of the water infrastructure.

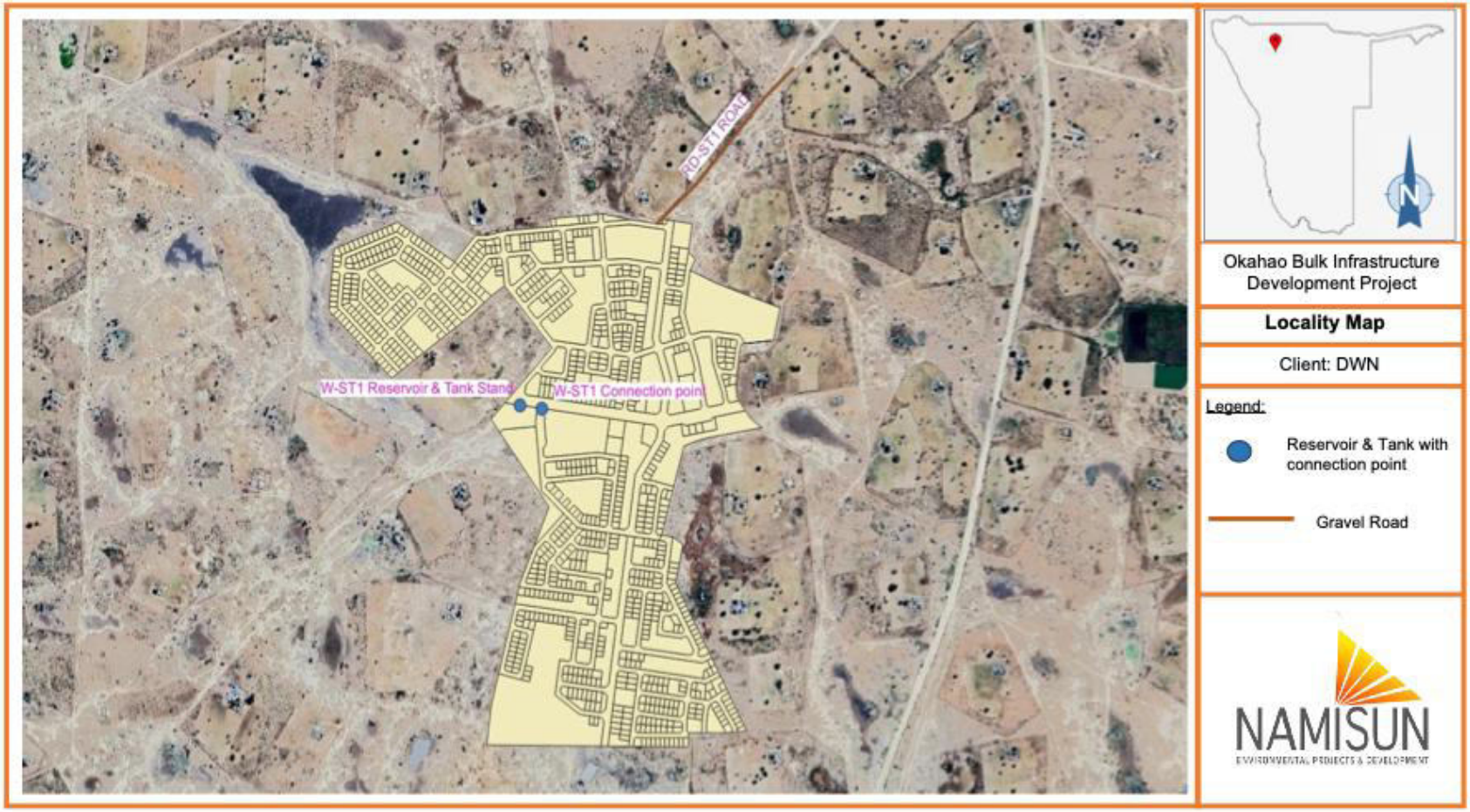

FIGURE 4: W-ST1 THE BLUE DOTS SHOW THE GROUND LEVEL RESERVOIR AND ELEVATED TANK WITH CONNECTION POINT *(REF. LCE)*

3.4 Project ID RD-ST1 Gravelling of 0.6 km main road in Kashenda & DWN Area

Kashenda Proper and Kashenda Extension 1 are situated to the south of Okahao and the new DWN Extension is situated to the west of Kashenda Proper. The main road linking Kashenda Proper to Okahao Extension 9 was chosen to be upgraded to the gravelled road.

RD-ST1 Gravelling of 0.6 km main access roads in DWN project area connecting the Regional Town Council (RTC) gravel road from the tarred road. This will provide access to the existing DWN project area, as well as the new DWN Extension.

- The project consists of gravelling 1 main road section to access DWN project area.
- Section 1 is a 0.6 km road to access Kashenda Proper from Okahao Extension 9 up north.
- The proposed project complements the DWN land program under Component 1, as the project ensures that the clients buying into the DWN project area under Component 1 can access their plots.

See Figure 5 below showing the proposed main road to be gravelled.

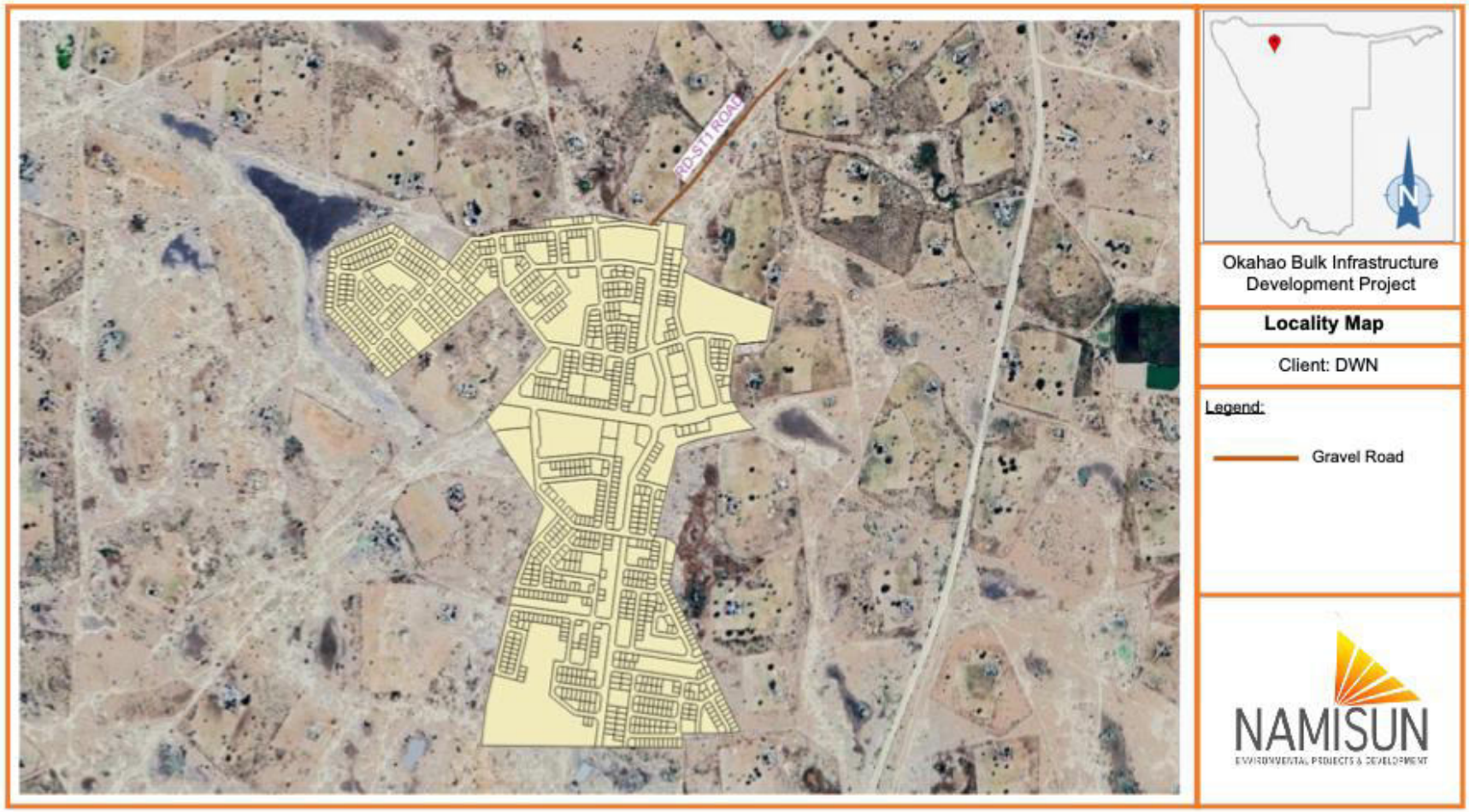

FIGURE 5: RD-ST11 THE BROWN LINE SHOWS THE 0.6 KM MAIN ROAD TO BE GRAVELLED *(REF. LCE)*

3.5 Facilities and Support Structures for the Construction Phase

Within the proposed Project area mobile ablution facilities and other associated infrastructure and services, product handling and loading areas, general waste handling and storage facilities, etc. would need to be constructed. The following facilities are expected to be placed at the site (mainly in the immediate area of the various project components):

- Contractors lay-down areas.
- Workshops, maintenance areas, stores, wash bays, lay-down areas, batch plant, fuel handling and storage area, offices, change houses.
- Ablution facilities such as chemical toilets or septic tanks.
- Handling and storage area for construction materials (paints, solvents, oils, grease) and waste.
- Generators for temporary power supply.
- Waste collection and storage areas.

These facilities would be removed at the end of the construction phase.

3.6 Construction Phase Employment

The required staff during construction will be in the order of 20 people.

Accommodation

The contractors and general workers will be accommodated in the town of Okahao, as the project sites are located nearby. Site offices will consist of small structures or, alternatively, container offices installed directly on-site.

Occupational Health and Safety

Construction workers involved in the construction (and associated activities) of the bulk electricity, sewer line installation, water storage facility construction, and gravelling must comply with strict occupational health and safety standards. These include the provision and use of personal protective equipment (PPE), regular safety training, hazard identification and mitigation measures, and emergency response preparedness. A separate Occupational Health and Safety Plan will be developed by each contractor responsible for the specific Project Component(s), as required in the Environmental and Social Management Plan (ESMP – see Section 11.2 of Appendix F). Contractors must comply with all relevant Namibian legislation, as well as the

requirements of the project's financing partners concerning workers' rights, employment conditions, health and safety standards, and community relations, etc.

3.7 Waste Management during construction

Sanitation

Mobile ablutions will be installed onsite. Cleaning of these mobile toilets will be done regularly to maintain good hygiene conditions.

Other waste (hazardous and non-hazardous)

The types of waste that could be generated during construction include hazardous industrial waste, general industrial waste, medical waste from the staff medical station, and domestic waste. Waste will be sorted at source, stored in a manner that there can be no discharge of contamination to the environment and recycled or reused where possible. The remainder will be transported off site to appropriate recycling or disposal facilities.

Waste management practices are presented in the ESMP (Appendix F).

3.8 Construction phase activities and infrastructure

The following (key) activities are expected to take place during the construction phase:

- Appoint contractors, labourers, etc.
- Limited earth moving activities to create flat surfaces.
- Pipeline trench excavations, laying of pipelines and backfilling.
- Grading activities for roads.
- Foundation excavations.
- Setting up contractors' laydown areas.
- Digging of foundations and trenches.
- Delivery of materials – storage and handling of material such as sand, rock, cement, etc.
- General building / construction activities including, amongst others: mixing of concrete; operation of construction vehicles and machinery; refuelling of machinery; civil, mechanical and electrical works; painting; grinding; welding; etc.
- Handling and storage of hazardous material, including lubricants, paints, gas (welding), cement, chemical additives for cement, diesel and petrol.
- Handling, storage and disposal of non-hazardous waste, including steel off-cuts, domestic waste, wood off-cuts, grinding wheels, other general construction waste, redundant concrete packaging, e.g. plastic wrapping, styrofoam.

- Handling, storage and disposal of hazardous waste, including empty paint containers, cements bags, chemical additives (for cement) containers, hydrocarbon contaminated PPE and soil and other.

4. IDENTIFICATION AND DESCRIPTION OF POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS AND ASSESSMENT FINDINGS

The environmental and social aspects and potential impacts associated with the development and implementation of the proposed Bulk Infrastructure Project were identified during the scoping process, in consultation with I&APs and the project team.

An understanding of the environment and the sensitivity of the sites and surroundings is important to ensure the potential impacts of the proposed Bulk Infrastructure Project activities and infrastructure can be identified and then assessed. A general overview of the current baseline conditions associated with the proposed Bulk Infrastructure Project were therefore first established. The following baseline conditions were therefore described in section 6 of the ESIA Scoping (including Impact Assessment) Report: Climate; topography and soils; hydrology, biodiversity; visual / sense of place; noise; air quality; archaeology; and socio-economic aspects.

Table 2 provides a high-level summary of the proposed facilities and activities, along with the key sensitive receptors in the environment that might be impacted, as identified by the environmental team. These receptors were considered when further identifying the aspects and potential impacts related to the various project components for both the construction and operational phases (Table 3).

A summary of the activities associated with the proposed Bulk Infrastructure Project and the associated key environmental and social aspects and potential impacts that were identified as part of the ESIA process are summarised in Table 3 below. The relevance of the potential impacts ("screening") is also presented in Table 3 to determine which aspects / potential impacts needed to be assessed in further detail.

TABLE 2: HIGH-LEVEL SUMMARY OF THE PROPOSED FACILITIES AND ACTIVITIES AND KEY SENSITIVE RECEPTORS THAT COULD POTENTIALLY BE AFFECTED

Project Phase	Resource / Receptors (e.g.) / Project Activities (e.g.)	Sensitive receptors in the receiving environment that could potentially be affected																	
		Physical				Biological						Socio-economic							
		Topography	Soil and land capability	Watercourse (i.e. drainage channels)	Aquifer	Terrestrial Habitats and Ecosystems	Floral communities	Faunal communities (mammals, birds,	Aquatic Habitats and Ecosystems	Protected Areas & other designated sensitive	Alien and Invasive species	Land use (agriculture, open space, recreation)	Heritage	Traffic	Occupational health and Safety	Public Health and Safety	Infrastructure and services	Visual and Sense of Place	Employment & Income
Implementation and construction	Employment of people														X	X			X
	Clearance, site preparation	X	X	X		X	X	X	X		X	X							X
	Stripping and stockpiling of topsoil	X	X	X		X	X	X				X			X	X	X		X
	Establishment of contractors laydown areas	X	X	X		X	X	X				X		X	X	X	X	X	X
	Digging / excavation of foundations and trenches	X	X	X		X	X	X				X		X	X	X	X	X	X

Project Phase	Resource / Receptors (e.g.) / Project Activities (e.g.)	Sensitive receptors in the receiving environment that could potentially be affected																	
		Physical				Biological						Socio-economic							
		Topography	Soil and land capability	Watercourse (i.e. drainage channels)	Aquifer	Terrestrial Habitats and Ecosystems	Floral communities	Faunal communities (mammals, birds,	Aquatic Habitats and Ecosystems	Protected Areas & other designated sensitive	Alien and Invasive species	Land use (agriculture, open space, recreation)	Heritage	Traffic	Occupational health and Safety	Public Health and Safety	Infrastructure and services	Visual and Sense of Place	Employment & Income
	Maintenance area, stores, work areas, wash bay, batch plant, fuel handling and storage area, site offices. Ablution facilities, change rooms, sanitation / septic tank. Delivery of building materials such as sand, rock, bricks and cement. Storage and handling of supplies and materials. Storage and handling of hazardous materials. Storage and handling of non-hazardous materials.		X	X	X	X	X	X	X						X	X			X
	Operations of vehicles and equipment	X	X	X		X	X	X			X	X		X	X	X	X	X	X
	Vehicle movements to and off site													X					X
	Water supply and use	X	X	X										X			X		X

Project Phase	Resource / Receptors (e.g.) / Project Activities (e.g.)	Sensitive receptors in the receiving environment that could potentially be affected																	
		Physical				Biological						Socio-economic							
		Topography	Soil and land capability	Watercourse (i.e. drainage channels)	Aquifer	Terrestrial Habitats and Ecosystems	Floral communities	Faunal communities (mammals, birds,	Aquatic Habitats and Ecosystems	Protected Areas & other designated sensitive	Alien and Invasive species	Land use (agriculture, open space, recreation)	Heritage	Traffic	Occupational health and Safety	Public Health and Safety	Infrastructure and services	Visual and Sense of Place	Employment & Income
	Excavation and earthworks	X	X	X		X	X	X				X		X	X	X	X	X	X
Implementation and construction (continued)	Roadbuilding	X	X	X		X	X	X				X		X	X	X	X	X	X
	Concrete batching and mixing	X	X	X		X	X	X				X		X	X	X	X	X	X
	Construction and or installation of structures	X	X	X		X	X	X				X		X	X	X	X	X	X
	Backfilling of excavations	X	X	X		X	X	X				X		X	X	X	X	X	X
	Shaping and profiling of the landscape	X	X	X	X	X	X	X				X		X	X	X	X	X	X
	Spoil and rubble management	X	X																X
	Hazardous waste management	X	X	X	X	X	X	X						X	X	X	X	X	X
	Non-hazardous waste management	X	X	X	X	X	X	X						X	X	X	X	X	X
	Rehabilitation and decommissioning	X	X	X	X	X	X	X						X	X	X	X	X	X
Operations	Maintenance of electrical substation, distribution network and meters (if installed)														X	X		X	X

Project Phase	Resource / Receptors (e.g.) / Project Activities (e.g.)	Sensitive receptors in the receiving environment that could potentially be affected																	
		Physical				Biological						Socio-economic							
		Topography	Soil and land capability	Watercourse (i.e. drainage channels)	Aquifer	Terrestrial Habitats and Ecosystems	Floral communities	Faunal communities (mammals, birds,	Aquatic Habitats and Ecosystems	Protected Areas & other designated sensitive	Alien and Invasive species	Land use (agriculture, open space, recreation)	Heritage	Traffic	Occupational health and Safety	Public Health and Safety	Infrastructure and services	Visual and Sense of Place	Employment & Income
	Maintenance of the power supply connection							X							X	X		X	X
	Maintenance of the sewage pump station and system				X	X									X	X	X	X	X
	Maintenance of the connections to other linear infrastructure (power, water)															X		X	X
	Maintenance of water pipeline, pumps, valves and meters															X		X	X

Colour key:

	No / Very Minor interaction	X	Minor / Moderate negative interaction	X	Major negative interaction	X	Positive interaction

TABLE 3: KEY ENVIRONMENTAL ASPECTS AND POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED BULK INFRASTRUCTURE PROJECT

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
Construction phase: • Clearance, site preparation • Stripping and stockpiling of topsoil • Establishment of contractor laydown areas • Digging / excavation of foundations and trenches • Maintenance area, stores, work areas, wash bay, batch plant, fuel handling and storage area, site offices • Ablution facilities, change rooms, sanitation / septic tank • Delivery of building materials such as sand, rock, bricks and cement • Storage and handling of supplies and materials • Storage and handling of hazardous materials • Storage and handling of non-hazardous materials	Soil: • Clearing of vegetation and soil stripping. • Use of machinery, vehicles, equipment, etc.	Soil related impacts associated with the project entails: • Loss of soil because of disturbance and subsequent (aeolian) erosion. • Compaction of soil because of heavy vehicles, equipment and structures • Contamination of soils because of sewage and dirty water discharges, waste and because of leaks and spills of hazardous substances. Refer to Chapter 8 for the assessment of soil impacts
	Hydrology: • Use of machinery, vehicles and equipment that can, amongst others spill hydrocarbons. • The infrastructure area causing reduced storm water flow.	Hydrological impacts associated with the project entails: • Enhancement of pooling of water (e.g. through man-made obstructions) can influence the recharge of the groundwater on which the “omithima” depends and cause knock-on effects such as water-borne diseases and mosquito breeding grounds. • Blocking of the water flow can exacerbate potential flooding causing the inundation of residences, damages to infrastructure, disrupt operations and cause drownings of humans and animals. • Fluvial erosion can be increased due to the redirecting (e.g. through excavations), partial blocking and channelling of surface water through man-made interferences in the drainage channels. • Surface water can be contaminated through discharges (of sewage and dirty water), waste and discarded items, and leaks and spills (of hazardous substances), which may in turn lead to contamination of groundwater. • Surface water can spread aquatic alien invasive organisms when accidentally released into the channels of the Cuvelai Basin. Refer to Chapter 8 for the assessment of hydrological impacts

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT

• Operations of vehicles and equipment
• Maintenance of vehicles and equipment
• Vehicle movements to and off site
• Water supply and use
• Excavation and earthworks
• Roadbuilding
• Concrete batching and mixing
• Construction and or installation of structures
• Backfilling of excavations
• Shaping and profiling of the landscape
• Spoil and rubble management
• Hazardous waste management
• Non-hazardous waste management
• Rehabilitation and decommissioning
Operations:
• Maintenance of electrical substation, distribution network and meters (if installed).
• Maintenance of the power supply connection
	Biodiversity:
	• Clearing of vegetation and soil stripping.
	• Use of machinery, vehicles, equipment, etc.
	• Activities disturbing/ destroying biodiversity and habitats.
	• Overhead powerline and associated infrastructure.
		The project can cause biodiversity impacts:
		• Loss of biodiversity (e.g. removal of vegetation, road kills, etc.)
		• Change, fragmentation or loss of the (modified) habitats.
		• Introduction and spread of opportunistic, less usable plants, or even alien invasive plants
		• Temporary or permanent blockage, channelling or redirecting the surface water can interfere with water's vital role as ecological driver by:
		  ○ inhibiting the spread of aquatic organisms through water
		  ○ limiting the rejuvenation role of water by not distributing seeds and nutrients, not wetting the soil, decomposing organic matter, etc.
		  ○ reducing the recharge rates of the groundwater supplies abstractable through the "omithima
		• By advancing the town through the development and implementation of the project, people can be attracted to an urban area and by doing so relieve the pressure on biodiversity in the degraded areas of the Cuvelai Basin
		
		Refer to Chapter 8 for the assessment of biodiversity impacts

	Visual: • Construction activities and new site infrastructure.	A project of this nature can trigger negative visual (and sense of place) impacts because of the visual intrusion of its man-made facilities and activities on a flat landscape. Visual impacts on the receiving environment may be lessened though because it is an already developed urban area surrounded by a densely populated rural periphery with existing man-made structures, marked by a severe degraded environment and modified habitats. The landscape is thus already altered, lacking natural features, and may be considered non-sensitive to visual change in general. The activities and land use within the Okahao Townlands are consistent with the Cuvelai Basin. As the Bulk Infrastructure Project will be situated within this existing urban area, it will not disrupt the current sense of place of the built-up environment. No further assessment is thus required.

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
• Maintenance of the sewage system • Maintenance of the connections to other linear infrastructure (power, water) • Maintenance of the water distribution network and associated components (tanks, pumps, valves and meters). • Maintenance of road surface • Maintenance of culverts, pipes and flow of surface water • Maintenance of stormwater arrangements	<u>Noise:</u> • Noise from various construction activities, vehicles, equipment and associated activities.	Daytime erratic increases in noise levels during the construction phase is possible. It is not expected that the ambient noise in the Okahao Townlands will increase significantly because of the project during the operational phase. These noise-related impacts are qualitatively assessed in Chapter 8.
	<u>Air quality:</u> • Air emissions (e.g. dust) from various construction activities, vehicles, equipment and associated activities.	Although ambient atmospheric impurities can increase during the construction of the project, it is not going to exceed industry-related thresholds. Also, the increase of ambient atmospheric impurities during the operational is not expected to be much different from the current situation. Impacts related to air quality are qualitatively assessed in Chapter 8.
	<u>Archaeology:</u> • Construction, land clearing; use of machinery, vehicles, equipment, etc. that could damage	The construction activities associated with the project have the potential to encroach upon, disturb, damage or destroy archaeological remains and unknown heritage sites, including graves, which are protected under the National Heritage Act (27 of 2004). However, the likelihood of this to happen is low, as the project is proposed within a disturbed environment. If the project impacts unknown archaeological sites, precautionary measures must be taken to protect them. A Chance Finds Procedure is recommended, and team members should be trained on identifying and reporting discoveries. No further assessment is thus required.

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
	archaeological / heritage sites.	
Construction activities and general operations: • Employment of people • Advancement of the Okahao Townlands	<u>Socio-economic:</u> • Impacts to local, regional and national economy. • Jobs creation and skills development. • Impacts to community (i.e. surrounding landowners) health, safety and security, including Sexual Exploitation/ Harassment and Abuse. • Emissions to land, environmental degradation,	Socio-economic impacts associated with the project entail: • Economic benefits • Social benefits • Socio-economic ills (community welfare – health, safety and security issues) Refer to Chapter 8 for the assessment of the socio-economic impacts. The construction activities and the location of the physical infrastructure could result in potential impacts relating to the relocation of residents or inhibition of their current activities / land use. However, these potential impacts are eliminated by considering their location in the design and the layout. Therefore, the impact relating to the potential resettlement / relocation of people / expropriation or any associated land use impacts are not relevant to the proposed activities. See Section 1.4.1. Furthermore, this is a commitment in the ESMP (Appendix F) to ensure compliance.

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
	visual and nuisance impacts. • Construction activities and placement of infrastructure on existing properties.	

The issues that were identified as requiring further assessment; and the assessment findings are summarised in Table 4. Some of the issues (based on the assessment findings and issues raised by I&APs) are further described in the sections below.

Management and mitigation measures and monitoring requirements are presented in the ESMP.

TABLE 4: SUMMARY OF POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED PROJECT (L = LOW; M = MODERATE; H = HIGH)

Potential Impact	Significance	
	Before mitigation	After mitigation
Soil:		
Loss of soil because of disturbance and subsequent (aeolian) erosion	**L**	**L**
Compaction of soil because of heavy vehicles, equipment and structures	**M**	**L**
Contamination of soils because of sewage and dirty water discharges, waste and because of leaks and spills of hazardous substances	**L**	**L**
Hydrology:		
Artificial pooling of the water can influence the recharge of the groundwater on which the “omithima” depends and can lead to knock-on effects such as the spread of water-borne diseases and mosquito breeding grounds	**M**	**L**
Episodic flooding and flash floods can be enhanced by man-made interferences, causing the inundation of residences, damage of infrastructure, disrupt operations and even drownings of humans and animals	**L**	**L**
Redirecting surface flow through man-made interferences can enhance the fluvial erosion potential	**M**	**L**
Surface water can be contaminated through discharges (of sewage and dirty water), waste and discarded items, and leaks and spills (of hazardous substances)	**L**	**L**

Potential Impact	Significance	
	Before mitigation	After mitigation
Surface water can spread alien invasive aquatic organisms when accidentally released into the channels of the Cuvelai Basin	**L**	**L**
Biodiversity:		
Loss of biodiversity (e.g. removal of vegetation, road kills, etc.)	**M**	**L**
Change, fragmentation or loss of the (modified) habitats	**M**	**L**
Introduction and spread of opportunistic, less usable plants, or even alien invasive plants	**L**	**L**
Temporary or permanent blockage, channelling or redirecting the surface water can interfere with water's vital role as ecological driver	**M**	**L**
Noise:		
Noise disturbance to third parties (closest sensitive noise receptors)	**L**	**L**
Air quality:		
Air pollution, dust nuisance and increased risk of health impact to third parties (closest receptors)	**L**	**L**
Socio-economic:		
Economic impacts – construction and operational phases	**H+**	**H+**
Job Creation And Skills Development	**H+**	**H+**
Potential negative social impacts associated with the construction workers in the area	**M**	**L**

4.1 Soil

a) Issue: Loss of soil because of disturbance and subsequent (aeolian) erosion

The Cuvelai Basin is marked by severe environmental degradation and barren surfaces are common. Physical activities associated with the construction phase (land clearance, earthworks, roadbuilding, excavation, trenching or digging) may expose the soil even more by mixing the soil layers and by loosening it and making it prone to erosion. Temporary stockpiles are susceptible to aeolian erosion. The barren surfaces of the flat landscape are also not protected against potential wind erosion during the construction phase.

The possibility of wind erosion diminishes during the operational phase of the project.

b) Issue: Soil Compaction

Temporary (partial) blocking of the channels by means of man-made interferences and the permanent blocking of surface flow by means of the connection road across the drainage channel(s) can cause artificial pooling, which pose consequences for the recharge of the aquifer on which the “omithima” depends. Pooling can also lead to knock-on effects such as water-borne diseases and mosquito breeding grounds.

Heavy vehicles and equipment will be used during the construction phase (to do land clearance, earthworks, roadbuilding, excavation, trenching or digging, or to transport goods), which can compact the soil in the work areas. In addition, heavy equipment and goods will be placed in the laydown areas, causing compaction as well.

Arable land is heavily cultivated, and the compaction of soil may reduce the size of available land during the construction phase. The possibility of soil compaction diminishes during the operational phase of the project.

c) Issue: Soil Contamination

Several activities associated with the construction and operation phase (including maintenance of equipment, vehicles and infrastructure) have the potential to create contamination risks to soil through discharges of sewage and dirty water and leaks and spills of hazardous substances. Soil contamination is closely related to the potential contamination of surface and groundwater, in turn. It is noteworthy to mention that waste management is a common problem in the Cuvelai Basin, where Okahao is located, contaminating soil and surface water in many places already.

During the construction phase contamination of soil – through discharges of sewage and dirty water, spills and leak of hazardous substances and improper waste management can happen, but this possibility diminishes during the operational phase of the project.

4.2 Hydrology

a) Issue: Artificial Pooling

Temporary (partial) blocking of the channels by means of man-made interferences and the permanent blocking of surface flow by means of the connection road across the drainage channel(s) can cause artificial pooling, which pose consequences for the recharge of the aquifer on which the “omithima” depends. Pooling can also lead to knock-on effects such as water-borne diseases and mosquito breeding grounds.

b) Issue: Flooding

Episodic flooding and flash floods in the Cuvelai Basin can occur during any wet season – either from local rainfall or from surface water flow deriving from upstream. Many structures are built in the way of the surface water flow and when the drainage channels overflow, many residences are inundated, damages of infrastructure are caused, operations are disrupted and even drownings of humans and animals can happen. Blocking of the drainage channels by means of man-made interferences because of the project can exacerbate this flooding potential.

c) Issue: Fluvial Erosion

Man-made interferences can have a profound effect on the flow regime and the direction of the surface water flow on the flat landscape of the Cuvelai Basin. These interferences can include small topographical changes because of excavations, trenching and digging, partial blocking because of the placement of equipment, the placement of permanent man-made obstructions (such as the connection road) across the flow direction of the drainage channels, and channelling of the surface water through culverts and pipes underneath the connection road. Through activities such as earthworks, roadbuilding, excavation, trenching or digging the soil can be loosened, which makes it prone to erosion. By blocking, redirecting and channelling the surface flow by man-made interferences, the natural velocity is changed, which may enhance fluvial transport and thus fluvial erosion at places where the velocity of water is increased.

d) Issue: Water Contamination

Several activities associated with the construction and operation phase (including maintenance of equipment, vehicles and infrastructure) have the potential to create contamination risks to

surface water through discharges of sewage and dirty water and leaks and spills of hazardous substances. Surface water contamination is closely related to the potential contamination of groundwater, in turn. It is noteworthy to mention that waste management is a common problem in the Cuvelai Basin, where Okahao is located, contaminating the surface water in many places already.

During the construction phase contamination of surface water (and indirectly groundwater) – through discharges of sewage and dirty water, spills and leak of hazardous substances and improper waste management can happen, but this possibility diminishes during the operational phase of the project.

e) Issue: Aquatic Alien Invasive Species

Alien invasive aquatic organisms can be spread when accidentally introduced into the channels of the Cuvelai Basin during the construction phase of this project.

4.3 Biodiversity

a) Issue: Loss of Biodiversity

Although the Cuvelai Basin is characterized by severe environmental degradation, direct loss of biodiversity is possible during the construction phase. Construction activities such as land clearance and earthworks, roadbuilding, excavation, trenching or digging can damage or destroy plants and during the movement of vehicles road kills are possible.

b) Issue: Habitat Change, Fragmentation or Loss

Due to the severe environmental degradation, all habitats are modified and the (original) natural habitat is not known. It is also not known which (key) plant species and wildlife species have been lost over time as only those remaining can be recorded. Regardless of this situation, the change, fragmentation or loss of habitats is possible during the construction phase. This possibility diminishes during the operational phase of the project.

c) Issue: Introduction of Opportunistic (and Alien Invasive) Plants

Opportunistic, less usable plants, and alien invasive plants can establish in the overutilized and disturbed areas of the Cuvelai Basin. The most likely alien candidates are Mexican poppy *Argemone mexicana*, thorn apple *Datura* species, wild tobacco *Nicotiana glauca* and castor oil *Ricinus communis*. Stinkbush - *Pechuel-Loeschea leubnitziae* and sand Acacia – *Acacia arenaria* are common opportunistic species.

Although the introduction and spread of opportunistic and alien invasive plants can happen during the construction phase, this possibility diminishes during the operational phase of the project.

d) Issue: Inhibited Rejuvenation

The seasonal availability of water is an important impulse for the ecological functioning of the Cuvelai landscape – a variety of aquatic organisms (including fish and frogs) are delivered seasonally via the channels of the Cuvelai Basin. Also, the rejuvenating role of water as ecological driver (for the redistribution of seeds and nutrients, and the availability of moisture) is important for the ecological functioning of the Cuvelai Basin.

Temporary or permanent blocking of the channels by means of man-made interferences and the blocking of surface flow by means of the connection road across the drainage channel(s) pose consequences for the rejuvenation role of flowing water flow in the channels – to make water available to humans and animals, to create fishing grounds and to renew pastures.

4.4 Noise

a) Issue: Noise disturbance to third parties (closest sensitive noise receptors)

Construction phase

Several activities associated with the construction phase will generate noise. Noise will be emitted by construction equipment including all related activities such as land clearing, site preparation, excavation, roadbuilding, etc. Noise generated during construction will be highly variable. Besides having daily variations in activities, construction projects are generally executed in several different phases where each phase has a specific equipment mix depending on the phase.

The noise impact is defined as the difference between expected cumulative noise levels and existing noise levels for the area. Reference is made to the 3 dBA increase guideline by the IFC for human receptors (see Section 6.6.1). A person with average hearing acuity may be able to detect an increase of 3 dBA in ambient noise.

Noise generating equipment can be divided into distinct categories. These are:

a. Earthmoving equipment.
b. Materials handling equipment.
c. Stationary equipment.
d. Impact equipment.
e. Other types of equipment.

The first few categories include machines that are powered by internal combustion engines. Machines in the latter two categories are powered pneumatically, hydraulically, or electrically. Exhaust noise tends to account for most of the noise emitted by machines in the first three categories (those that use internal combustion engines) whereas engine-related noise is usually secondary to the noise produced by the impact between impact equipment and the material on which it acts. Noise generated by mechanical equipment, including electric motors (drive units), gearboxes, pumps, fans etc. is dependent on the portion of total mechanical or electrical energy that is transformed into acoustical energy (Soundscape, 2022).

During the construction phase, erratic increases in noise levels can thus be expected, but during daytime only. This increase will also be temporary as it will stop at the end of the construction period. It is not expected to exceed 60 dBA during daytime – i.e. typical for an urban district with workshops, business premises and main roads.

Operational phase

During the operational phase the additional contribution of ambient noise by the road and the pump station are not expected to exceed the thresholds for an urban district with workshops, business premises and main roads, i.e. 60 dBA during daytime and 50 dBA during nighttime.

In the area where the road is planned, it is expected that the increase in noise from vehicles on the road will be erratic and not limited to daytime. Yet, it is not expected that the ambient noise in this area will exceed 50 dBA during the day and 40 dBA at night, i.e. corresponding to a suburban district with little road traffic.

4.5 Air Quality

a) Issue: Air pollution, dust nuisance

Construction phase

Construction activities associated with the development of the individual components of the project are likely to have the most significant impact on air quality due to land clearance, earthworks, roadbuilding, excavation, trenching and digging and the movement of vehicles and equipment.

Windblown dust will typically only occur when winds exceed 5.4 m/s. Accurate scientific data about wind is absent for Okahao. It can be generalized that the predominant wind direction is from the east for most of the year (>7 months) and from the south (<5 months). Wind speeds are

normally low, seldomly exceeds 6-8 m/s, which equates to a moderate breeze. Calms dominate almost 60% of the time (SPC, 2024).

Vehicle-entrained dust is a constant nuisance in the Okahao Townlands during the dry season, as people stated during the focus group meeting. Several unpaved roads and tracks exist in and around Okahao Townlands, also in vicinity of the area where the connection road is proposed. Two gravel roads, the D3635 and the D3626 branch off from the section of the C41 tar road within the townlands. As a rule of thumb, more traffic make use of the C41 than the two gravel roads while less traffic occurs on the other unpaved roads than on the D3635 and the D3626 roads. The concerns about dust are perceptual and not based on empiric data, in the end. It is not expected that dustfall will exceed the residential limit of 600 mg/m²/day – without the project being developed. Exceedance of the residential limit during the construction phase is also unlikely.

On average, air quality impacts from construction activities are likely to be localised and limited to the work sites. Gaseous emission from the construction equipment and vehicles are also likely to be localised impacting mainly onsite. Restricting construction activities to daytime, reduces the risk of increased ground level concentrations, which are more likely to occur during the stable atmospheric conditions prevalent, especially at night. Also, the potential to create excessive fugitive dust is unlikely if the development takes place during the wet season.

Operational phase

Vehicle-entrained dust from the connection road is expected to be the main source of air pollution during the operational phase of the project, with tail (exhaust) emissions from vehicles to a lesser extent responsible. The dust contribution from the connection road during the operational phase will not make a big difference from the existing situation as the proposed road will be in an area where several tracks already exist, already generating vehicle-entrained dust. It is not expected that dustfall will exceed the residential limit of 600 mg/m²/day during the operational phase.

4.6 Socio-Economic

a) Issue: Economic Impacts

During the construction phase some direct economic benefits (employment, investment, and capital spending and procurement) can be created. Induced economic benefits can derive from the spending of the construction workers and the contractor(s). Indirect benefits relate to tax that will be paid – by individuals, corporate and business as well as Value Added Tax (VAT) on goods and services.

Some cumulative impacts on the (local) economy are expected through the project – boosting upstream, downstream and sideways linkages. Every job counts in a country with high unemployment, and employment provides incomes to the employees, their immediate household members and to others living elsewhere in Namibia who depend on cash remittances.

By enabling future residents to have access to basic infrastructure, potential income through rates and taxes and municipal services become possible – eventually benefitting the Okahao Town Council, i.e. during the operational phase.

b) Issue: Social Impacts

In addition to the positive economic impacts during the construction phase (employment, investment, and capital spending and procurement, taxes) and the economic multiplier effect, employment and income trigger several social benefits. Skills development is such a direct positive social benefit.

By enabling future residents to have access to basic infrastructure (water, sanitation, power and a connection road), the positive social gains are more indirect, but long-term.

Implementation of this project will advance Okahao and it will be possible for people living in the surrounding rural areas of the townland to relocate to the town, benefitting from the infrastructure. Although this may be seen as urbanization – and can even be perceived in a negative way – the outcome is positive. The concentrated supply of essential services such as water, sanitation, power and a connection road comes at a lower cost in comparison to the supply of individual rural households with the same services. Moreover, people in the rural areas of the Cuvelai Basin will be offered a residing option different from relying on a severely degraded environment with dwindling natural resources – and in this way the biodiversity can benefit.

c) Issue: Social Ills

Community health, safety and security issues of concern can be raised during the construction phase. The presence of construction workers could lead to an increase in crime and illicit activities such as theft, prostitution and rape, drug dealing and spreading sexually transmitted diseases. It is the responsibility of contractors to recognise that project activities, equipment, and infrastructure can increase community exposure to risks and impacts avoid or minimize the risks and impacts to community health, safety and security that may arise from project-related activities, with particular attention to vulnerable groups.

The objectives of the IFC‘s Performance Standard PS-4: Community Health, Safety and Security PS-4 are:

- To anticipate and avoid adverse impacts on the health and safety of the potentially affected community during the project life, from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the affected communities.

Accordingly, contractors must conform to the abovementioned standard. The project design and management plan must be compliant with health and safety regulations. Of relevance here is the need to minimise community and employee exposure to disease – particularly sexually transmitted diseases. PS-4 states "The client will avoid or minimize transmission of communicable diseases that may be associated with the influx of temporary or permanent project labour".

The project is , however, a relatively small-scale operation, localized and with a relatively small number of people involved during the construction phase. After construction, the project will be under the auspices of the Okahao Town Council to operate, meaning that the potential impact will diminish.

5. WAY FORWARD

The way forward is as follows:

- MURD and MEFT review the documentation and provide record of decision.

6. ENVIRONMENTAL IMPACT STATEMENT AND CONCLUSIONS

It is Namisun's opinion that the environmental and social aspects and potential impacts relating to the proposed Okahao Bulk Infrastructure Project activities and the associated facilities have been successfully identified.

The results of this impact assessment present the potential for negative environmental impacts and positive socio-economic benefits that can all be mitigated to acceptable levels, by implementing the ESMP.

Taking the above-mentioned into consideration, Namisun believes that all environmental and social aspects and potential impacts associated with the proposed Okahao Bulk Infrastructure Project were identified, described and appropriately assessed.

It is recommended that, if MEFT provides a positive decision on the application for the proposed Okahao Bulk Infrastructure Project, they should include a condition to the clearance that DWN must implement all commitments in the ESMP.

ESIA SCOPING (INCLUDING IMPACT ASSESSMENT) REPORT FOR THE PROPOSED BULK INFRASTRUCTURE PROJECT IN OKAHAO, OMUSATI REGION

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ACRONYMS AND ABBREVIATIONS

The list of acronyms and abbreviations used in this report are summarized in the table below:

Acronyms / Abbreviations	Definition
AQG	Air Quality Guideline
AQO	Air Quality Objectives
BIA	Bulk Infrastructure Assessment
CITES	Convention on International Trade in Endangered Species
CMS	Convention on Migratory Species
CV	Curriculum vitae
DEA	Department Environmental Affairs
DWN	Development Workshop Namibia
EAP	Environmental Assessment Practitioner
EAPAN	Environmental Assessment Professionals Association of Namibia
EC	European Community
ECC	Environmental Clearance Certificate
EIA	Environmental Impacts Assessment
EMP	Environmental Management Plan
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impacts Assessment
ESMP	Environmental and Social Management Plan
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GmbH	Gesellschaft mit beschränkter Haftung
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
I&APs	Interested and / or affected parties
IFC	International Finance Corporation
IRR	Issues & Responses Report
KfW	Kreditanstalt für Wiederaufbau
Km	Kilometre
kV	Kilovolt
kVA	Kilovolt-amperes
LCE	Lund Consulting Engineers CC
m^2	square metres
m^3	cubic metres
MEFT	Ministry of Environment, Forestry and Tourism
MOHSS	Ministry of Health and Social Services
MURD	Ministry of Urban and Rural Development
MW	Megawatt
NAAQS	South African National Ambient Air Quality Standard
Namisun	Namisun Environmental Projects & Development
NCE	Namibian Chamber of Environment
NDP	National Development Plan

NGO	Non-governmental organisation
NO_2	Nitrogen Dioxide
NORED	Northern Regional Electricity Distributor
NPC	National Planning Commission
NSA	Namibia Statistics Agency
OCE	Om'Kumoh Consulting Engineers
OTC	Okahao Town Council
PHC	Public health Care
PM	Particulate Matter
PS	Pump Station
PV	Photovoltaic
RA	Roads Authority
SANS	South African National Standard
SO_2	Sulphur Dioxide
SSA	Standards South Africa
TSP	Total Suspended Particulate

1. INTRODUCTION

This Chapter describes the purpose of the report, briefly describes the background and proposed project activities, summarizes the legislative requirements, explains the report structure, summarizes assumptions and limitations of the study, and explains how the input from Interested and / or Affected Parties (I&APs) was included.

1.1 PURPOSE OF THIS REPORT

This Scoping (including Impact Assessment) Report has been compiled as part of the Environmental Clearance Certificate (ECC) application and associated Environmental and Social Impact Assessment (ESIA) process for the proposed Okahao Bulk Urban Infrastructure Projects. It includes an assessment of the environmental and social impacts that the proposed project activities are likely to have. The proposed management and mitigation measures relating to the proposed projects are documented in an Environmental and Social Management Plan (ESMP), see Appendix F.

Registered Interested and / or Affected Parties (I&APs) are being provided with the opportunity to comment on this Scoping (including impact assessment) Report (see Section 1.4.1). Once the comment period closes, the report will be updated to a final report with due consideration of the comments received and will be submitted to the Ministry of Urban and Rural Development (MURD) (i.e. Competent Authority) and the Ministry of Environment, Forestry and Tourism (MEFT) for decision-making.

1.2 BACKGROUND AND INTRODUCTION TO THE PROPOSED PROJECT

The Development Workshop Namibia (DWN) is implementing the overall Project “Poverty-Oriented Development of Infrastructure in urban areas of Namibia” with financial support from KfW Development Bank (KfW). The project seeks to contribute to more sustainable and inclusive urban development in Namibia by supporting DWN to plan and develop low-cost residential land with titles in 15 towns across Namibia.

The overall objective is to transform current informal settlement growth into more formal urban growth and to initiate and contribute to changing the way urban planning is done towards a more holistic and participatory planning approach to create socially and economically conducive living environments.

The overall project is being implemented by three distinct components:

Component one: Planning and developing low-cost residential land with title.

Component two: Providing "pro-poor" infrastructure investments in four selected towns (*which relates to this report*).

Component three: Improving public hygiene and access to appropriate sanitation.

The infrastructure requirements subject of Component two was identified in some of the project towns through a Bulk Infrastructure Assessment (BIA) exercise conducted by various consulting firms engaged by DWN. Thereafter, priority infrastructure projects were jointly drawn up by the DWN and the Town Council authorities.

DWN subsequently planned to deploy part of the KfW grant through Component two of the overall Project and hired Lund Consulting Engineers (LCE) to design and supervise the construction of various pro-poor infrastructure components in (amongst others) the town of Okahao, in the Omusati Region (refer to Figure 1 and Figure 2), i.e. "the proposed Okahao Project".

The proposed Okahao Bulk Infrastructure Project includes the following:

- The construction of an underground power supply line.
- Construction of a pump station for the sewerage system.
- Gravelling of the main roads.
- Construction of water storage facilities.

The proposed Okahao Project forms the subject of this report, and its planned activities constitute the basis for a new application for an Environmental Clearance Certificate (ECC).

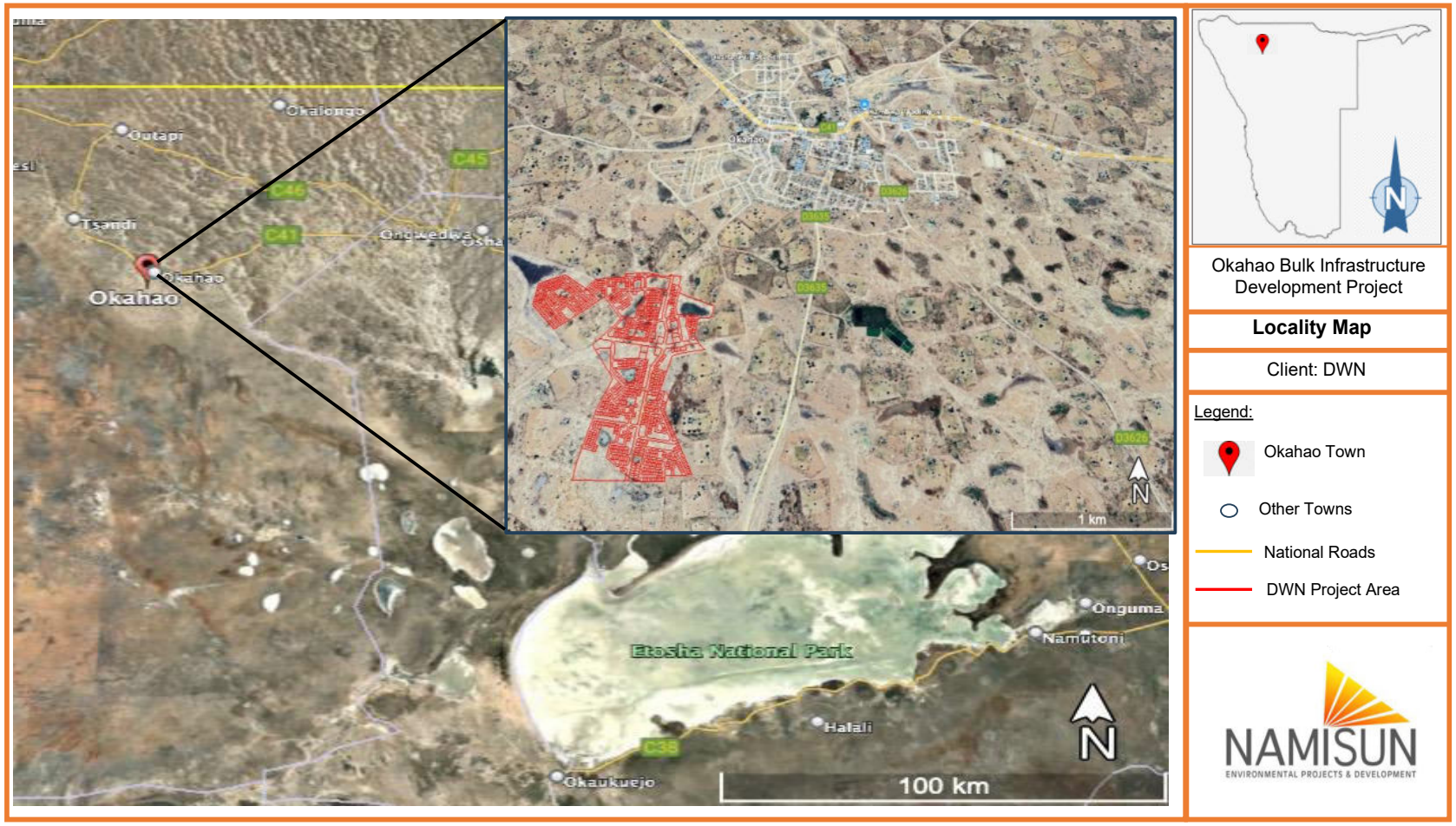

FIGURE 1: LOCATION OF OKAHAO TOWN WITH RED LINES INDICATING DWN PROJECT AREA *(REF. GOOGLE EARTH)*

Rapid BIAs conducted by Om'kumoh Consulting Engineers (OCE) in the town of Okahao culminated in various provisional infrastructure requirements. The following sections provide a brief description of the proposed infrastructure and its associated activities, as part of the Proposed Okahao Project. Information from these sections were copied from the BIAs of Okahao, prepared by Om'kumoh Consulting Engineers (March 2023).

1.2.1 CONSTRUCTION OF AN ELECTRICITY SUPPLY LINE

Okahao Town is connected to the national power grid via NORED's 1 MVA substation which is fed from a 33 kV overhead powerline. At the substation the 33 kV is stepped down to 11 kV which is then distributed to different miniature substations (minisubs) and pole mounted transformers within the town. The 11 kV reticulation from the substation is primarily underground, with a few overhead lines. The minisubs and the pole mounted transformer in the town steps down the 11 kV to 420 volts for 3-phase and 230 volts for 1-phase that is used for household and other applications.

The construction of a new 1.65 km 11 kV underground electricity supply line from an existing 315 kVA mini substation namely Okahao Ext 9 MS, north of Kashenda Proper. (see Figure 3).

1.2.2 SEWERAGE INFRASTRUCTURE UPGRADES

i. Construction of a Pump Station

The existing sewer reticulation system contains ten (10) catchment areas with sewer pump stations as a lowest draining input.

Due to the topographic nature of the area being relatively flat, the sewer network requires additional pump capacity to convey the sewage to the treatment work.

The construction of a new pump station (i.e. PS-11) and a 0.61 km rising main for Kashenda Proper is proposed (see Figure 4).

1.2.3 CONSTRUCTION OF A WATER RESERVOIR & TANK

The evaluation of the existing bulk storage reservoir and elevated water tanks confirmed that the existing capacity is sufficient for the current demand but will not be able to accommodate the future development scenarios.

Therefore, the construction of a 178 m³ ground steel reservoir and associated 20 m³ elevated tank is proposed for the Okahao Project (see Figure 5).

1.2.4 GRAVELLING OF ROADS

Okahao Town has a formalized road network of approximately 32.2 km comprising 24.3 km gravel roads and 7.9 km of surfaced roads in the six (6) out of 20 Extensions that have been serviced.

The gravelling of 0.6 km of the main roads in the DWN project area is proposed as part of the proposed Okahao Project (see Figure 6).

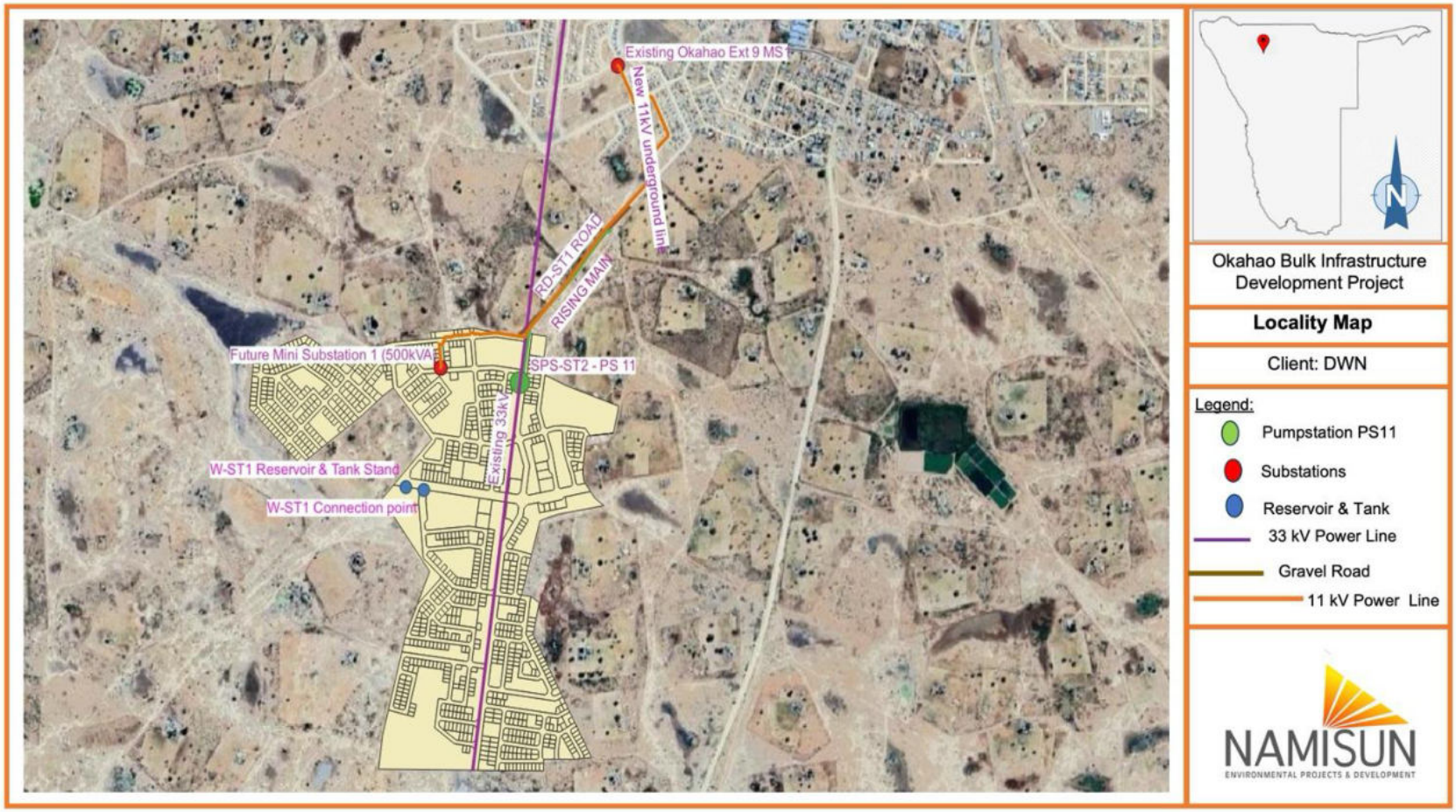

FIGURE 2: MAP OF PROPOSED OKAHAO BULK INFRASTRUCTURE PROJECT *(REF. LCE)*

1.3 MOTIVATION (NEED AND DESIRABILITY) FOR THE PROJECT AND PROJECTS

To address the rapid growth of informal settlements in Namibia, Development Workshop Namibia (DWN) and the Namibian Chamber of Environment (NCE) launched a programme in 2018 to provide low-cost land for formal housing. DWN has implemented the programme through partnership agreements with local authorities in selected towns. Under these agreements, local authorities provide the land, while DWN supplies the initial funding and professional services needed to develop the land into serviced plots.

These titled plots are then sold to low-income residents at the development cost. The proceeds from the sales are deposited into a local bank account jointly managed by the local authority and DWN. This account operates as a revolving fund, financing the development of additional areas and ensuring the programme's financial sustainability.

This model forms Component One of the proposed Programme. Component Two focuses on the construction of critical bulk infrastructure in selected new residential areas. Component Three includes both physical (construction) and social initiatives aimed at promoting public hygiene and improving access to appropriate sanitation facilities. (SLR, 2021).

1.3.1 NEED FOR BULK INFRASTRUCTURE

Many Namibian towns, including Okahao, have underinvested in bulk infrastructure, making new residential development costly and limiting affordability for low-income residents. A programme will fund critical infrastructure in four towns, including Okahao, to support affordable housing. Okahao, with over 4,600 planned erven and strong business, institutional, and agricultural potential, serves as a key rural-urban hub with schools, healthcare facilities, government offices, and public amenities (SPC, 2024).

1.3.2 OPPORTUNITIES TO IMPROVE BULK INFRASTRUCTURE

In 2022, Okahao Town Council, with support from DWN, the Ministry of Urban and Rural Development (MURD), and GIZ, appointed Om'kumoh Consulting Engineers cc (OCE) to conduct a Bulk Infrastructure Assessment (BIA) for Okahao Town. The assessment focused on water supply, sanitation and sewerage, electricity, waste management, and the road network. The findings and recommendations are detailed in separate reports covering each infrastructure area (Volumes 2–6). Okahao has developed significant infrastructure in recent years, with the Town Council providing services based on evolving needs. The assessment will guide the Council in planning capital improvement projects, estimating costs, and setting short- and long-term priorities (SPC, 2024).

1.4 INTRODUCTION TO THE ESIA PROCESS

Environmental Impact Assessments (EIAs – which typically include 'social aspects') are regulated by the Directorate of Environmental Affairs (DEA) of the MEFT in terms of the Environmental Management Act, No. 7 of 2007. This Act was gazetted on 27 December 2007 (Government Gazette No. 3966) and its associated Regulations were promulgated in January 2012 (Government Gazette No. 4878) in terms of the above-mentioned Act.

Prior to the commencement of the proposed Okahao bulk infrastructure project activities, an application for an environmental clearance certificate (ECC) will be submitted in terms of this Act and the associated EIA Regulations to the MURD, as the competent authority. MURD will review the application and relevant reports and submit their comments and recommendations to the MEFT for their final review and decision.

The specific objective is to conduct an ESIA and develop an Environmental and Social Management Plan (ESMP) to enable the MEFT (DEA) to make an informed decision regarding the application for an ECC. Due to the nature and scale of the proposed activities, and the fact that it will be undertaken in areas which have largely been disturbed (i.e. within townlands), it is Namisun's opinion that a Combined Scoping and Impact Assessment Process be undertaken.

The ESIA will comply with Namibian legislation and EIA regulations. As KfW is the donor, additional best practice standards must also be considered. However, given the nature and scale of the activities, not all KfW requirements and standards will be implemented within this ESIA process. Instead, these standards will be reviewed and incorporated into the ESIA (and ESMP) where relevant.

The overall objectives of this assessment process are to:

- Provide information on the activities and infrastructure (i.e. facilities) associated with the proposed Okahao bulk infrastructure project.
- Describe the current environment (i.e. baseline) in which the project will be situated.
- Identify, in consultation with interested and / or affected parties (I&APs) the potential environmental and social aspects associated with the proposed project.
- Assess the potential impacts associated with the proposed project activities and infrastructure.
- Develop management and mitigation measures required to avoid impacts or to mitigate such impacts to acceptable levels by developing an ESMP. Include relevant monitoring requirements in the ESMP.

LCE appointed Namisun Environmental Projects and Development (Namisun), as an independent environmental consulting company to undertake the required ESIA process, to compile the ESIA Scoping (including Impact Assessment) Report and the accompanying ESMP as part of the application process for an ECC.

It is thought that this report and ESMP (attached in Appendix F) will provide sufficient information for MEFT to make an informed decision regarding the proposed Okahao Bulk Infrastructure Project, and whether an ECC can be issued or not.

1.4.1 OPPORTUNITY TO COMMENT

This ESIA Scoping (including Impact Assessment) Report was distributed for public / authority review. I&APs were invited to comment on these documents, which were available for a review and comment period from **16 June to 7 July 2025**. Comments had to be sent to Namisun at the telephone numbers, or e-mail addresses shown below by no later than **7 July 2025**.

Namisun
Attention: Karin Maletzky / Werner Petrick
E-mail address: karin.maletzky2021@gmail.com / wpetrick@namisun.com
Cell number: +264 (0)81 149 0473 / +264 (0)81 140 5969

1.5 ASSUMPTIONS AND LIMITATIONS

In 2022, Okahao Town Council assisted by DWN in association with the MURD and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) appointed Om'kumoh Consulting Engineers cc (OCE) to carry out Bulk Infrastructure Assessment of Okahao Town. Reference is made to these assessments for specific assumptions and limitations. Some general assumptions are described below.

1.5.1 TECHNICAL INFORMATION

It is assumed that the technical (project) information provided by DWN, OCE, LCE and their Technical Teams are accurate. The scoping report and ESMP are based on the preliminary designs prepared by LCE, who have confirmed that the detailed design will avoid any potential resettlement, relocation, expropriation, or related land use impacts.

Due to the relatively frequent alterations in the scope of the proposed project infrastructure, the Environmental Team could not visit each of the specific sites relating to the final layouts and could not engage with all closest sensitive receptors / neighbours.

1.5.2 ENVIRONMENTAL AND SOCIAL ASSESSMENT LIMIT

The ESIA process focuses on the proposed Bulk Infrastructure Project only. Potential impacts associated with other proposed facilities and activities are not considered in this report. Furthermore, as described in Section 1.4, due to the nature and scale of the activities, and the fact that it will be undertaken in areas which have largely been disturbed (i.e. within townlands), it is Namisun's opinion that a Combined Scoping and Impact Assessment Process be undertaken. Therefore, no specialists studies were undertaken and assessments were qualitatively conducted, also taking into account the designs changing at the time of the process (see Section 1.5.1).

The ESIA focused on third parties only and did not assess health and safety impacts on workers because the assumption was made that these aspects are separately regulated by labour acts, health and safety legislation, policies and standards, which Contractors will adhere to. However, the ESMP provides general (i.e. 'high level') requirements for the Contractors to implement and further develop occupational health and safety risks assessments, requirements and procedures.

The EIA process only considered the proposed infrastructure and associated activities described under Component two (see section 1.2) and did not consider the town planning layout and related aspects (i.e. component 1, which is not part of the scope of this EIA).

1.6 REPORT CONTENT

Table provides a summary of the report content.

TABLE 1: SCOPING REPORT STRUCTURE

Chapter	Objective
Chapter 1: Introduction	Describes the purpose of the report, briefly describes the background and proposed project activities, summarizes the legislative requirements, explains the report structure, summarizes assumptions and limitations and explains how the input from I&APs was included.
Chapter 2: ESIA process and Methodology	Outlines the approach and methodology for the ESIA (Combined scoping and impact assessment) process, including the public participation process.
Chapter 3: Legal Framework	Provides an overview of relevant Namibian policies and applicable Namibian legislation and international conventions / treaties applicable to the proposed Bulk Infrastructure Project.
Chapter 4: Project description	Provides a description of the proposed Bulk Infrastructure Project and the associated facilities and activities.
Chapter 5: Alternatives	Describes the various alternatives that were considered as part of the planning of the proposed Bulk Infrastructure Project.
Chapter 6: Description of the current environment	Provides a general overview of the current baseline conditions (i.e. existing biophysical and social environment) that could potentially be affected by the proposed Bulk Infrastructure Project. The link to relevant environmental and social aspects and potential impacts are also explained.
Chapter 7: Identification and Description of potential impacts	Outlines the environmental and social aspects and potential impacts associated with the development and implementation of the proposed Bulk Infrastructure Project. It reasons potential cumulative impacts, and which environmental and social aspects and potential impacts need further assessment (Chapter 8).
Chapter 8: Impact Assessment	Assesses the key potential impacts (as identified in Chapter 7), relating to the proposed Bulk Infrastructure Project and associated activities and facilities.
Chapter 9: Way forward	Explains the way forward in terms of completing the ESIA process and final submission of the Application.
Chapter 10: Conclusion and Recommendations	ESIA Conclusion and impact statement.
References	Reference list.

2. ESIA PROCESS (SCOPING AND ASSESSMENT) METHODOLOGY

This Chapter outlines the approach and methodology for the ESIA (Scoping and Impact Assessment) process, including the public participation process.

2.1 ESIA TEAM

Namisun is independent Environmental Assessment Practitioners appointed by LCE to undertake the ESIA process.

Werner Petrick, the EIA Project Manager, has more than twenty-four years of relevant experience in conducting / managing ESIAs, compiling ESMPs and implementing EMPs and Environmental and Social Management Systems (ESMSs). Werner has a B. Eng (Civil) degree and a master's degree in environmental management and is certified as lead environmental assessment practitioner (EAP) and reviewer under the Environmental Assessment Professionals Association of Namibia (EAPAN).

Dr Pierré Smit, the ESIA Project Assistant, holds a PhD in Landscape Ecology and has more than twenty-eight years of experience in environmental management, managing environmental assessment, the implementation of ESMPs and ESMSs in Namibia.

Karin Maletzky, the Junior ESIA Project Assistant, holds a BSc in Geology & Economics and has more than twenty years of experience in the mining industry. She joined Namisun as a junior ESIA Project Assistant in 2024.

The relevant curriculum vitae (CV) documentation is attached as Appendix A.

The environmental project team and proponent details for the ESIA process relating to the Bulk Infrastructure Project is outlined in Table 2.

TABLE 2: ESIA TEAM AND PROPONENT DETAILS

Team	Name	Designation	Tasks and roles	Company
Project proponent	Salmi Neshila	Programme Manager	Implementation of the Bulk Infrastructure Project	DWN
	Younes Seghrouchni	Junior Professional Officer		
ESIA Project Management Team	Werner Petrick	Lead ESIA Practitioner	Management of the ESIA process and reporting	Namisun
	Pierré Smit	ESIA Project Assistant Ecology input		
	Karin Maletzky	Junior ESIA Project Assistant		
Technical Team	Stefan Grögli	Civil Engineer	Technical input Implementation of the ESMP	LCE
	Aneska Swart	Engineer		

Acknowledgements: Her Worship the Mayor, Alderwoman Cornelia Iiyambula and the Manager Finance & ICT, Mr Efraim Shikesho (who was the acting CEO of the Okahao Town Council at the time of Namisun's site visit and stakeholder engagement) for welcoming Namisun and displaying great enthusiasm and support to the implementation of the Bulk Infrastructure Development Project in Okahao.

2.2 INFORMATION COLLECTION

Namisun obtained a description of the proposed project activities from DWN and LCE to identify the environmental and social aspects associated with the proposed project; and to assess the potential impacts.

Information for the preparation of this ESIA Scoping (including impact assessment) Report was sourced from, amongst others[1]:

- The Development Workshop Namibia (DWN) Poverty-oriented development of Infrastructure in Urban Areas in Namibia (BMZ-No. 2019 67 462) Environmental and Social Commitment Plan (ESCP) (2021).
- Environmental and Social Management Framework for Sustainable Urban Development in Namibia (SLR, 2021).
- Bulk Infrastructure Assessment of Okahao Town, Omusati Region, Namibia (OCE, 2023).
- 2022 – 2024 Okahao Structure Plan (SPC, 2024).

[1] Refer to the Baseline Description (Chapter 6) for further references used as well as Chapter 11.

- C2 – Okahao Site Assessment Report, Risk Scan and E&S Screening (DWN, 2023).
- Okahao Selection of Infrastructure Projects (DWN, 2023).
- Okahao Town Preliminary Design Final (LCE, 2025).
- Technical information provided by DWN and LCE.
- Site visits by Namisun, DWN and technical team (LCE)
- Consultations and focus group meetings with I&APs.
- Google Earth.
- Additional references in the Reference list (Chapter 11).

2.3 ESIA PROCESS FOR THE PROPOSED PROJECT

Prior to the commencement of the proposed project activities, environmental clearance is required in terms of the Environmental Management Act, 7 of 2007 and the associated EIA[2] Regulations (January 2012). An application for an ECC will be submitted to the competent authority MURD and regulating authority MEFT. This (ESIA Scoping with Impact Assessment) Report will be submitted as part of the application. The ESIA process includes an internal screening phase; a scoping phase, which includes an impact assessment; and an ESMP. A final decision relating to the above-mentioned application will be made by MEFT: Directorate of Environmental Affairs (DEA).

During the internal screening exercise, Namisun collected relevant information from DWN and LCE, also taking the assessments that have been completed for the proposed Bulk Infrastructure Project into consideration.

Information in this report has therefore been augmented by considering the aspects and potential impacts assessed for the Bulk Infrastructure Project; a site visit to the project area and surroundings in Okahao; the infrastructure assessments conducted by other consulting firms and input from comments gathered because of consultations with key stakeholders during focus group meetings. The potential impacts of the activities associated with the Bulk Infrastructure Project could therefore be assessed.

It is thought that this ESIA Scoping (including Impact Assessment) Report and the accompanying ESMP will provide sufficient information for the DEA of the MEFT to make an informed decision regarding the proposed Project and whether an ECC for the Application can be issued or not.

[2] Note: The Namibian Regulations refer to "EIA," and social aspects are an integral component of this process.

The ESIA process and corresponding activities which have been undertaken for this project are outlined in Table 3. The process that was followed was in accordance with the requirements outlined in the EIA Regulations of 2012[3].

TABLE 3: THE ESIA PROCESS

Objectives	Corresponding activities
Phase I: Project initiation and internal screening (February – March 2025)	
• Information requirements • Initiate the ESIA Scoping process	• Project initiation meetings with DWN and LCE teams to discuss the proposed project and ESIA / ECC Application process. • Review existing Project information shared by DWN and LCE and prepare list of further requirements. • Initial identification of environmental and social aspects and potential impacts associated with the proposed project and determine legal requirements. • Decision on ESIA process to be followed and prepare information sharing documents • Identify key stakeholders and compose I&APs database.
Phase II: Scoping (including assessment) and ESMP (March – July 2025)	
• Involve I&APs in the scoping process through information sharing. • Identify further potential environmental and social issues associated with the proposed Project. • Determine the terms of reference for assessment work. • Consider alternatives. • Provide details associated with the potentially affected environment. • Assessment of potential environmental and social impacts associated with the proposed project. • Develop management and mitigation measures. • ECC application.	• Notify authorities and I&APs of the proposed ESIA process (distribute background information document (BID), e-mails, telephone calls, newspaper advertisements, radio announcements and site notices). • I&APs registration and initial comments. • Key stakeholder (open public and focus group) meetings and include I&APs issues and concerns in the assessments. • Conduct site visits. • Compilation of ESIA Scoping (including Impact Assessment) Report and ESMP. • Distribute ESIA Report and ESMP to relevant authorities and I&APs for review. • Update and finalise ESIA Report with ESMP, considering comments received. • Online submission of the final report onto the MEFT's portal. • Submit Application and finalised ESIA Scoping Report with ESMP and I&APs comments to MURD and MEFT for decision-making.

[3] Note: While a Screening Phase is not explicitly required by the EIA Regulations, Namisun included it in the ESIA as part of best practice.

Objectives	Corresponding activities
Phase III: Review and decision-making	
• Review and decision-making by relevant ministries. • Receive feedback on the application.	• MURD review the application and final report, and send their recommendation to MEFT (DEA) for their review and the final decision regarding the environmental clearance application.

2.4 ESIA SCOPING (INCLUDING IMPACT ASSESSMENT) REPORT

The main purpose of this ESIA Scoping (including Impact Assessment) Report is to provide information relating to the proposed project activities and facilities / infrastructure; to indicate which environmental and social aspects have been identified during the internal screening and scoping phases (also taking the findings from the Rapid BIAs into account); and to indicate which environmental and social aspects might have an impact on the environment and community. These potential impacts could also be assessed, and the findings presented in this report (refer to Chapters 7 and 8).

The structure of this ESIA Scoping (including Impact Assessment) Report is outlined in Table , following largely the Scoping Report requirements as set out in Section 8 of the EIA Regulations (2012), promulgated under the Environmental Management Act, No. 7 of 2007.

TABLE 4: REPORT STRUCTURE

Component	Report reference
(a) Details of the Environmental Assessment Practitioners (EAPs) who prepared the report	Section 2.1 and Appendix A
(b) A description of the proposed activity (i.e., proposed Bulk Infrastructure Project)	Chapter 4
(c) A description of the environment that may be affected by the activity and the way the physical, biological, social, economic, and cultural aspects of the environment may be affected by the proposed activity	Chapters 6, 7 and 8
(d) 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, Chapter 5, 7 and 8
(e) An identification of laws and guidelines that have been considered in the preparation of the Scoping Report.	Chapter 3
(f) Details of the public consultation process conducted in terms of Regulation 7(1) in connection with the application, including:	Section 2.5

Component	Report reference
(i) steps that were taken to notify potentially interested and affected parties of the proposed application;	Section 2.5 and Appendix B
(ii) proof that notice boards, advertisements, radio announcements and site notices notifying potentially interested and affected parties of the proposed application have been displayed, placed or given;	
(iii) a list of all persons, organisations and organs of state that were registered in terms of Regulation 22 as interested and affected parties in relation to the application; and	Section 2.5.1 and Appendix B
(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 2.5.3 and Appendix D & E
(g) An indication of the methodology used in determining the significance of potential effects / A description and assessment of the significance of 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	Chapters 7 and 8
(h) A description and comparative assessment of all alternatives identified during the assessment process	Chapter 5
(i) A description of all environmental and social issues that were identified during the assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures	Chapter 7 and 8
(j) An assessment of each identified potentially significant effect	
(k) A description of any assumptions, uncertainties and gaps in knowledge	Section 1.5
(l) A management plan	Appendix F
(m) 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	Chapter 10
(n) A non-technical summary of the information	Executive Summary

2.5 PUBLIC PARTICIPATION

The public participation process for the proposed project was conducted to ensure (as far as possible) that all persons and or organisations that may be affected by, or interested in, the proposed activities and infrastructure, were informed of the project and could register their views and concerns. By consulting with relevant authorities and I&APs (specifically the beneficiaries), the range of environmental and social issues to be considered in this ESIA Scoping Report has been given specific context and focus.

Section 2.5.1 provides a summary of I&APs consulted, Section 2.5.2 describes the process that was followed and the issues that were identified are summarized in Section 2.5.3.

2.5.1 INTERESTED AND AFFECTED PARTIES

The broad list of persons, group of persons or organisations that were informed about the project and were requested to register as I&APs, should they be interested and or affected, include:

- Government and parastatals – National, Regional and Local, including (amongst others) the following:
  - The Ministry of Urban and Rural Development.
  - The DEA at the MEFT.
  - The Ministry of Agriculture, Water and Land Reform.
  - Omusati Regional Council and the local authorities (Okahao Town Council)
  - Traditional Authorities.
  - NamPower.
  - NORED.
  - NamWater.
  - Roads Authority.
- Non-government organisation (i.e. Development Workshop Namibia).
- Local Community
- Beneficiaries.
- Consultants (i.e. Stubenrauch Planning Consultants).
- Other I&APs that registered on the project.

These stakeholders were informed about the need for the proposed project activities, the ESIA process (including the public consultation), as well as the outcomes of the assessment (see Appendix B).

The full stakeholder database for this project is included in Appendix B of this report.

2.5.2 STEPS IN THE CONSULTATION PROCESS

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

TABLE 5: CONSULTATION PROCESS WITH I&APS

TASK	DESCRIPTION	DATE
Notification - regulatory authorities and I&APs		
I&APs identification	The stakeholder database was developed. This database is updated as and when required. A copy of the I&APs database is attached in Appendix B.	February 2025 – ongoing

<table>
<tr><th>TASK</th><th>DESCRIPTION</th><th>DATE</th></tr>
<tr><td>Distribution of Background Information Document (BID)</td><td>Copies of the BID were distributed via email to relevant authorities and I&APs on the stakeholder database and copies were made available on request.
The purpose of the BID was to inform I&APs and authorities about the proposed activities, the assessment process being followed, possible environmental and social impacts and ways in which I&APs could provide input / comments to Namisun.
A copy of the notifications and BID are attached in Appendix C.</td><td>March 2025</td></tr>
<tr><td>Site Notices</td><td>Site Notices (A2 & A3 sizes) were placed at the entrance of the Okahao Town Council building, on the notice boards inside the building and at open public spaces to notify I&APs of the proposed project, and the ESIA process being followed. Photos of the Site Notices that were displayed are attached in Appendix C.</td><td>March 2025</td></tr>
<tr><td>Newspaper Advertisements, Radio Announcements and Verbal Notifications</td><td>Block advertisements were placed in the Market Watch on 26 February 2025 as part of the following newspapers:
The Namibian Sun
Die Republikein
Allgemeine Zeitung
Further advertisements were placed on two consecutive weeks, i.e. 4 June and 11 June 2025 in the Market Watch forming part of the same newspapers mentioned above.

Copies of the advertisements are attached in Appendix C.

Locally-based DWN Coordinators verbally informed the residents (as far as possible) near the proposed development areas about the EIA process and public meeting.

Radio announcements with concise messages similar to the newspaper adverts were broadcasted as follows<table><tr><td>Station</td><td>Language</td><td>Date</td></tr><tr><td>National</td><td>English</td><td>4 March 2025</td></tr><tr><td>Hartklop</td><td>Afrikaans</td><td>4 March 2025</td></tr></table></td><td>February – June 2025</td></tr>
<tr><td colspan="3">Key stakeholder and focus group meetings and submission of comments</td></tr>
<tr><td>Open Public and Focus group meetings</td><td>The above-mentioned notifications and adverts stated the following: “Open Public and Focus Group meetings will be arranged and BIDs are available for a review and comment period from 26 February – 14 March 2025. If you would like your comments to be addressed in the ESIA Scoping (including Impacts Assessment) Report, please submit them to Namisun no later than 14 March 2025”.

ESIA Open Public and Focus group meetings were held as follows:
Open Public Meeting: Local Community and Beneficiaries on 11 March 2025 at the Okahao Town Council Fire Station.
Focus Group Meeting: Local authorities and parastatals on 11 March at the Okahao Town Council Chamber.</td><td>March 2025</td></tr>
</table>

TASK	DESCRIPTION	DATE
	The outcomes of these meetings are summarised and attached under Appendix D.	
Email correspondence and telephone discussions	Various emails were sent and telephone discussions and WhatsApp messages conducted with numerous I&APs to share further information, the BID and to offer Focus Group meetings.	March 2025
Comments and responses	All comments received via e-mail are included in Appendix E. A summary of questions / comments / issues raised (with responses) during the meetings and received per email are documented in the Issues and response Report (see Appendix E) and were incorporated in this report, where relevant.	February – March 2025
Review of ESIA Scoping (including Impact Assessment) Report by I&APs and authorities and submission of Application to MURD and MEFT		
I&APs and authorities review of ESIA Report with ESMP	A hard copy and electronic copy of the ESIA Scoping (including Impact Assessment) Report with the ESMP were available for review at the Okahao Town Council Offices. Electronic copies of the report were also available on request from Namisun. Summaries of the report were distributed to all relevant authorities and I&APs on the I&APs database via e-mail (see Appendix B). Further newspaper adverts were placed to announce the availability of the review period of the scoping report (refer to the above for further details). Also, locally-based DWN Coordinators informed the residents (as far as possible) near the proposed development areas about the availability of the draft scoping report for review by means of distribution of flyers. Authorities and I&APs had the opportunity to review the draft report and submit comments in writing to Namisun. The comments period commenced on the **16 June 2025** and the closing date for comments was **7 July 2025.** No further comments were received from the I&APs during the review period of the report.	June – July 2025
MURD and MEFT review of Final ESIA Report and decision on Application	Namisun considered all the comments from I&APs and regulatory authorities received during the review period. A copy of the final report with the Application Form, including comments from authorities and I&APs, will be submitted to the MURD for their review and recommendation to MEFT who will do the final review for decision-making. The final report (including I&APs comments) and Application will be uploaded onto the MEFT portal.	July 2025

2.5.3 SUMMARY OF THE ISSUES RAISED

The comments received from I&APs (also during the open public and focus group meetings) relate to the following key aspects:

- Biodiversity impacts. The issue was how impacts on biodiversity will be mitigated or managed. All possible impacts on plants, animals and habitats will be identified and assessed, and mitigation and management measures will be documented in the ESMP.
- Dust related impacts. Dust generation especially during the construction phase is a concern, but it was highlighted that impacts will be limited and temporary. Mitigation and management measures will entail dust suppression, no work during strong windy conditions, etc.
- Road erosion. The issue raised pointed to the fact that several roads in Okahao were built with substandard material that erodes and makes the roads horrible to drive on. The ESIA team takes this issue seriously and will ensure that concerns about erosion of the road are addressed by the design team and considered in the ESMP.
- Surface water flow and stormwater management. The ESIA team considers the importance of flowing surface water as a crucial ecological driver and will make recommendations to limit the damming or channelling of flowing surface water. The damming of water will be prevented because of the potential to create breeding conditions for mosquitos and the channeling of water will be limited to prevent erosion.
- Waste management. It is not expected that a lot of waste will be generated during the construction phase. The ESIA team will make sure that the best practice measures to mitigate and manage waste are contained in the ESMP.
- Potential resettlement of homestead owners. Two traditional fields and homesteads are located within the original proposed route of the road. However, LCE amended the route to avoid passing through the two homesteads.
- Location of water reservoir and steel tank (clarification required as maps contradict). Clarification was provided by LCE in an email dated 3rd April 2024.
- Nuisance of mosquitoes due to open water sources. The proposed pump station for the sewage will be a closed pump station and therefore it will not a breeding ground for mosquitoes.

Refer to Appendix E for the IRR which contains all questions / comments / issues raised (with responses) during the meetings and received per email.

3. LEGAL FRAMEWORK

This Chapter provides an overview of relevant Namibian policies and applicable Namibian legislation and international conventions / treaties and lender environmental and social safeguards applicable to the proposed Bulk Infrastructure Project.

The Republic of Namibia has five tiers of law and a few guiding policies relevant to environmental and social assessments and protection, which include the Constitution of the Republic of Namibia, statutory law, common law, customary law and international law.

As the main source of legislation, the Constitution of the Republic of Namibia (1990) makes provision for the creation and enforcement of applicable legislation. Article 95 (1) of the Constitution says: *"The State is obliged to ensure maintenance of ecosystems, essential ecological processes and biological diversity and utilisation of living natural resources on a sustainable basis for the benefit of Namibians both present and future"*.

In this context and in accordance with the constitution, Namibia has passed numerous laws intended to protect the natural and social environment and mitigate against adverse environmental and social impacts.

3.1 RELEVANT ACTS

The following legislation are relevant to environmental and social assessments in Namibia and the proposed Bulk Infrastructure Project:

- The Local Authorities Act, 1992 (No. 11 of 2013).
- The Public Health Act 36 of 1919.
- Public and Environmental Health Act, No. 1 of 2015, Government Notice No. 86 of 2015.
- The Water Act, No. 54 of 1956
- Soil Conservation Act, No. 76 of 1969 and the Soil Conservation Amendment Act, No. 38 of 1971.
- Hazardous Substance Ordinance, No. 14 of 1974.
- National Heritage Act, 2004 (No. 27 of 2004).
- National Monuments Act 28 of 1969.
- Nature Conservation Ordinance, No.14 of 1975 (as amended).
- Atmospheric Pollution Prevention Ordinance, No. 11 of 1976.
- Petroleum Products and Energy Act, No. 13 of 1990.
- Foreign Investment Act No. 27 of 1990.

- The Constitution of the Republic of Namibia of 1990.
- Nature Conservation General Amendment Act of 1990, the Nature Conservation Amendment Act, No.5 of 1996, and the Nature Conservation Amendment Act, No. 3 of 2017.
- Environmental Management Act, No. 7 of 2007 and Regulations promulgated in terms of the Act in 2012.
- Road Traffic and Transport Act, 1999 (No. 22 of 1999).
- Road Ordinance 1972 (No. 17 of 1972).
- The Forestry Act, No. 12 of 2001 as amended by the Forest Amendment Act, No. 13 of 2005 and its regulations of 2015.
- Communal Land Reform Act, 2002 (No. 5 of 2002).
- Pollution Control and Waste Management Bill (3rd Draft September 2003).
- Electricity Act, No. 4 of 2007
- Labour Act, 2007 (No. 11 of 2007).
- Social Security Act, 1994 (No. 34 of 1994, as amended).
- Employees Compensation Act, 1995 (No. 5 of 1995).
- Regulations relating to the health and safety of employees at work (No. 165 of 1997).
- Affirmative Action (Employment) Act, 1998 (No. 29 of 1998).
- Anticorruption Act, 2003 (No. 8 of 2003).
- Town Planning Ordinance (No. 18 of 1954).
- Townships and Division of Land Ordinance (No. 11 of 1963).
- Water Resources Management Act, No. 11 of 2013 and Regulations promulgated in terms of the Act in 2023.

3.1.1 APPLICABLE LISTED ACTIVITIES

The EIA Regulations promulgated in terms of the Environmental Management Act of 2007, identify certain activities which could have a substantially detrimental effect on the environment. These listed activities require environmental clearance from MEFT prior to commencing. The following activities identified in the regulations apply to the proposed Bulk Infrastructure Project:

TABLE 6: LISTED ACTIVITIES TRIGGERED BY THE PROPOSED PROJECT[4]

LISTED ACTIVITY	PROJECT COMPONENT
Energy generation, transmission and storage activities	
1. The construction of facilities for - (a) the generation of electricity; (b) the transmission and supply of electricity.	• Power supply lines will be constructed in the project area.
Waste management, treatment, handling and disposal activities	
2.1 The construction of facilities for waste sites, treatment of waste and disposal of waste.	• General waste will be managed and stored on site and disposed of off-site at licenced facilities.
Water resource developments	
8.5 Construction of dams, reservoirs, levees and weirs. 8.6 Construction of industrial and domestic wastewater treatment plants and related pipeline systems. 8.8 Construction and other activities in watercourses within flood lines.	• Construction of a water reservoir. • Construction of a new sewer line. • Gravelling of roads within flood areas (oshanas).
Infrastructure	
10.1 The construction of – (a) Public roads	• Gravelling of roads within the project area.

3.2 MUNICIPAL BY-LAWS, GUIDELINES AND REGULATIONS

Various municipal by-laws, guidelines, and regulations apply to different municipal areas in Namibia, where relevant.

3.3 RELEVANT POLICIES

Policies and plans currently in force and relevant to this assessment include:

- The EIA Policy (1995).
- Namibia's Environmental Assessment Policy for Sustainable Development and Environmental Conservation (1995).
- White Paper on the Energy Policy, 1998.
- Namibia Vision 2030.
- National Development Plan, 2017/2018 – 2021/2022, guided by Vision 2030.
- Policy for the Conservation of Biotic Diversity and Habitat Protection, 1994.
- Namibia's Second National Biodiversity Strategy and Action Plan (2013-2022).
- National Environmental Health Policy (2002).

[4] Numbering as per the EIA Regulations.

- National Waste Management Policy (2010).
- National Integrated Resource Plan (2016).
- National Forest Policy (1992).
- National Land Policy, the National Resettlement Policy, the Agricultural (Commercial) Land Reform Act (1995).
- Land Tax and Communal Land Reform Act (2002).
- Poverty Reduction Strategy for Namibia (1998).
- National Industrial Policy (2012).
- Namibia's Integrated Water Resources Management (IWRM) Plan (2010).
- The National Climate Change Policy of Namibia (2011).
- National Agriculture Policy (2015).

3.4 Other Guidance and Regulatory Frameworks

Some international legislation, treaties, standards and guidelines – some to which Namibia is a signatory – are also of relevance, including the following:

- The Stockholm Declaration on the Human Environment, Stockholm 1972.
- The Convention on International Trade in Endangered Species (CITES) of 1973 regulates the trade in endangered species – specifically species threatened with global extinction and species that may become extinct unless trade in them is strictly regulated.
- The Convention on Biological Diversity (CBD) of 1992 details the preservation of rare and endemic species and Article 14 of the convention requires that EIAs are carried out for projects that are likely to have an adverse effect on biodiversity.
- Vienna Convention for the Protection of the Ozone Layer (1985).
- Montreal Protocol on Substances that Deplete the Ozone Layer (1987).
- United Nation Framework Convention on Climate Change, 1992 and the adoption of the Paris Climate Change Agreement (2015; under the above convention).
- Kyoto Protocol on the Framework Convention on Climate Change, 1998.
- SADC Protocol on Wildlife Conservation and Law Enforcement, 1999.
- The African Convention on the Conservation of Nature and Natural Resources (revised) 2003.
- SADC Protocol on Forestry, 2002 (entered into force within SADC on 1 September 2006).
- Convention to Combat Desertification.
- Convention on Migratory Species (CMS 2011).

- United Nations Sustainable Development Goals (SDGs) 2015.
- United Nations Convention on Biological Diversity (UNCBD).
- United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) 2007.

3.4.1 KFW'S SUSTAINABILITY GUIDELINE[5]

The KfW Sustainability Guideline (2021) sets out that the relevant national law and legal requirements as well as the relevant Environmental and Social Standards (ESS) of the World Bank Group are required during the identification and assessment of environmental, social and climate risks and impacts. Additionally, the World Bank's General and sector-specific Environmental, Health and Safety (EHS) Guidelines and core labour standards of the International Labour Organization (ILO) must be applied. During the assessment the requirements of the Human Rights Guidelines of the BMZ must be taken into account.

Referring to Section 1.4, the ESIA will adhere to Namibian legislation and EIA Regulations. While considering the Screening Study and findings from the Rapid BIAs, KfW requirements and certain Environmental and Social Standards (ESS) of the World Bank Group will not be fully applied due to the nature and scale of the proposed activities. Nonetheless, these standards will be reviewed and incorporated where applicable, as detailed in the following sections.

3.4.2 WORLD BANK ENVIRONMENTAL AND SOCIAL FRAMEWORK[6]

The World Bank's Environmental and Social Framework (ESF) is aimed at enabling the World Bank and Borrowers to better manage environmental and social risks of projects and to improve development outcomes. The ESF offers broad and systematic coverage of environmental and social risks. The ESF sets out the World Bank Groups commitment to sustainable development, through a Vision for Sustainable Development, a Policy for Investment Project Financing and a set of Environmental and Social Standards (ESS).

KfW's Sustainability Guideline (2021) requires the application of the World Bank's Environmental and Social Standards to their projects, but not the overall ESF.

3.4.2.1 WORLD BANK ENVIRONMENTAL AND SOCIAL STANDARDS (2018)

The World Bank's Environmental and Social Standards consist of ten standards as summarised below. Application of the standards intends to: (a) support Borrowers in achieving good

[5] SLR, "Environmental and Social Management Framework for Sustainable Development in Namibia," V1, (2021): 30.
[6] SLR, "Environmental and Social Management Framework for Sustainable Development in Namibia," V1, (2021): 31 - 35.

international practice relating to environmental and social sustainability; (b) assist Borrowers in fulfilling their national and international environmental and social obligations; (c) enhance non-discrimination, transparency, participation, accountability, and governance; and (d) enhance the sustainable development outcomes of projects through ongoing stakeholder engagement.

KfW's Sustainability Guidance (2021) require the application of the relevant ESS. The likely applicability of each standard to the proposed Bulk Infrastructure Project in Okahao is indicated in Table 7.

TABLE 7: WORLD BANK E&S STANDARDS AND THEIR APPLICABILITY TO THE PROGRAMME

World Bank Environmental and Social Standards (ESS)	Applicability to the proposed Bulk Infrastructure Project in Okahao
ESS1: Assessment and Management of Environmental and Social Risks and Impacts sets out the Borrower's responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with each stage of a project supported by the Bank through Investment Project Financing (IPF), in order to achieve environmental and social outcomes consistent with the ESS.	The proposed Bulk Infrastructure Project in Okahao is rated as a Category B (moderate risk) project (DWN, 2023). This rating is based on both Component 1 Land Development and Component 2 Bulk Infrastructure. The need for an application for an ECC is therefore triggered by the Namibian Legislation (refer to Sections 1.4 and 3.1). Due to the nature, scale and location of the proposed activities a combined scoping and assessment process with the ultimate development of an ESMP is followed (see Section 1.4 and Chapter 2).
ESS2: Labour and Working Conditions recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions.	The proposed Bulk Infrastructure Project in Okahao will entail construction activities and involvement of various contractors (see Chapter 4), however at a relatively small scale. The related labour and working conditions aspects are therefore relevant but addressed through management and mitigation measures which are included in the ESMP (Appendix F). No detailed / further assessment required.
ESS3: Resource Efficiency and Pollution Prevention and Management recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people,	The proposed Bulk Infrastructure Project in Okahao will entail construction activities, however at a relatively small scale. The related resource efficiency and pollution prevention and

ecosystem services and the environment at the local, regional, and global levels. This ESS is sets out the requirements to address resource efficiency and pollution prevention and management throughout the project lifecycle.	management aspects are therefore relevant to a certain extent, with relevant management and mitigation measures are included in the ESMP (Appendix F) to address these aspects. No further assessment required.
ESS4: Community Health and Safety addresses the health, safety, and security risks and impacts on project-affected communities and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts, with particular attention to people who, because of their particular circumstances, may be vulnerable.	The proposed Bulk Infrastructure Project in Okahao will entail construction activities and involvement of various contractors (see Chapter 4), however at a relatively small scale. The related impacts on the community (i.e. nearest receptors) are therefore described and qualitatively assessed in Chapters 7 and 8. Furthermore, relevant management and mitigation measures to ensure potential impacts on the nearby receptors are avoided (minimised as far as possible) are included in the ESMP (Appendix F).
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement – involuntary resettlement should be avoided. Where involuntary resettlement is unavoidable, it will be minimized and appropriate measures to mitigate adverse impacts on displaced persons (and on host communities receiving displaced persons) will be carefully planned and implemented.	The proposed activities will avoid any potential resettlement of communities or individuals. However, potential impacts to the nearest receptors were identified and described and qualitatively assessed in chapters 7 and 8. Relevant commitments related to the avoidance of involuntary resettlement aspects are also included in the ESMP together with other management and mitigation measures to ensure potential impacts on the nearby receptors are avoided (minimised as far as possible).

ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development and it recognizes the importance of maintaining core ecological functions of habitats, including forests, and the biodiversity they support. ESS6 also addresses sustainable management of primary production and harvesting of natural resources, and recognizes the need to consider the livelihood of project-affected parties, including indigenous Peoples, whose access to, or use of, biodiversity or living natural resources may be affected by a project.	The environmental aspects and potential impacts associated with the proposed project components and associated activities, including impacts on biodiversity, were identified by the environmental team in consultation with stakeholders. The baseline environment, which provides an understanding of the sensitivities of the site and surroundings is described in Chapter 6. The link between the receptors described in this chapter and the potential impacts of the project activities are also provided which then assists with the assessments provided in Chapter 8. With reference to Chapter 6, the current biodiversity in the project area and surroundings is described as “severely degraded” due to population pressure.
ESS7: Indigenous Peoples/Sub-Saharan African Historically Undeserved Traditional Local Communities ensures that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples/Sub Saharan African Historically Undeserved Traditional Local Communities. ESS7 is also meant to avoid adverse impacts of projects on Indigenous Peoples/Sub Saharan African Historically Undeserved Traditional Local Communities, or when avoidance is not possible, to minimize, mitigate and/or compensate for such impacts.	With reference to Chapter 6 there are no indigenous peoples in Okahao or nearby surroundings. Furthermore, the proposed project activities will advance the town and be beneficial to all inhabitants of the town in general.

ESS8: Cultural Heritage recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present and future. ESS8 sets out measures designed to protect cultural heritage throughout the project lifecycle.	The proposed Bulk Infrastructure Project will be implemented within the townlands of Okahao, in areas that have already been disturbed. With reference to Chapter 6, Section 6.8
ESS9: Financial Intermediaries (Fis) recognizes that strong domestic capital and financial markets and access to finance are important for economic development, growth and poverty reduction. Fis are required to monitor and manage the environmental and social risks and impacts of their portfolio and FI subprojects, and monitor portfolio risk, as appropriate to the nature of intermediated financing. The way in which the FI will manage its portfolio will take various forms, depending on a number of considerations, including the capacity of the FI and the nature and scope of the funding to be provided by the FI.	Not Applicable (SLR, 2023)
ESS10: Stakeholder Engagement and Information Disclosure recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improved the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation.	A comprehensive public participation (i.e. stakeholder engagement) process are being undertaken as part of the ESIA process (see Section 2.5 and Appendices B to E). Further requirements relating to consultations with key stakeholders are included as commitments in the ESMP.

3.4.2.2 EHS GUIDELINES

The World Bank Group's Environmental, Health and Safety (EHS) Guidelines are technical reference documents that are required to be applied, as required by respective policies and standards, when a member of the World Bank Group is involved in a project. The Guidelines include general and industry-specific examples of Good International Industry Practice and contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. The applicability of the EHS Guidelines should be tailored to the hazards and risks established. For each project in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are taken into account.

The General EHS guidelines that were identified by SLR (2023) likely to be relevant to the overall DWN programme. These (relevant) aspects were considered by the environmental team in consultation with stakeholders and further described and assessed in Chapters 7 and 8, taking baseline considerations (Chapter 6) into account and / or addressed through appropriate management and mitigation measures in the ESMP (Appendix F).

4. PROJECT DESCRIPTION

This Chapter provides a description of the proposed Bulk Infrastructure Project and the associated facilities and activities.

4.1 GENERAL PROJECT INFORMATION

4.1.1 DETAILS OF THE APPLICANT

Company name:	Development Workshop Namibia
Contact (responsible) person:	Ms. Salmi Neshila
Cell:	+264 81 616 5937
E-mail:	s.neshila@dw-namibia.org

Development Workshop Namibia (DWN) is a not-for-profit organisation with offices in Namibia, Zambia and Switzerland, and focus on sustainable urban development and urban poverty reduction. Founded in 2016, DWN has rapidly expanded its reach across Namibia, running projects in 13 out of 14 regions.

4.1.2 PROJECT OVERVIEW AND BACKGROUND

As stated in Section 1.2, DWN is implementing the Project "Poverty-Oriented Development of Infrastructure in urban areas of Namibia" with financial support from KfW. The project seeks to contribute to more sustainable and inclusive urban development in Namibia by supporting DWN to plan and develop low-cost residential land with titles in 15 towns across Namibia.

The objective is to transform current informal settlement growth into formal urban growth and to initiate and contribute to changing the way urban planning is done towards a more holistic and participatory planning approach to create socially and economically conducive living environments.

The project is implemented by three distinct components:

Component one: Planning and developing low-cost residential land with title.

Component two: Providing "pro-poor" infrastructure investments in four selected towns.

Component three: Improving public hygiene and access to appropriate sanitation.

The infrastructure requirements subject of Component two is identified in some of the project towns through a Bulk Infrastructure Assessment (BIA) exercise conducted by Consulting firms engaged by DWN. Thereafter, priority infrastructure projects are jointly drawn up by the DWN and the Town Council authorities.

DWN has planned to deploy part of the KfW grant through Component two of the project to hire Lund Consulting Engineers (LCE) to design and supervise the construction of various pro-poor infrastructure components in (amongst others) the town of Okahao, in the Omusati Region.

DWN has selected five infrastructure projects in Okahao which include one electricity project, two sanitation, one road and one water project. All four projects directly benefit DWN project area which comprises Kashenda Proper, Kashenda Extension 1, Kashenda Extension 2, and the new adjacent DWN project area under Component 1.

The funds of Component two will assist to provide bulk electricity, sewer lines, water storage facilities and gravelling of the main access roads to current and future DWN project area as well as support other bulk infrastructure that will benefit Okahao informal settlement areas.

The proposed Bulk Infrastructure Project includes the following key activities, which are further explained in the Sections below:

1. Construction of a 1.65 km 11 kV underground electricity supply line from an existing 315 kVA mini substation namely Okahao Ext 9 MS, north of Kashenda Proper. This will provide access to bulk electricity to the existing DWN project area, as well as the new DWN extension.
2. Construction of a pump station and a 0.61 km rising main. This will provide access to bulk sewer to DWN existing project area Kashenda Proper. Kashenda Extension 1 and Extension 2 will also benefit in future.
3. Construction of 178 m^3 ground reservoir and 20 m^3 elevated tank. This will provide water storage facilities and boost the water pressure at the new and existing DWN project area.
4. Gravelling of 0.6 km access road to DWN project area connecting to Okahao Ext 9. This will provide access to the existing DWN project area, as well as the new DWN extension.

The following Sections provide further details of the proposed Bulk Infrastructure Project and associated facilities and activities.

4.2 DESCRIPTION OF KEY COMPONENTS, FACILITIES AND INFRASTRUCTURE

The following Sections (i.e. 4.2.1 to 4.2.4) provide a detailed description of the proposed activities, facilities and infrastructure of the Bulk Infrastructure Project.

4.2.1 ELECTRICITY

4.2.1.1 PROJECT ID EE-ST2 11 KV POWERLINE

A new underground 11 kV power line will be installed from an existing 315 kVA mini substation namely Okahao Ext 9 MS1 to the north of Kashenda Proper. The underground power cable will follow the existing roads and the new proposed road that will be constructed to link Kashenda Proper to the existing Okahao town infrastructure. The underground cable will thereafter follow the new proposed extension roads to the new proposed position of a 500 kVA mini substation between Kashenda Proper and DWN Extension. The new cable route will avoid any existing properties.

- NORED is the supply authority for the region and all electrical infrastructure is the property of NORED. All day-to-day operation and maintenance are completed by NORED. The consultant has informed NORED of the required bulk electrical infrastructure and awaits their reply. All connections, routes and new infrastructure will have to be approved by NORED.EE-ST2 Construction of 1.65 km 11 kV underground electrical supply line to supply DWN Extension
- This will provide access to bulk electricity to the existing DWN project area. This project will allow the provision of bulk 11 kV overhead to the new area allocated to DWN.
- The project will motivate the low-income targeted population in DWN project areas to buy into the project area once DWN advertises the cost of plots with electrification under component 1.
- The project will motivate low-income residents to open up and operate small-scale businesses later into the night since the informal street is a place of economic activity.
- It will also provide safe mobility for women and children and the entire community at large during the night as authorities and communities will be able to surveillance at night.

- OTC has confirmed that they have a budget for internal reticulation once bulk lines are constructed.

See Figure 3 below showing the proposed route for the 11 kV underground power line and positions of the two substations.

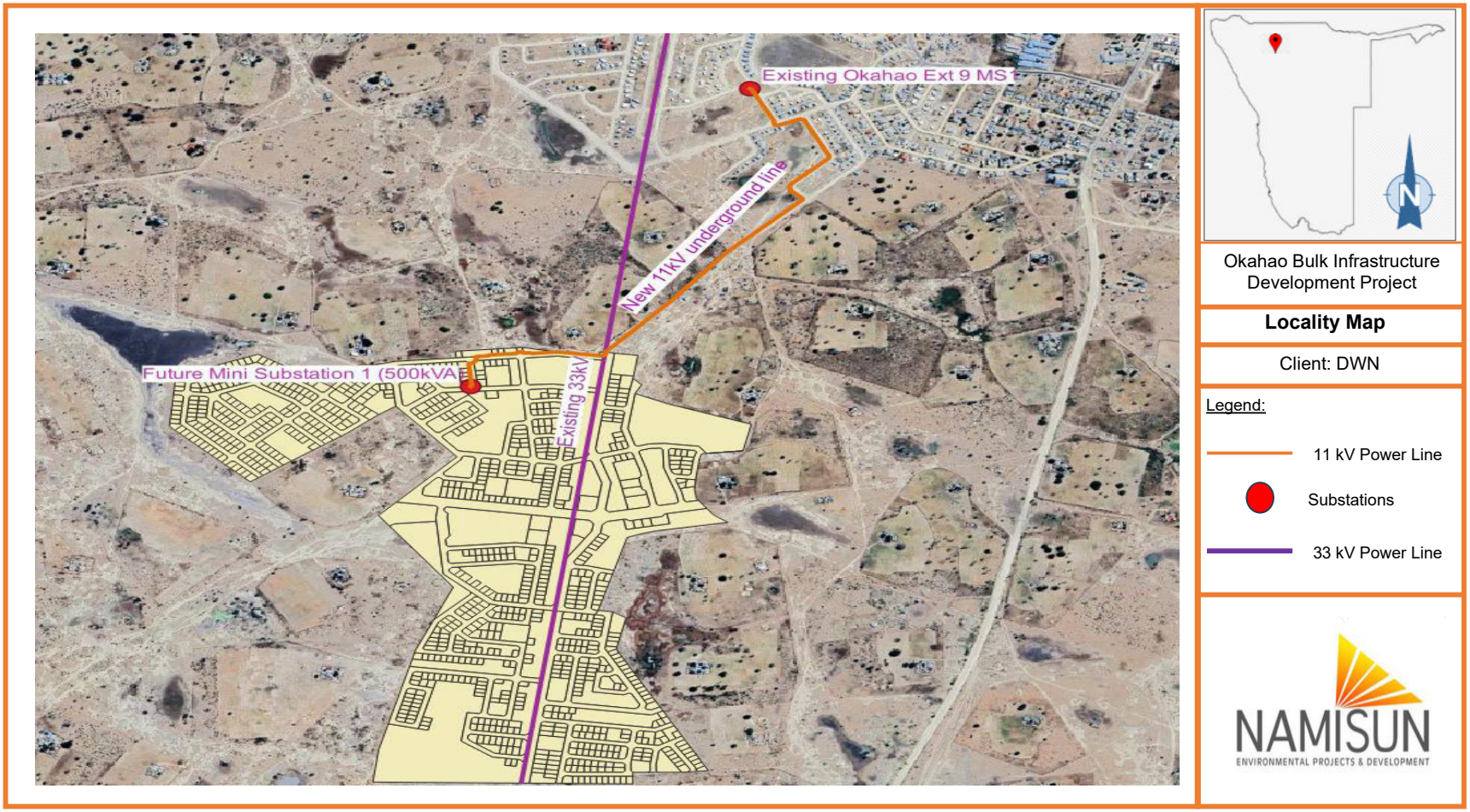

FIGURE 3: EE-ST2 THE ORANGE LINE SHOWS THE 1.65 KM 11 KV UNDERGROUND POWER LINE IN THE KASHENDA PROPER AREA. THE VIOLET LINE INDICATES THE EXISTING 33 KV POWER LINE IN THE AREA *(REF. LCE)*

4.2.2 SEWERAGE INFRASTRUCTURE UPGRADES

4.2.2.1 PROJECT ID SPS-ST2 PUMP STATION 11 & 0.61 KM RISING MAIN FOR KASHENDA PROPER

A new Pumpstation No. 11 will be constructed to the north of Kashenda Proper with a rising main connecting to the existing sewer network to the north-east.

Due to the topographic nature of the area being relatively flat, the sewer network requires additional pump capacity to convey the sewer to the treatment work.

SPS-ST2 Construction of Pump Station 11 and 0.61 km rising main. This will provide access to bulk sewer to DWN existing project area Kashenda Proper. Kashenda Extension 1 and Extension 2 will also benefit in future.

- The new pump station will be the last point to receive wastewater from DWN project area before pumping it to the new Junction Box 4.
- The proposed project complements the DWN land program under Component 1, enabling Kashenda Proper to be serviced with bulk sewer line and pump station network that will allow OTC to provide future internal sewer reticulation network for the project area.
- The project ensures that sewage generated from Kashenda Proper and future extensions is transported to the existing oxidation ponds and, in the future, to the wastewater treatment plants (WWTW).

See Figure 4 below showing the location of Pump Station 11 and the rising main.

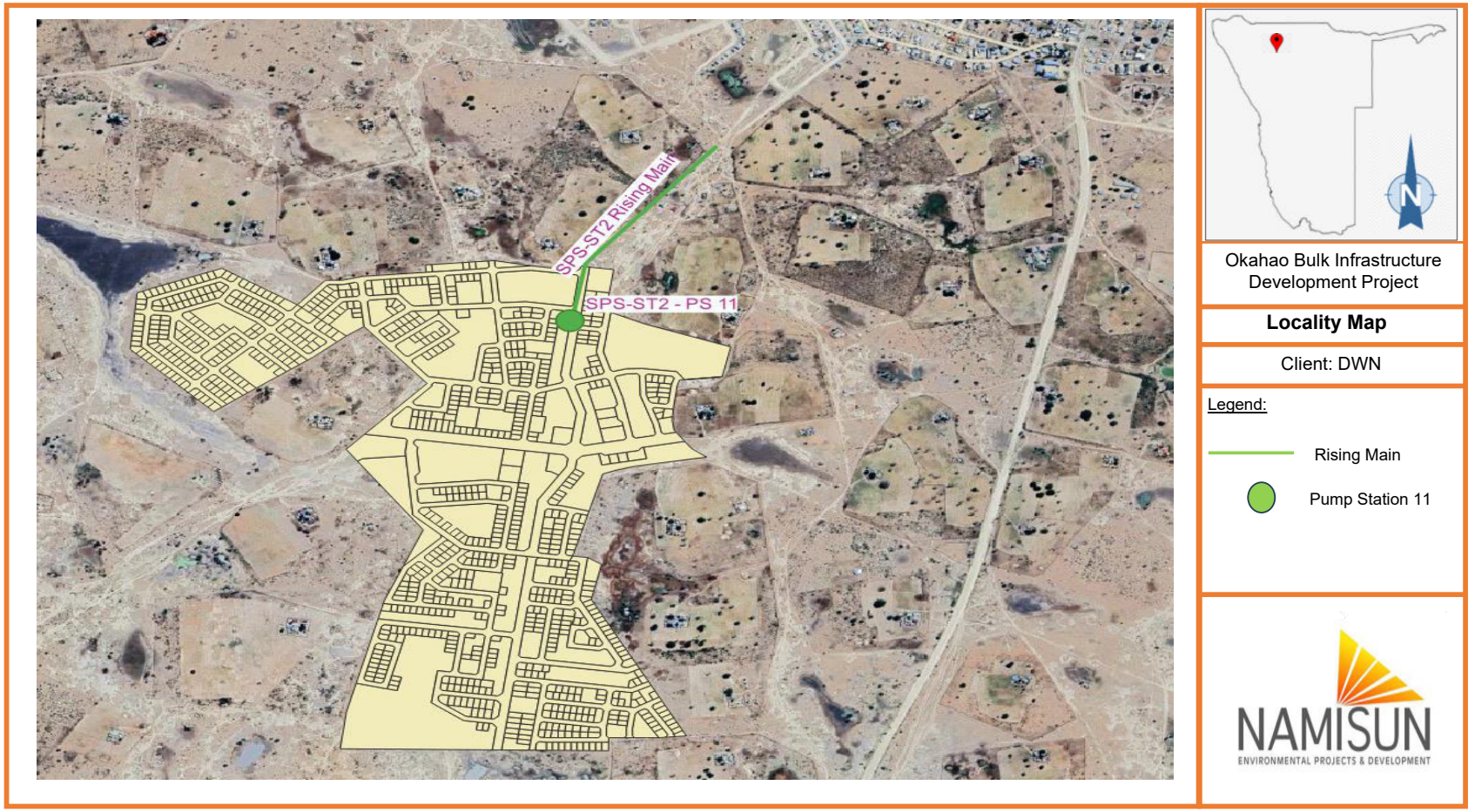

FIGURE 4: SPS-ST2 THE GREEN DOT SHOWS THE PUMPSTATION 11 AND THE GREEN LINE SHOWS THE RISING MAIN *(REF. LCE)*

4.2.3 WATER

4.2.3.1 PROJECT ID W-ST1 CONSTRUCTION OF GROUND LEVEL RESERVOIR AND ELEVATED TANK

The evaluation of the bulk storage reservoir and elevated water tank confirmed that the existing capacity is sufficient for the current demand but will not be able to accommodate the future development scenarios.

W-ST1 Construction of a 178 m³ ground steel reservoir and 20 m³ elevated tank. This will provide water storage facilities and boost the water pressure at the new and existing DWN project areas.

- The proposed project complements the DWN land program under component 1, as the current water for DWN project area comes directly from NamWater main supplier line. Thus, the reservoirs are required to store water to be used in case of emergency.
- The elevated tank will boost the water pressure for the project area and also enable DWN new extension to be serviced with water reticulation networks under Component 1.

See Figure 5 below showing the proposed position of the water infrastructure.

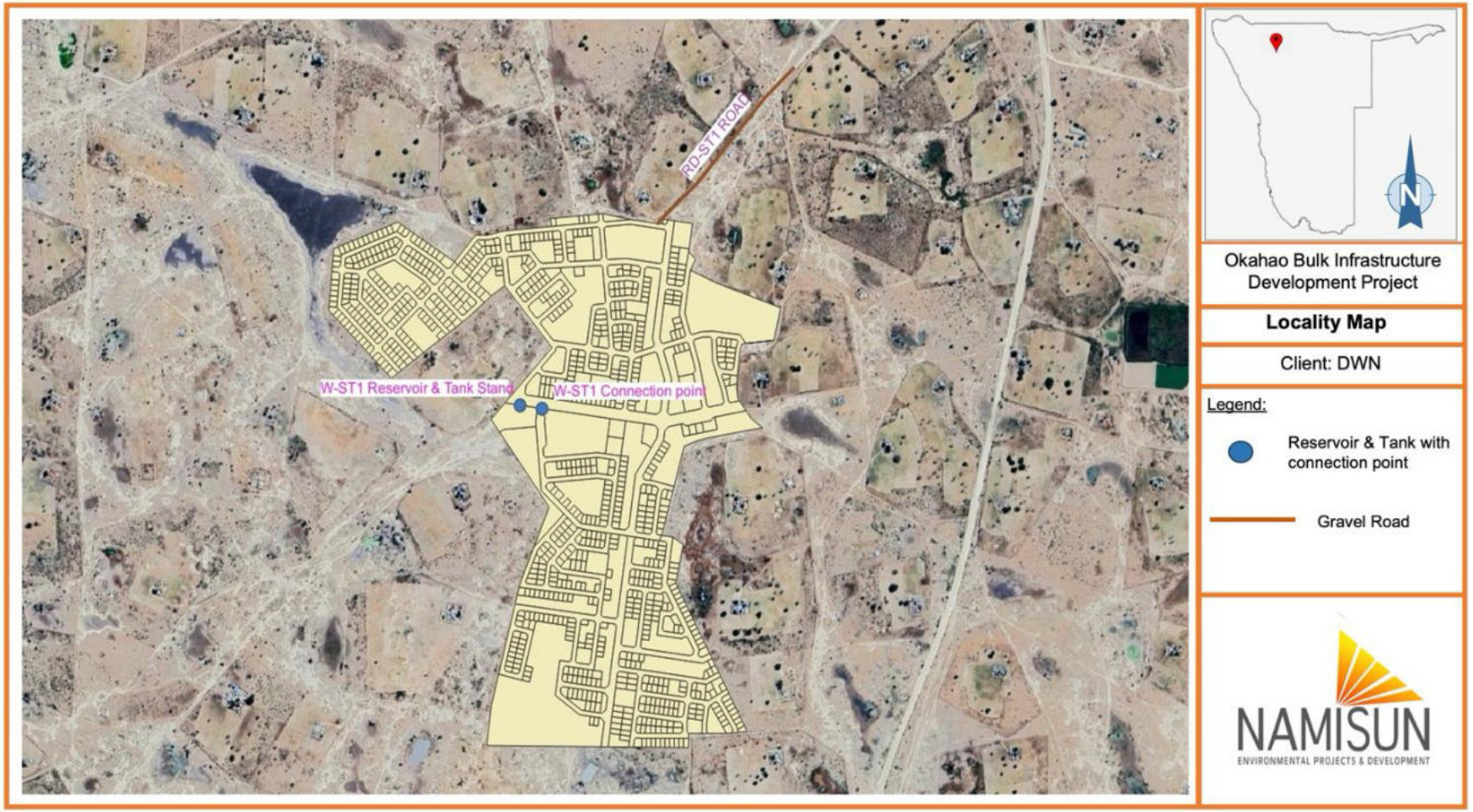

FIGURE 5: W-ST1 THE BLUE DOTS SHOW THE GROUND LEVEL RESERVOIR AND ELEVATED TANK WITH CONNECTION POINT *(REF. LCE)*

4.2.4 ROADS

4.2.4.1 PROJECT ID RD-ST1 GRAVELLING OF 0.6 KM MAIN ROAD IN KASHENDA & DWN AREA

Kashenda Proper and Kashenda Extension 1 are situated to the south of Okahao and the new DWN Extension is situated to the west of Kashenda Proper. The main road linking Kashenda Proper to Okahao Extension 9 was chosen to be upgraded to the gravelled road.

RD-ST1 Gravelling of 0.6 km main access roads in DWN project area connecting the Regional Town Council (RTC) gravel road from the tarred road. This will provide access to the existing DWN project area, as well as the new DWN Extension.

- The project consists of gravelling 1 main road section to access DWN project area.
- Section 1 is a 0.6 km road to access Kashenda Proper from Okahao Extension 9 up north.
- The proposed project complements the DWN land program under Component 1, as the project ensures that the clients buying into the DWN project area under Component 1 can access their plots.

Refer to Figure 6 below showing the proposed main road to be gravelled.

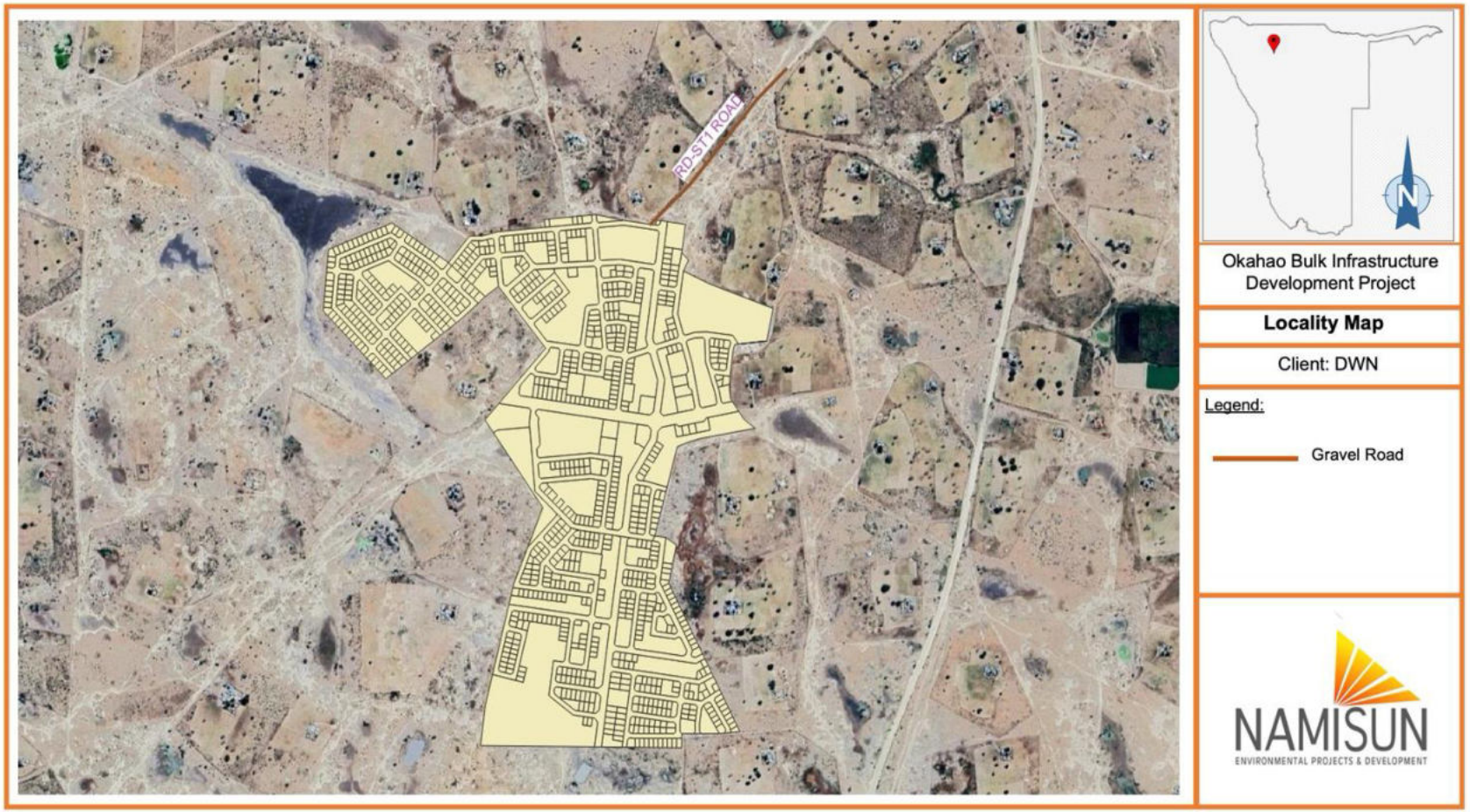

FIGURE 6: RD-ST1 THE BROWN LINE SHOWS THE 0.6 KM ROAD TO BE GRAVELLED *(REF. LCE)*

4.3 CONSTRUCTION PHASE ACTIVITIES AND INFRASTRUCTURE

4.3.1 CONSTRUCTION PHASE ACTIVITIES

The following (key) activities are expected to take place during the construction of the above-mentioned facilities:

- Appoint contractors, labourers, etc.
- Limited earth moving activities to create flat surfaces.
- Pipeline trench excavations, laying of pipelines and backfilling.
- Grading activities for roads.
- Foundation excavations.
- Setting up contractors' laydown areas.
- Digging of foundations and trenches.
- Delivery of materials – storage and handling of material such as sand, rock, cement, etc.
- General building / construction activities including, amongst others: mixing of concrete; operation of construction vehicles and machinery; refuelling of machinery; civil, mechanical and electrical works; painting; grinding; welding; etc.
- Handling and storage of hazardous material, including lubricants, paints, gas (welding), cement, chemical additives for cement, diesel and petrol.
- Handling, storage and disposal of non-hazardous waste, including steel off-cuts, domestic waste, wood off-cuts, grinding wheels, other general construction waste, redundant concrete packaging, e.g. plastic wrapping, styrofoam.
- Handling, storage and disposal of hazardous waste, including empty paint containers, cements bags, chemical additives (for cement) containers, hydrocarbon contaminated PPE and soil and other.

4.3.2 FACILITIES AND SUPPORT STRUCTURES FOR THE CONSTRUCTION PHASE

Within the proposed Project area mobile ablution facilities and other associated infrastructure and services, product handling and loading areas, general waste handling and storage facilities, etc. would need to be constructed. The following facilities are expected to be placed at the site (mainly in the immediate area of the various project components):

- Contractors lay-down areas.
- Workshops, maintenance areas, stores, wash bays, lay-down areas, batch plant, fuel handling and storage area, offices, change houses.
- Ablution facilities such as chemical toilets or septic tanks.

- Handling and storage area for construction materials (paints, solvents, oils, grease) and waste.
- Generators for temporary power supply.
- Waste collection and storage areas.

These facilities would be removed at the end of the construction phase.

4.3.2.1 WASTE MANAGEMENT DURING CONSTRUCTION

Sanitation

Mobile ablutions will be installed on the onsite. Cleaning of these mobile toilets will be done regularly to maintain good hygiene conditions.

Other waste (hazardous and non-hazardous)

The types of waste that could be generated during construction include hazardous industrial waste, general industrial waste, medical waste from the staff medical station, and domestic waste. Waste will be sorted at source, stored in a manner that there can be no discharge of contamination to the environment and recycled or reused where possible. The remainder will be transported off site to appropriate recycling or disposal facilities.

Waste management practices are presented in the ESMP (Appendix F). In summary, Table 8 outlines the types of waste anticipated during the construction phase of the proposed Bulk Infrastructure Project.

TABLE 8: PROPOSED WASTE MANAGEMENT FOR CONSTRUCTION

Waste type	Waste specifics (example of waste types)
Non-hazardous solid waste	During maintenance and possible replacements of panels and equipment: Broken panels, pallets and wooden crates, rubber, cardboard, paper, cable drums, metal cut-offs, scrap metal, general domestic waste such as food and packaging
	Building rubble and waste concrete
Hazardous solid waste	Treated timber crates, printer cartridges, batteries, fluorescent bulbs, paint, solvents, tar, empty hazardous (i.e. reagents, paint, etc.) material containers etc.
	Hydrocarbons (oils, grease).
	Sewage.
Medical waste	Syringes, material with blood stains, bandages, etc.

4.3.2.2 CONSTRUCTION PHASE EMPLOYMENT

The required staff during construction will be in the order of 20 people.

Accommodation

The contractors and general workers will be accommodated in the town of Okahao, as the project sites are located nearby. Site offices will consist of small structures or, alternatively, container offices installed directly on-site.

Occupational Health and Safety

Construction workers involved in the construction (and associated activities) of the bulk electricity, sewer line installation, water storage facility construction, and gravelling must comply with strict occupational health and safety standards. These include the provision and use of personal protective equipment (PPE), regular safety training, hazard identification and mitigation measures, and emergency response preparedness. A separate Occupational Health and Safety Plan will be developed by each contractor responsible for the specific Project Component(s), as required in the Environmental and Social Management Plan (ESMP – see Section 11.2 of Appendix F). Contractors must comply with all relevant Namibian legislation, as well as the requirements of the project's financing partners concerning workers' rights, employment conditions, health and safety standards, and community relations, etc.

4.4 PROJECT SCHEDULE

The implementation of the project is dependent on the approval of the ESIA process by MEFT (i.e. issuing of an ECC). Provided the necessary authorizations, construction is planned to commence in Q1 of 2026 and will take ~ 1 year to complete, where after the infrastructure will be handed over to OTC.

5. ALTERNATIVES

This Chapter describes the various alternatives that were considered as part of the bulk infrastructure assessment (conducted by OCE) and planning of the proposed Bulk Infrastructure Project.

5.1 ALTERNATIVE SUPPLY OF ELECTRICITY

Ensuring an alternative electricity supply in towns is crucial for reducing reliance on the main grid, enhancing resilience, and promoting sustainability. Solar energy, as a clean power source, should be actively promoted across Namibian towns due to the country's strong solar potential. This potential makes large-scale solar farming a viable option, especially considering the current dependence on imported electricity. In a comprehensive assessment by the OCE, a proposal was made to establish a Solar Photovoltaic (PV) Plant in Okahao at the request of DWN. This proposed PV plant would be grid-tied, allowing any excess power generated beyond local consumption needs to be exported to the national grid.

During discussions with NORED, it was noted that the existing bulk electricity infrastructure for Okahao Town does not support the integration of a Solar PV Plant. The current supply station lacks the functionality of a switching station, making the connection impractical. To facilitate the connection, the station would need an upgrade to include switching capabilities in the substation.

For the Solar PV Plant to be compatible with the existing infrastructure, its size must match that of the substation, which allows for a maximum installation of a 1 MW plant. Additionally, the plant should be located within 500 meters of the substation.

The OCE estimated the cost of building a 1 MW Solar PV Plant at approximately N$ 35,219,600, excluding any required upgrades of the bulk power station, which would be the responsibility of NORED. For this reason, a PV Plant as an alternative to was not feasible.

While the concept of a 1 MW solar photovoltaic (PV) plant aligns with long-term sustainability goals, the existing NORED substation lacks the switching functionality required for grid-tied solar integration. In addition:

- The estimated plant cost (N$35.2 million) excludes substation upgrades which fall outside the project scope.
- The required site location (within 500 m of the substation) presents practical land-use constraints.

- NORED has not committed to the required upgrades, nor is there a financing mechanism in place.

Conclusion: This alternative is technically sound but financially and operationally unfeasible for current implementation.

5.2 ALTERNATIVE SEWER & SANITATION INFRASTRUCTURE

5.2.1 ADDITIONAL OXIDATION PONDS

Oxidation ponds are less odour friendly but require low maintenance. Should there be an overflow of effluent, irrigation may be required, depending on the environmental requirements.

However, confirmation is required regarding the limitations in terms of maximum allowable oxidation pond area. An alternative may be to make use of oxidation ponds in the short term and convert the dams to maturation ponds in conjunction with a conventional treatment works (OCE, 2023).

5.2.2 CONVENTIONAL TREATMENT WORKS

A convectional treatment works (activated sludge and / or trickling filter technologies) can be designed with the inlet works sized sufficiently for future inflow and follow a stepped phase approach to accommodate future effluent. However, this option will require a higher capital cost and needs to make allowance for skilled staff as part of the operation and maintenance.

The possible options were discussed with the OTC, and it was agreed to consider a new technology biological treatment plant for the future growth scenarios. Hence, the recommended requirements for the upgrading and / or extension for the Wastewater Treatment Works (WWTW) are summarized as follows:

1. Current: temporary upgrade / extension of the existing pond system at least by 2000 m^3 additional retention capacity.
2. Short term: Construction of Phase-1 of the wastewater treatment plant (750 m^3 / day) and use in combination with the existing oxidation pond system.
3. Medium term: Construction of Phase-2 of the wastewater treatment plant, additional 750 m^3 / day, to upgrade to 1500 m^3 / day and decommission the oxidation pond system.
4. Long term: Construction of Phase-3 of the wastewater treatment plant, additional 750 m^3 / day, to upgrade to 2250 m^3 / day.

a) Oxidation Ponds

Oxidation ponds are cost-effective short-term measures; however:

- They are not scalable for full township coverage.
- There are potential environmental and odour concerns, and land availability is uncertain.
- Effluent reuse for irrigation would require further regulatory approval and infrastructure.

b) Conventional Treatment Works

The phased WWTW option (750–2250 m³/day) has been agreed upon with stakeholders and offers:

- Better long-term scalability and control over effluent quality.
- Alignment with population growth projections and Red Book norms.

Conclusion: The oxidation pond option lacks long-term viability. A biological treatment plant with phased development remains the only sustainable solution.

5.3 ALTERNATIVE TO BULK WATER INFRASTRUCTURE

Alternatives to traditional bulk water infrastructure focus on decentralized, smaller-scale or nature-based solutions that reduce dependence on centralized water supply and distribution systems. These alternatives can improve resilience, sustainability, and often cost-effectiveness, especially in growing or resource-constrained communities. Here are several options for towns:

1. Rainwater Harvesting Systems which are large-scale collection and storage of rainwater from rooftops, roads, or other surfaces. Benefits are that demand on the main supply is reduced; systems are localized and environmentally friendly.
2. Water Reuse and Recycling. This is treatment and reuse of wastewater for irrigation, industrial use or potable supply.
3. Boreholes and Managed Aquifer Recharge. This is the extraction of groundwater via boreholes or replenishing aquifers with treated stormwater or recycled water. The benefits are that they are a secure backup source, particularly in dry seasons.
4. Modular/Decentralized Water Treatment Plants. These are smaller, mobile or semi-permanent treatment systems deployed in town sectors. The advantages are they are quicker to deploy than traditional plants and they are scalable.
5. Inter-town Water Transfer Schemes. These are means of sharing water resources between nearby towns via short pipelines or transport.

The town is dependent on NamWater's centralised bulk supply via the Ogongo–Okahao pipeline. Alternatives were assessed:

- Rainwater harvesting and boreholes are not dependable for year-round supply at the required scale.
- Water reuse requires high initial investment, regulatory clearance, and community buy-in.
- Modular plants are suitable only as interim or localised measures and cannot address full system demand.

Conclusion: While decentralised systems may supplement supply, the bulk water reservoir system remains the only practical solution for reliable service delivery.

5.4 ALTERNATIVE TO GRAVEL ROAD

Un-surfaced gravel roads constitute substantial part of the road network in the town of Okahao. Many of these roads could be upgraded to bituminous seal standard or Low Volume Seal Standard (LVS) in order to improve the level of service and road transport efficiency. However, it depends on the number of traffic volume that the road carries on a daily basis. This approach could become important against the background of depleting gravel resources or of limited funds for the construction of fully engineered bituminous seal roads (OCE, 2023).

- Low Volume Seal (LVS) or bitumen upgrades are beneficial only for roads with significant traffic volumes.
- The current gravel network (24.3 km) is largely in fair to poor condition, but a full upgrade would exceed budget availability.
- Road upgrade prioritization must be data-driven, based on traffic, connectivity, and gravel resource constraints.

Conclusion: A selective upgrade approach is the most cost-effective and service-oriented strategy.

5.5 NO-GO OPTION

The No-Go alternative relates to the option of not developing the proposed Bulk Infrastructure Project. In this case, the residual impacts (i.e. impacts after implementation of mitigation measures) of the proposed activities would not occur (refer to Chapters 7 and 8).

Implications in case DWN does not go ahead with the proposed project are listed as follows:

- The provision of electricity to the Kashenda Extension 1, Kashenda Extension 2, new DWN Extension and possible future DWN Extensions will not happen.
- The low-income targeted population in DWN Extensions will not buy into the project once DWN advertises the cost of plots with electrification under Component 1.
- The low-income residents will not open up and operate their small-scale businesses later into the night since the informal street is a place of economic activity.
- The safe mobility for women and children and the entire community at large during the night will be at risk.
- The sewage generated from Kashenda Proper and future Extensions will not be transported to the existing oxidation ponds, and in the future, to the WWTW.
- There will not be access to the DWN project area.
- The water supply for the DWN project area will come directly from Namwater main supplier line, and there will not be storage for water to be used in case of emergencies.
- The water pressure for the project area will be low.
- The potential job creation will not happen.
- The potential value creation and socio-economic development will not happen.

Opting not to implement the proposed infrastructure would:

- Jeopardize basic service access (water, sewer, power) for current and future township extensions.
- Undermine DWN's land development model, reducing plot uptake and affordability.
- Limit economic activity, mobility, and public safety, particularly at night.
- Result in low water pressure, insufficient sanitation, and no emergency storage capacity.

Conclusion: The No-Go option is not acceptable on technical, developmental, or social grounds.

6. DESCRIPTION OF THE CURRENT ENVIRONMENT AND LINK TO ENVIRONMENTAL ASPECTS AND IMPACTS

An understanding of the environment and its sensitivities is important to ensure an accurate identification and assessment of the potential impacts of the Okahao Bulk Infrastructure Project. This chapter provides a general overview of the current baseline conditions (i.e. the existing biophysical and social environment) that could be potentially affected by the proposed project.

This chapter was compiled by utilizing the following sources of information:

- Atlas of Namibia (Mendelsohn et al., 2002)
- Atlas of Namibia: its land water and life (Atlas of Namibia Team, 2022)
- A profile of north-central Namibia (Mendelsohn et al., 2000)
- Okahao Structure Plan 2022 - 2042 (SPC, 2024).
- Soundscape (2022)
- Airshed (2022)
- GYLA (2022)
- Namisun (2023)
- Namibia Statistics Agency (NSA) (2019, 2023 and 2024)
- Site visits by Namisun, DWN and LCE.
- Consultations and focus group meetings with I&APs.
- Google Earth.

6.1 CLIMATE

6.1.1 BASELINE DESCRIPTION

Namibia sits astride the Tropic of Capricorn, meaning that the country's weather patterns are dominated by quasi-stationary sub-tropical high-pressure systems.

Off the coast, air from the South Atlantic High sinks and spirals anticlockwise and outward, causing constant cool southwest winds, the Benguela Current and the upwelling cells of the ocean, having a profound climatic influence over the land that borders it. Along the coast there is hardly any rainfall, but humidity is consistently high (between 70 – 90% throughout the year) and overcast days and foggy nights are common.

Over the central interior of the subcontinent the Kalahari High dominates, especially during winter when the subsiding air spirals anticlockwise and outward, causing cloudless days capped with a

prominent inversion layer. This persistent air movement suppresses convection and the possibility of rain, unless the anticyclone is moved out of position.

As a result of their prominence, these two weather systems cause air flows of an opposite direction which collide along a line corresponding to the southwestern escarpment of Africa, most of the time.

During summer the positions of the two high-pressure cells fluctuate more, allowing low pressure cells to develop over the heated interior, which in turn pull moist air from the inter-tropical convergence zone. As the moist air from the north and the east moves south and west, the northeast parts of Namibia receive the most rain (>650 mm per annum) – diminishing to the west and south (<50 mm per annum).

Rainfall events are limited to the summer months, between November and April, in the form of sudden thunderstorms, sometimes associated with heavy rainfall causing flash floods. As the rainfall decreases from north to south and from east to west, the rain season becomes shorter and starts later. January and February are the two months with the highest average rainfall over the entire country. The variation coefficient of rainfall increases proportionally to the decrease of total rainfall, resulting in a figure of >70% to the west and south of the country. In general, the potential evaporation increases proportionally to the decrease in total annual rainfall too, reaching a figure of >2,500 mm per year in the south of the country. Ironically, the potential evaporation along the coast is the lowest because of the cold Atlantic Ocean, the lower temperatures and the higher humidity (Mendelsohn, et al., 2002).

Solar radiation over the entire country is high throughout the year and increases during summer when the hours of sunshine increase. Radiation is the highest over the western and southern parts of the country as cloud cover is less and the highest total hours of sunshine are recorded. The coastal areas have lower radiation values because of frequent overcasting and fog. At Okahao solar radiation levels vary between 7.0 – 7.5 kWh / m^2 per day and about 8 – 9 hours of sunshine is experienced per day (Atlas of Namibia, 2022), making the town ideal to increase the use of solar technology.

Average temperatures are closely coupled to solar radiation and the average maximum figures are also recorded in the west and south of Namibia, often exceeding 36 °C between October and February. Despite the higher radiation over the western and southern parts of the country, the generally low humidity over these parts means that heat is sometimes lost rapidly at night, implying wide diurnal temperature ranges, often greater than 20°C – in contrast to the coast where the average diurnal temperature ranges are the lowest (Atlas of Namibia, 2022). For the country

in general the lowest temperatures are recorded between June and August when the sunshine hours are shorter, and the cooling of the earth surface is the highest. Frost does not occur.

Okahao's climate can best be described as semi-arid, marked by high temperatures, evaporation potential that exceeds the amount of rainfall many times, low humidity and a short period of seasonal rainfall. Average minimum temperature ranges between 6°C to 8°C and the average maximum ranges between 34°C to 36°C. Rainfall usually falls in late summer; mostly as heavy thunderstorms of short duration that vary greatly over space, amount and time. Annual rainfall varies between 450 – 500 mm with a deviation coefficient of 30-40%, while the average annual potential evapotranspiration exceeds 2,300 mm (Atlas of Namibia, 2022).

Data on wind speed and direction is important for several reasons. Wind direction informs town planners and developers on the location of potential polluting activities including noise and dust (e.g. crushers, earthworks), odours (e.g. sewerage works), pollutants (e.g. waste removal sites), etc.

No scientific and official wind data for Okahao exists. The predominant wind direction is from the east for most of the year (7.5 months) and from the south (4.6 months of the year). Overall, the northern areas of Namibia experience low wind speeds. At Okahao, the wind speed is predominantly lower than 6-8 m/s, which equates to a moderate breeze, while calms dominate 57% of the time (SPC, 2024).

Future predictions on climate change are based on many time-space variables and remain speculative with respect to its potential impacts, subsequently – especially per geographical area. On a planet with more than 8 billion people since the end of 2022, environmental change is inevitable. One of the inevitable changes is a fluctuation in climatic patterns caused by human activities, supporting the presupposition that the frequency of climate extremes may increase. Due to an increased frequency of climatic events associated with the change in weather patterns, it is predicted that many catastrophic events such as droughts, floods and sea level rise can occur, leading to disastrous environmental consequences in turn.

Three decisive factors need to be considered regarding a worst-case climate change scenario for the Cuvelai Basin – the flatness of the terrain; the flow regime of the channels and existing population pressure. The flatness of the terrain implies wide-scale flooding over vast areas under a wet scenario, for example. Under a dry scenario the channels – on which so many people depend for their livelihoods – can become dysfunctional. Under both a wet and dry scenario the current population pressure implies far-reaching consequences. Adaptation efforts to climate

change must focus on these three factors before the amplified role of socio-economic factors are considered.

6.1.2 CLIMATOLOGICAL LINKS TO ENVIRONMENTAL SENSITIVITY

- Flash floods from heavy, sudden downpours can cause erosion, inundation of residences damages infrastructure, disrupt operations and can cause drownings of humans and animals.
- Conversely, lack of rainfall can lead to crop failures and agricultural drought, increase dust levels, and reduce biodiversity.
- High temperatures and evaporation potential aggravate the effects of limited rainfall.
- Temperature impacts air dispersion by affecting atmospheric stability and mixing layers, as well as vegetation growth and evaporation.
- Wind influences noise levels, erosion, and the dispersion of atmospheric pollutants.
- As rainfall is limited to the summer, the availability of run-off is limited to a short period of the year with long dry spells in between. Potential evaporation and average temperatures are high. Combined, this results in a water-stressed environment with implications for water availability, supply and management, dust suppression, vegetation growth and migration patterns of animals.
- There is potential for episodic flood events. This means that provision should be made for stormwater management and flood and erosion control measures, despite the long dry periods in between.
- Temperature differences and the contrast between stable and windy periods determine the dispersion of dust and other airborne impurities. During stable periods the ground level concentrations of airborne impurities are the greatest affecting human health and vegetation, while it is mobilized and dispersed during windy periods, which may also influence human health and lead to wind erosion.
- Ultimately, the contrast of long dry spells marked with high temperatures and a high evapotranspiration potential, and a short period of downpours and run-off availability has a profound influence on land use patterns.

6.2 TOPOGRAPHY AND SOILS

6.2.1 BASELINE DESCRIPTION

Okahao is located within the Cuvelai Basin, also known as the Owambo Basin. This ancient depression is filled with sediments and spans a flat saucer-shaped landscape with one third situated in Angola and two thirds in Namibia. The basin is marked by its monotonous flatness. Over 55 km between the border with Angola and Okahao there is only a difference of 14 m in altitude, meaning a vertical drop of 1 m for almost every 4,000 m in horizontal distance from north to south. From west to east the landscape is even flatter over a horizontal distance of 120 km, the vertical drop is only 15 m, i.e. 1:8,000.

The deepest sediments of the basin were deposited when the region first formed, and later when it lay in a shallow sea. More sediments were carried in by large river systems and long periods of wind. Intermediary periods of flooding, sand deposition and reworking of the sediments by wind and water produced the present mixture of soils. Today the Cuvelai Basin is characterised by nine major types of soil, predominantly sands and clays that have been reworked and mixed by water and wind over millennia. In the absence of intensive agricultural practices, the potential for crop cultivation in most areas is limited due to poor water retention capacity, low nutrient content, high salt levels, and a subsurface hard layer of clay (Mendelsohn et al., 2000).

Between the channels are raised areas, often hosting traditional fields for crop production or homesteads. These areas are often heavily cultivated because the soils are generally loamy or clayey sands and suitable for crop production. The southern reaches of the Cuvelai Basin flatten out to a saline grassland area, often underlain by a subsurface hard layer of clay or calcrete (Mendelsohn et al., 2000).

The importance of soil is highlighted here because soil plays an indirect but critical role as it provides important ecosystem services, besides of its role for the cultivation of crops. Soil is a filtering medium for water and a growth medium for plants, and it constitutes shelter and a habitat for specialist vertebrate and invertebrates.

Continuous cultivation of soil leads to the stagnation of its regenerative potential. Removal, displacement, and compaction of soil restricts its ecological functionality as a filter and growth medium, resulting into a reduced infiltration and recharge rate of water on the one hand and compromising the rooting ability of plants on the other hand. Compaction may also result into a lack of aeration, an increased likelihood to erode and a reduced ability to harbour plants. Avoiding of large-scale earthworks (through selective clearing and grubbing) is the best form of mitigation,

especially to minimize impacts such as erosion, compaction and the loss of the soils' ecological functionality.

6.2.2 PEDOLOGICAL LINKS TO ENVIRONMENTAL SENSITIVITY

- Due to the heavy cultivation of arable land, overuse of soil is common and cause a continuous degradation of the land's productivity. As the same soils are cultivated season after season with the same type of low-productive crops, fertility stagnates at low levels because the soil does not retain water well, and the nutrient content is generally low.
- The establishment of manmade landforms and built structures on a flat landscape like the Cuvelai Basin can bring changes to the local topography, which can influence and change the surface water drainage, by blocking it or advancing its erosive potential.
- Structures created on a flat landscape may pose visual impacts, more prominent than on an uneven landscape.
- Since terrain features, including land cover, can affect the way sound and the atmospheric movement of airborne impurities is propagated, noise and air pollution is dispersed limitless over a landscape without topographical variance, aggravated by a lack of vegetation.
- Excavations and the building of new structures and infrastructure might create a temporary danger to people and animals.
- Excavations and trenching can loosen soil, albeit temporary and localized, which may result into a loss of soil in the form of wind erosion as well as potential enhancing of water erosion over a short period (during construction).
- Soil can be compacted by heavy equipment, vehicles or when it is overlain by heavy structures.
- Several activities associated with construction and operation (including maintenance) of infrastructure have the potential to create contamination risks to soil through discharge, leaks and spills. Soil contamination is closely related to the potential contamination of surface and groundwater.

6.3 HYDROLOGY

6.3.1 BASELINE DESCRIPTION

Formed about 550 million years ago during the development of the supercontinent Gondwana, the Cuvelai Basin is most likely the remains of a vast network of shallow, slow-flowing streams that had fed the Kunene River, which originally ended in the ancient Lake Etosha.

The most unique feature of the Cuvelai Basin of today is its network of channels called “iishana” (Atlas of Namibia, 2022), which funnel towards the Etosha Pan. These channels meander the entire basin from north to south, forming a vast plain with shallow depressions. The depressions are winding but elongated, often forming interconnected channels that are seasonally water-filled. As the basin narrows towards the south, focusing on the Etosha Pan where the original Kunene River presumably ended, most of the channels deviate slightly from a straight north-south direction to connect to the Ekuma River that still ends in the Etosha Pan (see Figure 7).

In Angola, the Cuvelai Basin receives water from the area between the Kunene River to the west and the Okavango River to the east. Some of the channels get their headwaters as far north as the Encoco Highlands in Angola where average rainfall exceeds 800 mm per year (Mendelsohn et al., 2000). Approximately 100 channels flow into Namibia, feeding into each other at some places and part ways at others, converging in the interconnected Omadhiya lakes to the south and sometimes reaching the Etosha Pan via the Ekuma channel, where it terminates as an endorheic drainage system (Atlas of Namibia, 2022).

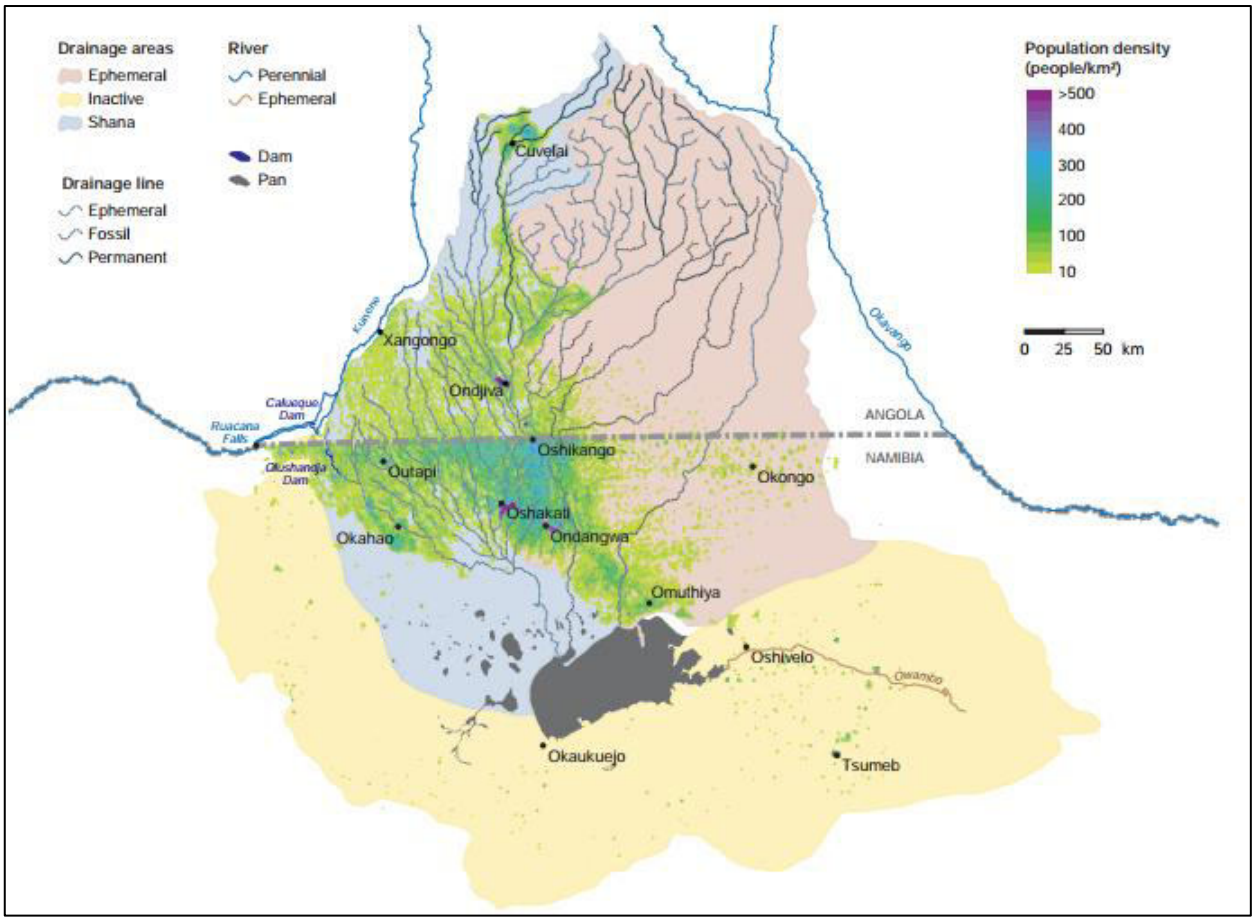

FIGURE 7: THE CUVELAI DRAINAGE SYSTEM
Source: Atlas of Namibia, 2022

Due to its gentle gradients, seasonal water moves slowly from north to south in the Cuvelai Basin with limited infiltration because of impermeable clay and saline soil beds. The nature and pattern of waterflows can vary a lot between seasons. The flow of water depends on how much, and where, rain has fallen in Angola and locally. The main streams form Angola drains an area of 50,000 km^2 and what flows downstream depends on what rains has fallen where in the catchment. On the Namibian side occasional heavy downpours add run-off into the channels as well (Mendelsohn et al., 2000).

The channels vary in width from a few meters to over a kilometre, and none of the channels are perennial. In the western parts of the Cuvelai Basin (where Okahao is situated) the channels tend to be broader and flatter and wider apart when compared to the eastern parts where the channels are narrower and closer to each other. One of the primary channels of the basin, the Etaka, is located west of Okahao, on the western edge of the basin, and likely the impoverished remnant of the ancient Kunene River, which historically ended in Etosha. This channel is also slightly deeper than the others (Mendelsohn et al., 2000). Most channels function seasonally, either by

receiving run-off from local downpours or from upstream areas in Angola. The water either evaporates or seeps into the ground, leaving the channels dry for extended periods during the dry season (Atlas of Namibia, 2022).

The Etaka is connected to the series of Omadhiya lakes but rarely carries water from Angola to the lakes. Lake Oponono is the most prominent of the interconnected lakes, receiving waters mainly from the central and eastern channels of the Cuvelai Basin. The Ekuma channel connects the Omadhiya lakes with the Etosha Pan (Mendelsohn et al., 2000).

In wet seasons, the “iishana” of the Cuvelai Basin can be filled with water from the upstream areas in Angola, fuelled also by local rain. These events are called “omafundja”, or “efundja” bringing fish and aquatic life to the populated parts of north-central Namibia. Sometimes these floods can also damage infrastructure and cause drownings. Over the past 80 years, significant flooding happened about one-third of the time, with major flows occurring every six years on average (Atlas of Namibia, 2022).

Flows of water in the channels depend very much on the volumes and force of water flows upstream and only reach the Omadhiya lakes during major flows. Due to the flatness of the entire basin, the flow of the water is slow, even during “efundja” years. As a result, the water easily stagnates as pools and cut-off puddles in the channels, eventually drying out. When dry, some of the channels are covered with grass, while the raised areas between channels host scrubs and support much of the crop production areas of the Cuvelai Basin.

To the east, the Cuvelai Basin transitions to a surface covered with deeper aeolian sand, reducing the likelihood of surface flow. To the south and west, the basin is less active, with minimal surface water collecting in the channels, and the soil becomes shallower and less fertile. Subsurface and surface calcretes are increasingly frequent to the west. Consequently, these areas are less suitable for habitation (Atlas of Namibia, 2022).

It is important to state that the flows of water in the channels of the Cuvelai Basin provide seasonal surface water to humans and animals, create fishing grounds, renew pastures and recharge groundwater supplies. The cycle is strictly seasonal and although some depressions may retain water as late as October and November, the system cannot be described as perennial.

In the past, the availability of surface water in the channels significantly influenced the habitation patterns in the Cuvelai Basin. Where reliable surface water was available, the first people settled. To survive the long dry periods between the rainy seasons they relied on water drawn from shallow wells called “omithima” in proximity of the seasonal water. There were also less people, and these wells played a key role in the settlement pattern of people in the Cuvelai Basin.

Although recharge of the shallowest aquifer in the Cuvelai Basin from the seasonal flooding of the channels occur, the rate depends on the amount and period of the water available. This water percolates through a layer of sand and is trapped by an underlying hard layer of clay or other hard material. The traditional wells, the “omithima”, have been dug into this aquifer. The depth of these wells varies, but some of the shallowest “omithima” are to be found in the western parts of the Cuvelai Basin, i.e. where Okahao is located. As “omithima” are not reliable and water can seep away from them, many had to be dug (Mendelsohn et al., 2000).

It is believed that the western parts of the Cuvelai Basin was first settled, as the water in the “omithima” is apparently fresher than the saltier water elsewhere in the Cuvelai Basin. Recently, an extensive network of pipes and canals has been established to supply water from the Kunene River to a large portion of the population, influencing the settlement pattern markedly. Some deep boreholes have been drilled to provide water to those not living near the canal and pipeline network (Mendelsohn et al., 2000)

Below the aquifer on which “omithima” depends is a widely distributed body of water underlying the entire Cuvelai Basin and extending south to the Etosha Pan. Between 20 and 40 m deep, the water in this aquifer is often salty and not suitable for human or animal consumption. Lying below both aquifers a whole series of other aquifers exist in the vast body of Kalahari sediments underneath the Cuvelai Basin. Boreholes into these aquifers vary between 30 and 140 m and its water are typically rather brackish but still usable for drinking purposes. The interrelationships between the surface water flow and the aquifers below are quite complicated and a topic for continuous research, not necessarily indicating that the deeper aquifers are recharged by the surface water (Mendelsohn et al., 2000).

The boreholes drilled in the Cuvelai Basin tap water from a variety of different aquifers from various depths. In most cases the yields from the boreholes are sufficient to supply a small village. Despite the reasonable yields found in most areas, the quality of groundwater varies a great deal and is poor in many places due to the high concentration of salts, and thus not suitable for human consumption (Mendelsohn et al., 2000).

6.3.2 HYDROLOGICAL LINKS TO ENVIRONMENTAL SENSITIVITY

- Flow of surface water in the Cuvelai Basin is marked by a stark seasonality.
- Although surface water might be available in abundance during the wet season, it can dry up completely during the dry season.

- Surface flow in the channels of the Cuvelai Basin can vary in amount, from place to place and in timing.
- Ultimately, the Cuvelai Basin is a water-stressed environment with implications for water availability, supply and management, dust suppression, vegetation growth and migration patterns of animals.
- Availability of surface water has a profound influence on land use patterns and determines the settlement patterns of the Cuvelai Basin decisively.
    - In the past people relied on the availability of surface water during the wet season and abstraction of groundwater through “omithima” during the dry season.
    - During the past three, four decades the increased availability of freshwater through an expanding supply network of canals and pipelines relieved the pressure on groundwater abstraction.
    - With more people living in urban areas now, less people remain dependent on the seasonal water supply from the Cuvelai channels and from abstraction water through “omithima”.
- Man-made obstructions such as the placement of linear infrastructure across the drainage channels or small topographical changes can have a profound effect on the flow regime and direction of surface water.
    - Blocking, channelling and redirecting the flow of water may enhance erosion.
    - Temporary or permanent blockages of the channels pose consequences for the rejuvenation role of flowing water flow in the channels – to make water available to humans and animals, to create fishing grounds, to renew pastures and to recharge the aquifer on which the “omithima” depends
    - Blocking of the drainage channels, even by means of minimal elevations because of development and infrastructure will enhance the pooling of water and can lead to knock-on effects such as water-borne diseases and mosquito breeding grounds.
- There is always a potential for episodic and flash floods – either from local rainfall or from surface water flow deriving from upstream, which can lead to inundation of residences damages of infrastructure, disrupt operations and can cause drownings of humans and animals. Therefore, blocking the surface flow must be discouraged and provision should

be made for stormwater management and flood and erosion control measures, despite the long dry periods in between.

- Several activities associated with the construction and operation (including maintenance) of infrastructure have the potential to create contamination risks to surface water through discharge, leaks and spills. Surface water contamination is closely related to the potential contamination of groundwater.
- It is noteworthy to mention that waste management is a basin-wide problem, contaminating the surface water in many places already. Impliedly, the development of the Bulk Infrastructure Project must not further contribute to this problem.
- Surface water can spread alien invasive aquatic organisms when accidentally released into the channels of the Cuvelai Basin.

6.4 BIODIVERSITY

6.4.1 BASELINE DESCRIPTION

Natural vegetation in the Cuvelai Basin has adapted to the soil types, with characteristic plants growing on certain soils only, creating distinct spatial differences. Seven distinctive vegetation types are identified in the Cuvelai Basin, mainly based on differences in the structure of woody plant growth, plant species composition and soil type. The units are mosaics of smaller, discrete vegetation types (Mendelsohn et al., 2000).

A variety of grasses grow on the flat areas which are seasonally flooded, including the drainage channels itself. Perennial grasses and sedges generally dominate the areas which are longer wet. *Diplachne* spp., *Eragrostis* spp., *Brachiaria deflexa* and *Elytrophorus globularis* are common grasses in these parts. The drier margins are dominated by the perennial grasses *Wilkommia sarmentosa*, *Eragrostis trichophora*, and *Sporobolus ioclados*. Where extensive areas of saline soils are flooded, *Sporobolus coromandelianus* is most common. The open water habitats host *Oryzidium barnardii*, *Echinochloa* spp., and *Oryza longistaminata* while a few *Cypherus* sedges are abundant along the edges of the channels and pools. Floating plants like *Nymphaea* spp. are common in the deepest open water habitats (Mendelsohn et al., 2000).

Over large parts of the basin the saline soils of the higher ground between the drainage channels support stands of varying densities of Mopane (omusati) – *Colophospernum mopane* with some other woodland species to a lesser extent also present. Omusati are dominant in the western parts of the basin, present as tall trees as well as a shrub layer. They also grow along the edges of the drainage channels. Additionally, the higher ground is home to an abundance of makalani

palms (omilunga) – *Hyphaene petersiana* and *Acacia* spp. with occasional fruit trees such as marula (omigongo) – *Sclerocarya birrea*, bird plum (embe) – *Berchemia discolor*, jackelberry - *Diospyros mespiliformis* and fig trees ('omikwiyu') – *Ficus* spp. present, but scarcer. Baobab trees ('omikwa') – *Adansonia digitata* occur predominantly to the west (Mendelsohn et al., 2000) but are present in the Okahao area.

Over the entire Cuvelai Basin patches of the higher ground where more fertile soils occur are heavily cultivated, inhabited and or disturbed. Stinkbush - *Pechuel-Loeschea leubnitziae* and sand Acacia – *Acacia arenaria* are common opportunistic species on these parts, especially on disturbed land. As the southern reaches of the Cuvelai Basin flatten out to a saline grassland area, trees and shrubs become scarcer.

Especially omusati, but also other trees, provide crucial wood sources for housing, fencing, and fuel. By far the greatest demands placed on natural vegetation are using wood for building houses, making fences and for firewood. The heavy demands of wood have led to deforestation over vast areas of the Cuvelai Basin. Omusati is favoured for building homes and fences, for firewood and for making storage containers for mahangu. From makalani palms the leaves are used for making baskets while its sap is used for making beverage. Big trees are used for their shade. Fruit, thatch and many other products from a variety of trees are harvested too, vital to the poorest people. Grasses and shrubs feed many domestic animals, but high grazing pressures in the Cuvelai Basin have reduced pasture availability and quality (Mendelsohn et al., 2000).

The grasslands of the Cuvelai Basin exhibit a strong correlation with periodic flooding and growth during the wet season, followed by die-back during the extended dry periods. It is anticipated that these grasslands possess resilience to intense grazing pressure. However, increased utilization and clearance of the grasslands have likely resulted in a decrease in the availability of high-quality and perennial grasses, suggesting that annual grasses now prevail. Furthermore, the densely populated parts of the Cuvelai Basin appears to show the lowest plant growth in any year when compared to the areas adjacent to it (Mendelsohn et al., 2000), emphasising the severity of its environmental degradation.

Although the Cuvelai Basin is characterized by its severe environmental degradation and modified habitats, the seasonal availability of water is an important impulse for the ecological functioning of the landscape – albeit it of a declining magnitude against the growing population pressure. A variety of fish and frogs are delivered seasonal via the channels of the Cuvelai Basin. Seventeen species of fish were originally recorded in the Cuvelai Basin, mostly catfish, barbs and tilapia. To these at least another 46 species have been added, which have come through the

supply of water from the Kunene River. The diversity of species decreases to the south. During “efundja” years, many fish and frogs make their way down the channels, even to the Omadhiya lakes. Fish and frogs attract fish-eating birds, but due to the population pressure along the largest part of the Cuvelai Basin, these birds tend to concentrate on the fish ending up in the Omadhiya lakes. Most fish die off as the water in the channels dries up, but catfish and frogs can bury themselves in the mud until the next wet season comes (Mendelsohn et al., 2000). Fish and frogs provide households with a temporary supplement protein in most years.

Very little remains of the abundance of wildlife that used to be present in the Cuvelai Basin, in contrast to the Etosha National Park just south of it. It is believed that the Cuvelai Basin was an important area for many wildlife species during the wet season, attracting big herds of migration species such as zebra and wildebeest in the past. Only 80 years ago, the Cuvelai Basin had probably more wildlife than Etosha today. Of the remaining wildlife it is believed that only some antelopes such as springbok, kudu and wildebeest and ostriches are still present, mainly occurring in small herds and individuals concentrated in the less densely populated areas to the south of the Cuvelai Basin (Mendelsohn et al., 2000). This can largely be ascribed to the present population pressure, which caused the extinction or displacement of wildlife, the lack of pasture as well as the fragmentation of the habitats on which they depend.

During times of flood, the Cuvelai Basin creates a dramatic landscape from which thousands of Namibians benefit. From the waters people fish and catch frogs to eat, from the trees they harvest fruit and the higher ground between the drainage channels are cultivated. Although bigger herds of cattle are moved to the grasslands of the south, plenty livestock remain behind and utilize the pastures created by the availability of surface water. Moreover, the “abundance” is overutilized – to the extent that the biodiversity cannot recover and show a gradual declining trend.

6.4.2 ECOLOGICAL FUNCTIONING AND LINKS TO ENVIRONMENTAL SENSITIVITY

- Due to the high population pressure on selective parts of the Cuvelai Basin, plant productivity is low and environmental degradation severe. Deforestation and overgrazing are common, leaving vast parts of the basin bare – even during the wet season.
    - Remaining natural vegetation of the Cuvelai Basin is under continuous threat.
    - Due to the severe environmental degradation, all habitats are modified and the (original) natural habitat not known. It is also not known which (key) plant species have been lost over time as only those remaining can be recorded.

  - Pasture in the Cuvelai Basin indicates a continuous decline in quality and perennial grasses are continuously replaced with annual grasses.
  - Except for sporadic individual trees that are utilized for their fruit or shade, big trees are a rarity in general. Denser stands of scrubs and trees are confined to areas further away from the Cuvelai Basin.
  - Opportunistic, less usable plants, invade the overutilized and disturbed areas.
  - The loss of natural vegetation force people, especially the poor, to use inferior materials, e.g. cattle dung for fuel and palm fronds for fencing material. Also, people need to get their firewood from further and further.
  - The poorest homes depend to the greatest extent on the use of natural vegetation and the (un)availability of it has a major impact on their quality of life.

- Also, due to the high population pressure on some parts of the Cuvelai Basin, wildlife (including birds, reptiles and even insects) is almost completely absent.
- The declining biodiversity resources of the Cuvelai Basin reduce the natural attractions remaining to a few, whereas they used to be in abundance a few decades ago.
- The low-quality pasture is heavily grazed by domestic animals, limiting the organic content of the soil and worsening its natural regeneration capacity.
- The seasonal availability of water is an important impulse for the ecological functioning of the landscape – a variety of fish and frogs (and possibly other aquatic organisms) are delivered seasonally via the channels of the Cuvelai Basin. Also, the rejuvenating role of water as ecological driver (redistribution of seeds and nutrients, and the availability of moisture) is important for the ecological functioning of the Cuvelai Basin.
- With reference to the proposed project the following remarks can be made:
  - The placement of linear infrastructure must take the flow regime, flow direction and topography of the drainage channels in the Cuvelai Basin into consideration – in order not to change, block or channel the seasonal flow of water.
  - Alien invasive species might be introduced to the Cuvelai Basin.
  - All the proposed components of the Bulk Infrastructure Project will be placed in an already disturbed area (i.e. the Okahao Townlands). The sewage line and powerline will be underground. Aboveground, both the pump station and the

elevated water tank will have minimal footprints, while the road follows a route through an area already traversed with several tracks.

- On a positive note – urbanization and increased concentration of people in urban areas can have a significant advantage in relieving the pressure on the biodiversity of the Cuvelai Basin. It is expected that the proposed project will be to the advancement of the town and offer them livelihoods different from relying on the dwindling natural resources of the Cuvelai Basin.

6.5 VISUAL / SENSE OF PLACE

6.5.1 BASELINE DESCRIPTION

The components of the proposed Bulk Infrastructure Project will be in an already disturbed area (i.e. the Okahao Townlands), marked by severe environmental degradation and modified habitats. The Cuvelai Basin, where Okahao is located, is also densely populated and as a result man-made structures are common. As pointed out earlier, the landscape of the Cuvelai Basin is characterized by its flatness and structures of only a few meters high is visible from a great distance. Changes to the current topography through the development and construction as well as operational phases of the components of the proposed Bulk Infrastructure Project may have visual consequences – temporary as well as permanent – and must be considered though.

For the purposes of this report, the visual study area, (i.e. “zone of potential influence”) is determined as ~10 km-radius surrounding the area where the components of the proposed Bulk Infrastructure Project are planned. This is based on the flat topography of the landscape, the scale (i.e. size and specifically height) of the components of the proposed Bulk Infrastructure Project and the fact that operations will solely be undertaken in the daytime (i.e. lighting issues are not considered significant).

The 10 km-radius includes the Okahao Townlands. Existing structures include typical urban features consisting of buildings and infrastructure. In the surrounding populated rural periphery common features are homesteads and infrastructure (i.e. fences, roads, pipelines, etc.).

The proposed Bulk Infrastructure Project include a sewage pump station, and an elevated water reservoir (a 20 m-high tank) aboveground, a sewer line and a powerline underground, as well as a connection gravel road. Hereof, the elevated tank, the sewage pump station and vehicle-entrained dust from the road has the potential to be visible from a substantial distance. However, the proposed elevated water tank and the sewage pump station will not be visually intrusive against the built townscape with structures that are also of a similar height. In turn, the dust from

the road will not be different from dust generated from the many other existing unpaved roads within the townlands.

Visual resource ratings (scenic quality) are dependent on a landscape's character (GYLA, 2022):

- How well does it contribute to the area's sense of place, distinctiveness and visual and aesthetic quality?
- In what condition is the landscape?
- Is the landscape valued by people, local community, visitors, and is the landscape recognised, locally, regionally or nationally?
- What scope is there for positive change in the existing landscape character?

The sense of place results from the combined influence of the landscape on all the viewers' subjective senses. A sense of place is the extent to which a person can recognise or recall a place as being distinct from other places - as having a vivid, unique, or at least particular, character of its own (GYLA, 2022).

The sense of place for the proposed project derives from the landscape as described above and its impact on the senses.

6.5.2 VISUAL LINKS TO ENVIRONMENTAL SENSITIVITY

- The background visual resource of Okahao is low, mainly because it is an existing urban built-up environment surrounded by a densely populated rural periphery with existing infrastructure and marked by a severe degraded environment and modified habitats. The landscape is thus already disturbed, deprived of its natural attractiveness and can be rated as non-sensitive to visual change in general.
- The activities and land use within the Okahao Townlands and its surroundings are common and uniform with that of the wider landscape, i.e. the Cuvelai Basin. Also, all the components of the proposed Bulk Infrastructure Project will be placed within an existing urban area, and neither of its proposed facilities or activities are conflicting with the built-up environment. None of the proposed facilities or activities of the project can be regarded as intrusive per se and in conflict with the existing sense of place, thus.

6.6 NOISE

6.6.1 BASELINE DESCRIPTION

To facilitate the assessment of noise impacts to third parties, current noise levels need to be considered against the scenario of potential change.

The existing acoustic climate in the proposed project area is likely to be typical of an urban district with a mix of urban use and facilities like workshops, business premises and main roads. Ambient noise is generated erratic but continuously during daytime – emanating from vehicles, the use of equipment, and a mix of everyday urban activities, including road use, etc. Residual noise levels might vary somewhat given weather conditions and the observer's location within the townscape. Natural sources such as wind (and thunder and rain during the wet season), birds, animals and insects may contribute to the ambient noise as well. It is expected that noise levels during the night are the lowest. With a constant increase of urban activities as the town grows, it is likely that the ambient noise levels are increasing steadily but not exceeding the thresholds associated with an urban environment yet.

The noise generating activities associated with the project can be divided between a construction and development phase and an operational phase. Initially an increase in ambient noise levels can be created because of the construction activities. However, the duration of this increase is temporary – limited to daytime – but may cause a disturbance to receptors in proximity of the activities, and only during the construction phase. The proposed new road and the pumps of the water and sewage lines may contribute additional to the ambient noise of the urban set-up during the operational phase. Noise increases from the pumps is expected to be minimal, while noise from the road might be erratic and not confined to the daytime.

In the absence of Namibian noise level guidelines and standards, reference is made to the guideline values for noise levels measured outdoors as set by the World Health Organisation (WHO) Guidelines for Community Noise, also contained in the 2007 International Finance Corporation (IFC) guidelines for noise, and the South African National Standard (SANS) code for outdoor noise – SANS 10103:2008. These guidelines are specifically for the protection of human receptors from noise (Soundscape, 2022).

According to the IFC guidelines noise impacts on residential, institutional and educational receptors should not exceed 55 dB during daytime (07:00 – 22:00) or result in a maximum increase in noise levels of 3 dB at the nearest receptor location off-site (Soundscape, 2022).

The guidelines for outdoor noise as per SANS 10103:2008 provide values and typical rating levels (LReq,T[7]) that should not be exceeded outdoors in the different districts listed. According to Standards South Africa (SSA) it is probable that the noise is annoying or otherwise intrusive to the community or to a group of persons if the rating level of the ambient noise under investigation exceeds the applicable of the following (Soundscape, 2022):

a) the rating level of the residual noise (determined in the absence of the specific noise under investigation), or
b) the typical rating level for the ambient noise for the applicable environment listed in Table 9.

TABLE 9: TYPICAL RATING LEVELS FOR OUTDOOR NOISES

	Equivalent continuous rating level ($L_{Req,T}$) for outdoor noise, dBA (SSA, 2008)		
	Day/night rating level $L_{R,dn}$[8]	Daytime rating level $L_{Req,d}$[9]	Night-time rating level $L_{Req,n}$[10]
Rural districts	45	45	35
Suburban districts with little road traffic	50	50	40
Urban districts	55	55	45
Urban districts with one or more of the following: workshops; business premises; and main roads	60	60	50
Central business districts	65	65	55
Industrial districts	70	70	60

Source: Soundscape, 2022

The guideline rating levels for urban areas are in line with the guideline values for residential, institutional, and educational areas adopted by IFC (Soundscape, 2022).

The probable community or group response to the excess LReq,T is given in Table 10. The overlapping ranges for the excess values are given because a spread in community reaction might be anticipated. ΔLReq,T is LReq,T of ambient noise under investigation minus the LReq,T

[7] $L_{Req,T}$ is the L_{Aeq} rated for impulsive sound, tonality, and time of day, in accordance with SANS 10103:2008.
[8] **$L_{Req,d}$**, the **equivalent continuous daytime rating level**, is the A-weighted equivalent sound pressure level rated for impulsive sound and tonality in accordance with SANS 10103:2008 for the daytime period from 06:00 to 22:00.
[9] **$L_{Req,n}$**, the **equivalent continuous night-time rating level**, is the A-weighted equivalent sound pressure level rated for impulsive sound and tonality in accordance with SANS 10103:2008 for the night-time period from 22:00 to 06:00.
[10] **$L_{R,dn}$**, the **equivalent continuous day/night rating level**, is the A-weighted equivalent sound pressure level during a reference time interval of 24 h, plus specified adjustments for tonal character, impulsiveness of the sound and the time of day as per SANS 10103:2008.

of the residual noise (determined in the absence of the specific noise under investigation) (Soundscape, 2022).

TABLE 10: CATEGORIES OF COMMUNITY OR GROUP RESPONSES

	Estimated community or group response (SSA, 2008)	
Increase ($\Delta L_{Req,T}$) in dBA	**Category**	**Description**
0 to 10	Little	Sporadic complaints
5 to 15	Medium	Widespread complaints
15 to 20	Strong	Threats of community or group action
More than 20	Very strong	Vigorous community or group action

Source: Soundscape, 2022

Potentially sensitive receptors in terms of noise typically include nearby places of residence and permanent community locations such as schools, hospitals, and places of worship (Soundscape, 2022).

These facilities are typically associated with an urban environment such as Okahao, including its densely populated rural periphery. In addition, the proximity of the receptors with respect to the proposed new road must be considered too.

6.6.2 NOISE LINKS TO ENVIRONMENTAL SENSITIVITY

- Due to the bareness of the environment (especially during the dry period) the dispersal of noise on the flat terrain can be propagated.
- During the construction phase, erratic increases in noise levels can be expected, but during daytime only. This increase will also be temporary as it will stop at the end of the construction period. It is not expected to exceed 60 dBA, i.e. the threshold for daytime – i.e. typical for an urban district with workshops, business premises and main roads.
- During the operational phase the contributions from the pump and the road to the ambient noise levels in the Okahao townscape are not expected to exceed the thresholds for an urban district with workshops, business premises and main roads, i.e. 60 dBA during daytime and 50 dBA during nighttime.
- In the area where the road is planned, it is expected that the increase in noise from vehicles on the road will be erratic and not limited to daytime. Yet, it is not expected that the ambient noise in this area will exceed 50 dBA during the day and 40 dBA at night, i.e. corresponding to a suburban district with little road traffic.

- Although there are two homesteads (houses) in relative proximity of the proposed road, it is not anticipated that they will be affected more than presently as many informal tracks already pass them in close vicinity.
- It is not expected that the potential increase in ambient noise will trigger a reaction more than sporadic complaints (see Table 10).

6.7 AIR QUALITY

6.7.1 BASELINE DESCRIPTION

To facilitate the assessment of air quality impacts to third parties, current ambient air pollution levels need to be considered.

Emissions from fuel combustion or production processes as well as noise, vibration, light, heat, and other forms of radiation are possible in any human settlement. Emissions may also result into pollutants, impurities, fumes, and odours. Air quality of any place is closely coupled to the local climate conditions, and specifically the wind regime. Wind determines both the distance of downward transport and the rate of dilution of pollutants.

Dust generation in Namibia is quite common, due to the aridity, and concerns are often raised. Most towns in Namibia have a particular problem with dust generated from unsealed surfaces such as roads, or the proximity of activities such as crushers and earthworks. Dusty conditions can be aggravated during periods of strong wind (>40 km/h). In addition to posing health risks to residents, dust can have an impact on businesses and urban facilities (e.g. restaurants, hospitals, schools, etc.) and simply as a nuisance. Dust can also have a deteriorating effect on the quality of open water bodies and visibility.

Fire has always been part of the Cuvelai landscape, mainly sparked by lightning during the dry season. Nowadays, most fires are started by people to promote grass regrowth, produce charcoal, and for maintenance. As the population grows, these fires increase, creating visible smoke layers in late winter and early spring.

Air quality is directly influenced by the surrounding natural environment, the presence of polluting sources such as industrial enterprises or activities such as crushing and earthworks, excavations, land clearance, roadbuilding, etc. in the immediate area, and the environmental conditions experienced.

From an air quality perspective, all sensitive receptors primarily relate to where people reside.

With reference to this project, the sensitive receptors are the residents of the Okahao Townlands, including the people residing in its densely populated periphery.

In the absence of guidelines on ambient air concentrations for Namibia, reference is made to the Air Quality Objectives (AQO) which are based on the World Health Organisation (WHO) interim targets of 2005 and the South African National Ambient Air Quality Standards (NAAQS) as listed by Airshed (2022). See Table 11. It must be noted that only dust parameters are reference for this study as concerns about dust was raised during the public open meetings. In the absence of industrial enterprises, the potential of air pollutants that are typically associated with industrial emissions (e.g. NO_2, SO_2, etc.) is likely to be nominal and not considered in this assessment.

The criteria are selected on the following basis:

- The WHO IT3 was selected for particulates since these limits are in line with the SA NAAQSs, and the latter are regarded feasible limits for Namibia.
- Even though $PM_{2.5}$ emissions are mainly associated with combustion sources and mainly a concern in urban environments, it is regarded good practice to include as health screening criteria given the acute adverse health effects associated with this fine fraction.
- The Botswana and South African criteria for dust fallout are the same and with limited international criteria for dust fallout, these were regarded applicable.

Fugitive dust emissions, or particulate matter (PM), comprise a mixture of organic and inorganic substances, ranging in size and shape and can be divided into coarse and fine particulate matter. Total Suspended Particulates (TSP) represents the coarse fraction greater than 10 µm, with particulate matter with an aerodynamic diameter of less than 10 µm (PM_{10}) and particulate matter with an aerodynamic diameter of less than 2.5 µm ($PM_{2.5}$) falling into the finer inhalable fraction. TSP is associated with dust fallout (nuisance dust) whereas exposure to PM_{10} and $PM_{2.5}$ are a health concern.

TABLE 11: PROPOSED EVALUATION CRITERIA

Pollutant	Averaging Period	Criteria	Reference
Particulate matter (PM_{10})	24-hour average ($\mu g/m^3$)	75[(a)]	WHO IT3 & SA NAAQS
	Annual average ($\mu g/m^3$)	40	SA NAAQS
Particulate matter ($PM_{2.5}$)	24-hour average ($\mu g/m^3$)	37.5[(a)]	WHO IT3
	Annual average ($\mu g/m^3$)	15	WHO IT3 & SA NAAQS
Dustfall	30-day average ($mg/m^2/day$)	600[(b)]	SA NDCR & Botswana residential limit
		1 200[(b)]	SA NDCR & Botswana industrial limit
		2 400	Botswana Alert Threshold

Notes: [(a)] Not to be exceeded more than 4 times per year (SA)

[(b)] Not to be exceeded more than 3 times per year or 2 consecutive months

The C41 main road (tarred) runs east-west through Okahao. Two gravel roads, the D3635 and the D3626 branch off from the section of the C41 within the townlands. As a rule of thumb, more traffic make use of the C41 than the two gravel roads. In addition to these roads, several unpaved roads and tracks exist in and around Okahao Townlands, also in vicinity of the area where the connection road is proposed. Use of these unpaved streets and tracks are less frequent than the gravel roads, in turn. The proposed new connection road will also be an unpaved street. However, it is important to emphasise that this new street will substitute the current tracks, not implying that the amount of present traffic will necessarily increase.

During the construction phase activities associated with the development of the individual components of the project are likely to have the most significant impact on air quality due to land clearance, earthworks, roadbuilding, excavation, trenching and digging and the movement of vehicles and equipment.

Vehicle entrained emissions from the unpaved roads and tracks are likely to be the most significant (current) background source of dust in the Okahao Townlands, as people confirmed during the Focus Group Meetings. Dust from the unpaved roads was also identified as a nuisance factor in the Structure Plan for Okahao (SPC, 2024). Vehicle-entrained dust from the connection road is expected to be the main source of air pollution during the operational phase of the project, with tail (exhaust) emissions from vehicles to a lesser extent responsible.

In the absence of scientific and official wind data for Okahao, it can be generalized that the predominant wind direction is from the east for most of the year (>7 months) and from the south

(<5 months). As wind speeds are normally low, it seldomly exceeds 6-8 m/s, which equates to a moderate breeze. Calms dominate almost 60% of the time (SPC, 2024).

During stable periods the ground level concentrations of airborne impurities are the greatest, which can affect human health and vegetation. During windy periods impurities is mobilized and dispersed, which may also influence human health and lead to wind erosion. Windblown particulates from natural exposed surfaces and unpaved roads, especially under high wind speed conditions (>10 m/s), can result in significant dust emissions with high particulate concentrations near the source locations, potentially affecting both the environment and human health.

6.7.2 AIR QUALITY LINKS TO ENVIRONMENTAL SENSITIVITY

- In the absence of scientific and official wind data for Okahao as well as lack of accurate background information about dust and airborne impurities for the Cuvelai Basin, and more specifically for the Okahao Townlands, concerns about dust are perceptual and not based on empiric data.
- Although dust deriving from vehicle entrainment is a constant nuisance in the Okahao Townlands during the dry season – as people stated during the focus group meeting – it is not expected that the dustfall will exceed the residential limit of 600 mg/m²/day – without the project being developed. Exceedance of the residential limit during the construction phase is also unlikely, even less so during the operational phase.
- It is not expected that the levels of ambient dust in the Okahao Townlands will increase significantly because of the construction of the proposed Bulk Infrastructure Project, as the earthworks (including excavations and roadbuilding) and movement of construction vehicles and equipment will be localized, for a limited duration and because standard dust suppression measures will be applied during construction.
- Also, it must be stated that the potential to create excessive fugitive dust is unlikely for those construction activities that will take place during the wet season.
- Although an additional unpaved road will be built, the dust contribution from this road during the operational phase will not make a big difference from the existing situation. The proposed road will be in an area where several tracks already exist, already generating vehicle-entrained dust.

6.8 ARCHAEOLOGY

6.8.1 BASELINE DESCRIPTION

Various natural and cultural assets collectively constitute what can be described as heritage. Heritage resources include all human-made phenomena and intangibles that are the result of the human mind. Natural, technological or industrial features may also be part of heritage resources, as places that have made an outstanding contribution to the cultures, traditions and lifestyles of the people or groups of people of Namibia. Any new project development has the potential to disturb surface heritage resources through the establishment of infrastructure and activities.

No specialist was appointed to conduct an archaeological study.

Most of the land in the Okahao Townlands is already heavily disturbed and therefore of low archaeological significance. The probability that any activity related to the development of the proposed Bulk Infrastructure Project will encroach into unknown archaeological sites is low. However, any chance finds need to be addressed in accordance with the ESMP.

6.8.2 ARCHAEOLOGICAL LINKS TO ENVIRONMENTAL SENSITIVITY

- Although there is a generally low likelihood that unknown heritage sites are uncovered, it is possible that hidden and buried archaeological remains, including graves, may be found during earthworks, as the project proceeds.
- Should activities related to the proposed Bulk Infrastructure Project encroach hitherto unknown archaeological sites, the necessary precautionary measures must be followed to prevent negative impacts and thus compromise the heritage sources of the area.
- It is recommended that a Chance Finds Procedure is adopted. Important, the precautionary principle must be applied throughout – team members should be given training to know what heritage resources they may encounter and what to do in case a discovery is made.

6.9 SOCIO-ECONOMIC FACTORS

6.9.1 DEMOGRAPHIC PROFILE

Namibia is one of the least densely populated countries in the world. Vast areas of the country are without people, in contrast to some dense concentrations, such as the north-central parts (i.e. the Cuvelai Basin) and along the Kavango River. The last national census was conducted in 2023 and counted just more than 3.0 million Namibians.

According to the Namibia Statistics Agency (NSA) Omusati Region is Namibia's third most populous region, with an estimated population of 316,671 as of 2023, primarily comprised of rural communal areas, along with four main towns (Outapi, Ruacana, Oshikuku and Okahao) and four main settlements (Ogongo, Okalongo, Onesi and Tsandi). It has a population density of 11.9 persons per km^2, significantly above the national average of 2.9 persons per km^2. The average household size (4.2 members per household) in the region is larger than the national average (NSA, 2024).

The region is predominantly rural, with only 11.1% of the population residing in urban areas. The annual growth rate is 2.2%, with the fertility rate of 4.3 children per woman. The women outnumber men, with only 87 males per 100 females; and hence many households are often led by females (NSA, 2024).

Based on the results of the latest national census, the population of Okahao town increased from 18 734 in 2011 to 24 909 in 2023; an annual population change of 2.4%. The gender disparity is relatively high with females (51.9%) and males (48.1%). The age groups are 0 – 14 years (36.4%); 15 – 64 years (53.8%) and 65+ years (9.8%) (NSA, 2024).

Namibia’s population is young – 37% was younger than 14 years of age and >46 % of the total population was younger than 19 years of age in 2023. The percentage of working age population (15 – 59 years of age) was 56.1% and only 6.8% was older than 59 (NSA, 2024). Although a young population presents a high employability, it presents also high dependency ratios, education demands, health care needs, employment challenges and urbanization pressures, which in turn demands effective policies on these fronts. These dependencies are also prevalent in the Omusati Region.

6.9.2 ECONOMIC PROFILE

Although Namibia is classified as a high middle-income country, this status is somewhat deceptive owing primarily to Namibia’s level of income inequality. Socio-economic inequalities inherited from pre-independence (35 years ago) remain extremely high and structural constraints to growth have hampered job creation. Economic advantage remains in the hands of a relatively small segment of the population and the large disparities of income have led to a dual economy – a highly developed modern sector co-existing with an informal subsistence-oriented one. The duality of the labour market, combined with slow job creation and low primary-sector productivity, results in very high unemployment (Ashby, 2022, referenced in Namisun, 2023).

Namibia's economy grew between 2010 and 2015 by an average of 5.3% per annum but then slumped into a recession with primary and secondary industries contracted by 2.0 and 7.8% respectively. During 2017 the economy contracted by 1.7, 0.7 and 1.9% in the first, second and third quarters respectively (Ashby, 2022, referenced in Namisun, 2023). In 2021 the domestic economy rebounded to a positive growth for the first time in two years, growing by 2.4% compared to a contraction of 7.9% recorded in 2020 during the height of COVID-19 pandemic. In 2022 an annual Gross Domestic Product (GDP) growth rate of 4.6% was recorded (www.nsa.org.na).

Agricultural is the leading economic sector in the Omusati Region. Dryland (rain-fed) crop production for subsistence purposes is predominant while irrigation and livestock production is also practiced. Most income is from wages, but formal employment is limited to the towns. The region is challenged in terms of poverty and unemployment (see Section 6.9.3.).

As indicated above, the key economic activities in the region are agriculture (mahangu is the key crop cultivated). A canal from the Kunene River provides opportunities for irrigation agriculture, including a large project at Etunda, where some cash crops are cultivated.

Informal employment opportunities like farming, herding livestock and collecting resources are some of the only options in rural areas. Retail trade is another key economic activity, offered by some supermarkets, restaurants and shopping facilities. The region has potential for tourism development, but much of its natural attraction has been lost because of its severe environmental degradation.

6.9.3 EMPLOYMENT AND INCOME

The labour force participation rate is the proportion of the economically active population, given as a percentage of the working age portion of the population (i.e., older than 15 years of age). According to the NSA, the rate of labour force participation for the Omusati region was 30.1% compared to the average of 46.2% for Namibia in 2023. According to the 2023 census report, the Omusati Region's unemployment rate increased from 24.0% (2018) to 41.1% (2023) which is the second highest in the country after Kavango West (NSA, 2024).

Nationally, a large portion of Namibia's young population is indeed unemployed. Using the broad definition of unemployment, the NSA estimated that 33.4% of all Namibians from a working age was unemployed in 2019 (NSA, 2019). There is also a strong correlation between unemployment and low or inadequate education. Of all employed people in Namibia, 63.5% are not higher qualified than junior secondary level (Grade 10 and lower) and the highest unemployment rates are found amongst persons with education levels lower than junior secondary (NSA, 2019).

Moreover, the low education levels affect employability and prevents many Namibian households to earn a decent income.

Using the unemployment rate of 33.4% of 2019, it means that one-third of the national population is unemployed, and another 46% is younger than 19 years of age, i.e. 79.4% in total. Just more than 20% of the population (one out of five people) is thus economic active – and this portion includes the 6.8% of the population that is older than 60 years of age. Moreover, it means that for every economic active person there are four dependent persons. With such a small base of economic active people, there is thus constant pressure on the individual and household income of economic active Namibians – not only in terms of taxes but also in terms of support to those without an income.

Low education levels affect employability and prevent many households to earn a decent income. According to the 2023 census, the literacy rate for Omusati region decreased since 2011 and currently stands at 84.1%, compared to the national literacy rate of 87.3%. According to the NSA, 45.8% of individuals achieve primary education as their highest level of educational attainment, while 19.6% complete secondary education and 8% complete tertiary education. Of all people, 12.3% have no educational attainment (NSA, 2024).

In Okahao, the main source of income are wages and salary jobs (27%) as most of the employed inhabitants work for governmental offices (central, regional and local), some private companies and local businesses. A substantial amount of the people depends on old-age pensions (26.3%). Considering the small amounts of these pensions that are the only income of some households, it mirrors the high level of poverty and unemployment that exists. Agriculture constitutes another form of income (19.5%), while non-farming business activities constitute 7.6% of household income (NSA, 2024).

6.9.4 PUBLIC HEALTH AND SAFETY

Since independence, the Ministry of Health and Social Services (MOHSS) in Namibia has implemented a primary health care (PHC) approach centred on four key pillars: health promotion, disease prevention, curative services, and rehabilitation services. MOHSS has set up various directorates at both national and regional levels to support these initiatives. Access to fundamental services like clean water, sanitation, and healthcare facilities is crucial for community health.

In 2023, 89.9% of the population in the Omusati Region had access to safe drinking water, up from 51.6% in 2011. The figure for households with no toilet facilities in the region was 57.8% while 17.1% of urban households did not have toilet facilities (NSA, 2024). Although these figures

improved since 2011, the absence of toilet facilities for such a large portion of the population provides some perspective on the challenges related to public health.

People living in improvised housing units, i.e. shacks, in the region increased from 1.1% in 2011 to 8.2% in 2023. Electricity for lighting is available to 20.2%, compared to 9% in 2011. In 2023, 82.4% of all households depend on firewood or charcoal for cooking (NSA, 2024), indicating the immense pressure on natural resources as fuel and indicating that a large percentage of people still prepare their meals on a fire, presumably outside a house.

Access to technology provides perspective in terms of public health and health education: Internet access is at 15.3%, and cell phone ownership slightly rose to 46.4% from 44.3% in the region (NSA, 2024).

Other indicators for a perspective on health include fertility rates, age at first live birth, and age the population. The average number of children per woman increased from 3.8 to 4.3 while the number of children under five years increased from 13.9% to 14.7% of the total population. A great portion of the population is young – 42% of the entire population in the region is under 14 years. For the Omusati Region the average age at first live birth is 22 years, further reflecting on the youthfulness of the population. Despite this, only 22% of children attend early childhood development support (NSA, 2024).

Okahao has one clinic, the Okahao Medical Clinic and two hospitals. The town also has a pathology laboratory.

6.9.5 INDIGENOUS PEOPLES

Namibia signed the United Nations Declaration on the Rights of Indigenous Peoples in 2007, and its constitution emphasizes equality and freedom from discrimination. While many Namibians can be considered indigenous, the San, Himba, Ovatue, Ovatjimba, and Ovazemba are recognized as marginalized groups by the government. Indigenous peoples in Namibia often experience significant marginalization.

Although it cannot be stated with scientific certainty, Okahao constitutes one of the centres for people of the Aangandjera ethnic group. Presumably, people of the Aakwanyama, Aandonga, Aakwaluudhi and Aakwambi ethnic groups may also reside in Okahao. However, little is known about the presence of Himba, Ovatjimba, and Ovazemba in the town as people from these groups tend to be present west of the Omusati Region – in the Kunene Region.

6.9.6 HERITAGE

Heritage refers to the legacy of intangible attributes as well as physical artefacts of Namibian society inherited from past generations, maintained in the present generation, and preserved for the benefit of future generations. “Heritage significance” includes cultural, historical, social, scientific, aesthetic, archaeological, and architectural significance, according to the National Heritage Act, No. 27 of 2004. The Act compels the reporting of any such finds to the National Heritage Council.

The cultural heritage of the Omusati Region is a source of national pride and an invaluable human resource that deserves protection and enhancement.

The Baobab Tree near Okahao, designated as a National Heritage Site, is situated just south of the C41 main road and holds significant historical importance for the local community. Like many baobab trees, a large cavity was carved into its trunk, offering soldiers shelter during the colonial era. Recognizing its historical value, the Baobab Tree was declared a national heritage site by the National Heritage Council of Namibia in 2011. Unfortunately, this heritage site is not well looked after and currently in a delipidated state.

6.9.7 DEVELOPMENT CONTEXT

The Omusati Region is primarily rural, with a population engaged predominantly in subsistence agriculture, contributing little to the national economy but providing livelihoods and food security to a substantial portion of the region’s population.

Okahao is located within the Okahao Constituency. The town has been experiencing gradual urbanization, with an increase in population and development activities over recent years. Okahao is a central place which provides service-related activities in the region such as schools, healthcare, and retail establishments. The C41 main road from Amakange in the west, off the C35 main road between Kamanjab and Ruacana, to Oshakati in the east passes through the town. The C41 main road is also connected to Tsandi, northwest of Okahao. Two gravel roads, the D3635 and the D3626 branch off from the section of the C41 within the townlands.

The town’s economy is made up of government services and small-scale retail businesses mainly. The Town Council prioritizes local economic development through capacity building for small and medium-sized enterprises (SMEs), actively works to support the growth of SMEs in the area and is also focused on attracting tourists and developing tourism facilities. Infrastructure development, including roads, water supply, and electricity, is crucial to support the growing population and enhance the quality of life for residents.

The Omusati Region and Okahao as such faces several challenges with regarding to its development. The population is young, economic dependency is high and a great portion of the population able to work is unemployed. Furthermore, necessities such as water, sanitation, housing and electricity are not in the reach of everyone. There are clearly several challenges that need to be addressed when developing Okahao for the future, but these challenges are not insurmountable, and development can take place in a way that will have a positive impact on the socio-economic conditions of people living both within townlands and beyond (SPC, 2024).

A local authority such as Okahao is thus confronted with a plethora of issues related to the sustainable development of the town, the upliftment of people and creating an economy that secures longevity. Recent efforts in the region have focused on local economic development, emphasizing the need for strategic planning and investment in infrastructure. Programs targeting education, health care, and agriculture aim to improve living conditions and empower local communities.

In summary, the development context of the Omusati Region and the Okahao constituency is characterized by a blend of ongoing urbanization, and the necessity for improved infrastructure and services to support the growing population and enhance overall community well-being.

7. IDENTIFICATION AND DESCRIPTION OF POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

This chapter outlines the environmental and social aspects and potential impacts associated with the development and implementation of the proposed Bulk Infrastructure Project. It reasons potential cumulative impacts, and which environmental and social aspects and potential impacts need further assessment (Chapter 8).

7.1 ASPECT AND IMPACT IDENTIFICATION

Table 12 provides a high-level summary of the proposed facilities and activities, along with the key sensitive receptors in the environment that might be impacted, as identified by the environmental team. These receptors were considered when further identifying the aspects and potential impacts related to the various project components for both the construction and operational phases (Table 13).

Table 13 therefore provides a summary of the activities associated with the components of the proposed Bulk Infrastructure Project and the various environmental aspects and potential impacts that were identified as part of the EIA process.

The potential impacts were identified during the scoping process, in consultation with I&APs and the project team. For context, the description of the potential impacts should be read with the corresponding descriptions of the current environment in Chapter 6 of this report.

The relevance of the potential impacts (“screening”) is presented in Table 13 to determine which aspects / potential impacts need to be assessed in further detail (Chapter 8 of this report).

TABLE 12: HIGH-LEVEL SUMMARY OF THE PROPOSED FACILITIES AND ACTIVITIES AND KEY SENSITIVE RECEPTORS THAT COULD POTENTIALLY BE AFFECTED

Project Phase	Resource / Receptors (e.g.) / Project Activities (e.g.)	Sensitive receptors in the receiving environment that could potentially be affected																	
		Physical				Biological						Socio-economic							
		Topography	Soil and land capability	Watercourse (i.e. drainage channels)	Aquifer	Terrestrial Habitats and Ecosystems	Floral communities	Faunal communities (mammals, birds, reptiles)	Aquatic Habitats and Ecosystems	Protected Areas & other designated sensitive areas	Alien and Invasive species	Land use (agriculture, open space, recreation)	Heritage	Traffic	Occupational health and Safety	Public Health and Safety	Infrastructure and services	Visual and Sense of Place	Employment & Income
Implementation and construction	Employment of people														X	X			X
	Clearance, site preparation	X	X	X		X	X	X	X		X	X							X
	Stripping and stockpiling of topsoil	X	X	X		X	X	X				X			X	X	X		X
	Establishment of contractors laydown areas	X	X	X		X	X	X				X		X	X	X	X	X	X
	Digging / excavation of foundations and trenches	X	X	X		X	X	X				X		X	X	X	X	X	X

Project Phase	Resource / Receptors (e.g.) / Project Activities (e.g.)	Sensitive receptors in the receiving environment that could potentially be affected																	
		Physical				Biological						Socio-economic							
		Topography	Soil and land capability	Watercourse (i.e. drainage channels)	Aquifer	Terrestrial Habitats and Ecosystems	Floral communities	Faunal communities (mammals, birds, reptiles)	Aquatic Habitats and Ecosystems	Protected Areas & other designated sensitive areas	Alien and Invasive species	Land use (agriculture, open space, recreation)	Heritage	Traffic	Occupational health and Safety	Public Health and Safety	Infrastructure and services	Visual and Sense of Place	Employment & Income
	Maintenance area, stores, work areas, wash bay, batch plant, fuel handling and storage area, site offices. Ablution facilities, change rooms, sanitation / septic tank. Delivery of building materials such as sand, rock, bricks and cement. Storage and handling of supplies and materials. Storage and handling of hazardous materials. Storage and handling of non-hazardous materials.		X	X	X	X	X	X	X						X	X			X
	Operations of vehicles and equipment	X	X	X		X	X	X			X	X		X	X	X	X	X	X
	Vehicle movements to and off site													X					X
	Water supply and use	X	X	X										X			X		X

Project Phase	Resource / Receptors (e.g.) / Project Activities (e.g.)	Sensitive receptors in the receiving environment that could potentially be affected																	
		Physical				Biological						Socio-economic							
		Topography	Soil and land capability	Watercourse (i.e. drainage channels)	Aquifer	Terrestrial Habitats and Ecosystems	Floral communities	Faunal communities (mammals, birds, reptiles)	Aquatic Habitats and Ecosystems	Protected Areas & other designated sensitive areas	Alien and Invasive species	Land use (agriculture, open space, recreation)	Heritage	Traffic	Occupational health and Safety	Public Health and Safety	Infrastructure and services	Visual and Sense of Place	Employment & Income
	Excavation and earthworks	X	X	X		X	X	X				X		X	X	X	X	X	X
Implementation and construction (continued)	Roadbuilding	X	X	X		X	X	X				X		X	X	X	X	X	X
	Concrete batching and mixing	X	X	X		X	X	X				X		X	X	X	X	X	X
	Construction and or installation of structures	X	X	X		X	X	X				X		X	X	X	X	X	X
	Backfilling of excavations	X	X	X		X	X	X				X		X	X	X	X	X	X
	Shaping and profiling of the landscape	X	X	X	X	X	X	X				X		X	X	X	X	X	X
	Spoil and rubble management	X	X																X
	Hazardous waste management	X	X	X	X	X	X	X						X	X	X	X	X	X
	Non-hazardous waste management	X	X	X	X	X	X	X						X	X	X	X	X	X
	Rehabilitation and decommissioning	X	X	X	X	X	X	X						X	X	X	X	X	X
Operations	Maintenance of electrical substation, distribution network and meters (if installed)														X	X		X	X

Project Phase	Resource / Receptors (e.g.) / Project Activities (e.g.)	Sensitive receptors in the receiving environment that could potentially be affected																	
		Physical				Biological						Socio-economic							
		Topography	Soil and land capability	Watercourse (i.e. drainage channels)	Aquifer	Terrestrial Habitats and Ecosystems	Floral communities	Faunal communities (mammals, birds, reptiles)	Aquatic Habitats and Ecosystems	Protected Areas & other designated sensitive areas	Alien and Invasive species	Land use (agriculture, open space, recreation)	Heritage	Traffic	Occupational health and Safety	Public Health and Safety	Infrastructure and services	Visual and Sense of Place	Employment & Income
	Maintenance of the power supply connection							X							X	X		X	X
	Maintenance of the sewage pump station and system				X	X									X	X	X	X	X
	Maintenance of the connections to other linear infrastructure (power, water)															X		X	X
	Maintenance of water pipeline, pumps, valves and meters															X		X	X

Colour key:

	No / Very Minor interaction	X	Minor / Moderate negative interaction	X	Major negative interaction	X	Positive interaction

TABLE 13: KEY ENVIRONMENTAL ASPECTS AND POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED BULK INFRASTRUCTURE PROJECT

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
Construction phase: • Clearance, site preparation • Stripping and stockpiling of topsoil • Establishment of contractor laydown areas • Digging / excavation of foundations and trenches • Maintenance area, stores, work areas, wash bay, batch plant, fuel handling and storage area, site offices • Ablution facilities, change rooms, sanitation / septic tank • Delivery of building materials such as sand, rock, bricks and cement • Storage and handling of supplies and materials • Storage and handling of hazardous materials • Storage and handling of non-hazardous materials	Soil: • Clearing of vegetation and soil stripping. • Use of machinery, vehicles, equipment, etc.	Soil related impacts associated with the project entails: • Loss of soil because of disturbance and subsequent (aeolian) erosion. • Compaction of soil because of heavy vehicles, equipment and structures • Contamination of soils because of sewage and dirty water discharges, waste and because of leaks and spills of hazardous substances. Refer to Chapter 8 for the assessment of soil impacts
	Hydrology: • Use of machinery, vehicles and equipment that can, amongst others spill hydrocarbons. • The infrastructure area causing reduced storm water flow.	Hydrological impacts associated with the project entails: • Enhancement of pooling of water (e.g. through man-made obstructions) can influence the recharge of the groundwater on which the “omithima” depends and cause knock-on effects such as water-borne diseases and mosquito breeding grounds. • Blocking of the water flow can exacerbate potential flooding causing the inundation of residences, damages to infrastructure, disrupt operations and cause drownings of humans and animals. • Fluvial erosion can be increased due to the redirecting (e.g. through excavations), partial blocking and channelling of surface water through man-made interferences in the drainage channels. • Surface water can be contaminated through discharges (of sewage and dirty water), waste and discarded items, and leaks and spills (of hazardous substances), which may in turn lead to contamination of groundwater. • Surface water can spread aquatic alien invasive organisms when accidentally released into the channels of the Cuvelai Basin. Refer to Chapter 8 for the assessment of hydrological impacts

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT

• Operations of vehicles and equipment
• Maintenance of vehicles and equipment
• Vehicle movements to and off site
• Water supply and use
• Excavation and earthworks
• Roadbuilding
• Concrete batching and mixing
• Construction and or installation of structures
• Backfilling of excavations
• Shaping and profiling of the landscape
• Spoil and rubble management
• Hazardous waste management
• Non-hazardous waste management
• Rehabilitation and decommissioning
Operations:
• Maintenance of electrical substation, distribution network and meters (if installed).
• Maintenance of the power supply connection
	Biodiversity:
	• Clearing of vegetation and soil stripping.
	• Use of machinery, vehicles, equipment, etc.
	• Activities disturbing/ destroying biodiversity and habitats.
	• Overhead powerline and associated infrastructure.
		The project can cause biodiversity impacts:
		• Loss of biodiversity (e.g. removal of vegetation, road kills, etc.)
		• Change, fragmentation or loss of the (modified) habitats.
		• Introduction and spread of opportunistic, less usable plants, or even alien invasive plants
		• Temporary or permanent blockage, channelling or redirecting the surface water can interfere with water's vital role as ecological driver by:
		  ○ inhibiting the spread of aquatic organisms through water
		  ○ limiting the rejuvenation role of water by not distributing seeds and nutrients, not wetting the soil, decomposing organic matter, etc.
		  ○ reducing the recharge rates of the groundwater supplies abstractable through the "omithima
		• By advancing the town through the development and implementation of the project, people can be attracted to an urban area and by doing so relieve the pressure on biodiversity in the degraded areas of the Cuvelai Basin
		
		Refer to Chapter 8 for the assessment of biodiversity impacts

	Visual: • Construction activities and new site infrastructure.	A project of this nature can trigger negative visual (and sense of place) impacts because of the visual intrusion of its man-made facilities and activities on a flat landscape. Visual impacts on the receiving environment may be lessened though because it is an already developed urban area surrounded by a densely populated rural periphery with existing man-made structures, marked by a severe degraded environment and modified habitats. The landscape is thus already altered, lacking natural features, and may be considered non-sensitive to visual change in general. The activities and land use within the Okahao Townlands are consistent with the Cuvelai Basin. As the Bulk Infrastructure Project will be situated within this existing urban area, it will not disrupt the current sense of place of the built-up environment. No further assessment is thus required.

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
• Maintenance of the sewage system • Maintenance of the connections to other linear infrastructure (power, water) • Maintenance of the water distribution network and associated components (tanks, pumps, valves and meters). • Maintenance of road surface • Maintenance of culverts, pipes and flow of surface water • Maintenance of stormwater arrangements	Noise: • Noise from various construction activities, vehicles, equipment and associated activities.	Daytime erratic increases in noise levels during the construction phase is possible. It is not expected that the ambient noise in the Okahao Townlands will increase significantly because of the project during the operational phase. These noise-related impacts are qualitatively assessed in Chapter 8.
	Air quality: • Air emissions (e.g. dust) from various construction activities, vehicles, equipment and associated activities.	Although ambient atmospheric impurities can increase during the construction of the project, it is not going to exceed industry-related thresholds. Also, the increase of ambient atmospheric impurities during the operational is not expected to be much different from the current situation. Impacts related to air quality are qualitatively assessed in Chapter 8.
	Archaeology: • Construction, land clearing; use of machinery, vehicles, equipment, etc. that could damage archaeological	The construction activities associated with the project have the potential to encroach upon, disturb, damage or destroy archaeological remains and unknown heritage sites, including graves, which are protected under the National Heritage Act (27 of 2004). However, the likelihood of this to happen is low, as the project is proposed within a disturbed environment. If the project impacts unknown archaeological sites, precautionary measures must be taken to protect them. A Chance Finds Procedure is recommended, and team members should be trained on identifying and reporting discoveries. No further assessment is thus required.

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
	/ heritage sites.	
Construction activities and general operations: • Employment of people • Advancement of the Okahao Townlands	<u>Socio-economic:</u> • Impacts to local, regional and national economy. • Jobs creation and skills development. • Impacts to community (i.e. surrounding landowners) health, safety and security, including Sexual Exploitation/ Harassment and Abuse. • Emissions to land, environmental degradation, visual and	Socio-economic impacts associated with the project entail: • Economic benefits • Social benefits • Socio-economic ills (community welfare – health, safety and security issues) Refer to Chapter 8 for the assessment of the socio-economic impacts. The construction activities and the location of the physical infrastructure could result in potential impacts relating to the relocation of residents or inhibition of their current activities / land use. However, these potential impacts are eliminated by considering their location in the design and the layout. Therefore, the impact relating to the potential resettlement / relocation of people / expropriation or any associated land use impacts are not relevant to the proposed activities. See Section 1.4.1. Furthermore, this is a commitment in the ESMP (Appendix F) to ensure compliance.

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
	nuisance impacts. • Construction activities and placement of infrastructure on existing properties	

7.2 Summary of Environmental and Social Aspects and Potential Impacts that Require Assessment

Based on the discussions in Table 13, the following aspects / potential impacts require further assessment (see Chapter 8):

- Soil
  - Aeolian erosion
  - Compaction
  - Soil contamination
- Hydrology
  - Fluvial erosion
  - Artificial pooling
  - Flooding
  - Water contamination
  - Aquatic alien invasive species
- Biodiversity:
  - Direct loss
  - Habitat change, fragmentation or loss
  - Introduction of opportunistic (and alien invasive) plants
  - Inhibited rejuvenation
- Noise
  - Increased ambient noise
- Air quality
  - Increased ambient atmospheric impurities
- Socio-economic:
  - Economic benefits
  - Social benefits
  - Socio-economic ills (community welfare – health, safety and security issues)

8. ENVIRONMENTAL IMPACT ASSESSMENT

This Chapter assesses the key potential impacts (as identified in Chapter 7), relating to the proposed Bulk Infrastructure Project and associated activities and infrastructure.

The environmental (and social) issues that require further assessment, as identified in Chapter 7, relate to:

- Soil.
- Hydrology.
- Biodiversity.
- Noise.
- Air quality.
- Socio-economic.

The activities that are summarised in this chapter are linked to the descriptions provided in Chapters 4 and 7 (Table 13). This section must further be read in the context of the baseline conditions described in Chapter 6.

Management and mitigation measures to address the identified (potential) impacts are presented in the accompanying EMP.

The approach and criteria used to assess the impacts and the method of determining the significance of the impacts complies with the Environmental Management Act, No. 7 of 2007 and its regulations. Table 14 provides the impact assessment criteria and the approach for determining impact consequence (combining nature and intensity, extent and duration) and significance (the overall rating of the impact). Impact consequence and significance are determined from Table 15Table and Table 16 respectively.

The potential impacts are cumulatively assessed, where relevant, taking the existing environment into consideration.

TABLE 14: IMPACT ASSESSMENT CRITERIA

IMPACT ASSESSMENT CRITERIA		
SIGNIFICANCE determination	**Significance = consequence x probability**	
CONSEQUENCE	**Consequence is a function of:** • **Nature and Intensity of the potential impact** • **Geographical extent should the impact occur** • **Duration of the impact**	
Ranking the NATURE and INTENSITY of the potential impact		
Negative impacts		
Low (L)	The impact has no / minor effect/deterioration on natural, cultural and social functions and processes. No measurable change. Recommended standard / level will not be violated. (Limited nuisance related complaints).	
Moderate (M)	Natural, cultural and social functions and processes can continue, but in a modified way. Moderate discomfort that can be measured. Recommended standard / level will occasionally be violated. Various third party complaints expected.	
High (H)	Natural, cultural or social functions and processes are altered in such a way that they temporarily or permanently cease. Substantial deterioration of the impacted environment. Widespread third party complaints expected.	
Very high (VH)	Substantial deterioration (death, illness or injury). Recommended standard / level will often be violated. Vigorous action expected by third parties.	
Positive impacts		
Low (L) +	Slight positive effect on natural, cultural and social functions and processes Minor improvement. No measurable change.	
Moderate (M) +	Natural, cultural and social functions and processes continue but in a noticeably enhanced way. Moderate improvement. Little positive reaction from third parties.	
High (H) +	Natural, cultural or social functions and processes are altered in such a way that the impacted environment is considerably enhanced /improved. Widespread, noticeable positive reaction from third parties.	
Very high (VH) +	Substantial improvement. Will be within or better than the recommended level. Favourable publicity from third parties.	
Ranking the EXTENT		
Low (L)	Local (confined to within the project concession area and its nearby surroundings).	
Moderate (M)	Regional (confined to the region, e.g. coast, basin, catchment, municipal region, district, etc.).	
High (H)	National (extends beyond district or regional boundaries with national implications).	
Very high (VH)	International (Impact extends beyond the national scale or may be transboundary).	
Ranking the DURATION		
Low (L)	Temporary / short-term. Quickly reversible. (Less than the life of the project).	
Moderate (M)	Medium Term. Impact can be reversed over time. (Life of the project).	
High (H)	Long Term. Impact will only cease after the life of the project.	
Very high (VH)	Permanent	
Ranking the PROBABILITY		
Low (L)	Unlikely	
Moderate (M)	Possibly	
High (H)	Most likely	
Very high (VH)	Definitely	
SIGNIFICANCE Description		
	Positive	**Negative**
Low (L)	Supports the implementation of the project	No influence on the decision.
Moderate (M)	Supports the implementation of the project	It should have an influence on the decision and the impact will not be avoided unless it is mitigated.
High (H)	Supports the implementation of the project	It should influence the decision to not proceed with the project or require significant modification(s) of the project design/location, etc. (where relevant).
Very high (VH)	Supports the implementation of the project	It would influence the decision to not proceed with the project.

TABLE 15: DETERMINING THE CONSEQUENCE

DETERMINING THE CONSEQUENCE					
INTENSITY OF IMPACT = LOW					
DURATION	VH	Moderate	Moderate	High	High
	H	Moderate	Moderate	Moderate	Moderate
	M	Low	Low	Low	Moderate
	L	Low	Low	Low	Moderate
INTENSITY OF IMPACT = MODERATE					
DURATION	VH	Moderate	High	High	High
	H	Moderate	Moderate	High	High
	M	Moderate	Moderate	Moderate	Moderate
	L	Low	Moderate	Moderate	Moderate
INTENSITY OF IMPACT = HIGH					
DURATION	VH	High	High	Very High	Very high
	H	High	High	High	Very High
	M	Moderate	Moderate	High	High
	L	Moderate	Moderate	High	High
INTENSITY OF IMPACT = VERY HIGH					
DURATION	VH	Very high	Very High	Very High	Very high
	H	High	High	Very High	Very high
	M	High	High	High	Very High
	L	Moderate	High	High	Very High
		L	M	H	VH
		EXTENT			

TABLE 16: DETERMINING THE SIGNIFICANCE

DETERMINING THE SIGNIFICANCE					
PROBABILITY	VH	Moderate	High	High	Very high
	H	Moderate	Moderate	High	Very high
	M	Low	Moderate	High	High
	L	Low	Low	Moderate	High
		L	M	H	VH
		CONSEQUENCE			

8.1 SOIL

8.1.1 INTRODUCTION

Topography and soil are discussed in Section 6.2. and the pedological links to environmental sensitivity are described in Section 6.2.2.

With reference to Table 13, several activities implied by the construction as well as the operational phase of the Bulk Infrastructure Project can have impacts on soil.

Excavations, trenching and digging – in addition to creating a temporary safety hazard – can mix the soil layers and loosen the soil, albeit in localized areas, potentially leading to soil losses through wind erosion and an increased risk of water erosion during the construction period.

Heavy equipment and vehicles, and the laydown of heavy structures can compact soil during the construction period, limiting its cultivation potential, reducing the infiltration rate of water and the inhibit the ability for seeds to germinate.

Soil can be contaminated by discharges of sewage and dirty water, waste and the leaks and spills of hazardous substances during both the construction and operational phase.

8.1.2 ISSUE: AEOLIAN EROSION

The Cuvelai Basin is marked by severe environmental degradation and barren surfaces are common. Physical activities associated with the construction phase (land clearance, earthworks, roadbuilding, excavation, trenching or digging) may expose the soil even more by mixing the soil layers and by loosening it and making it prone to erosion. Temporary stockpiles are susceptible to aeolian erosion. The barren surfaces of the flat landscape are also not protected against potential wind erosion during the construction phase.

The possibility of wind erosion diminishes during the operational phase of the project.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

The potential of aeolian erosion during the construction phase is confined to a local extent (LOW), having short-term consequences which can be reversed easily, i.e. creating short-term impacts in terms of duration (LOW). The intensity can be rated as LOW as only minor effects are expected.

Consequence

The consequence of the impact is LOW for both the unmitigated and mitigated scenarios.

Probability

Although accurate scientific data about wind is absent for Okahao, it is believed that wind speeds are normally low, seldomly exceeds 6-8 m/s, which equates to a moderate breeze. Calms dominate almost 60% of the time (SPC, 2024). Windblown dust will typically only occur when winds exceed 5.4 m/s.

It is possible that construction activities can enhance the potential of aeolian erosion during times when the wind speed is more than 5.4 m/s. As the soil is loosened because of construction activities dust becomes prone to erosion under windy conditions, especially during the dry season.

The probability of enhancing the aeolian erosion potential through construction activities can be rated as MODERATE thus under an unmitigated scenario and LOW under a mitigated scenario.

Significance

The significance of the impact is rated as **LOW** for both the unmitigated and mitigated scenarios.

Tabulated summary of the assessed impact – aeolian erosion

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**L**	**L**	**L**	**L**	**M**	**L**
Mitigated	**L**	**L**	**L**	**L**	**L**	**L**

Management and mitigation measures

Key actions include the following:

- If construction activities are scheduled during the dry season, dust suppression must be applied in the work areas.
- Construction activities during windy conditions must be avoided.

Monitoring Recommendations

- Daily inspections can be conducted during the construction phase to prevent activities during windy conditions.
- After the backfilling of excavations and trenches, i.e. at the end of the construction phase, the disturbed areas must be monitored for potential aeolian erosion.

8.1.3 ISSUE: SOIL COMPACTION

Temporary (partial) blocking of the channels by means of man-made interferences and the permanent blocking of surface flow by means of the connection road across the drainage channel(s) can cause artificial pooling, which pose consequences for the recharge of the aquifer on which the “omithima” depends. Pooling can also lead to knock-on effects such as water-borne diseases and mosquito breeding grounds.

Heavy vehicles and equipment will be used during the construction phase (to do land clearance, earthworks, roadbuilding, excavation, trenching or digging, or to transport goods), which can compact the soil in the work areas. In addition, heavy equipment and goods will be placed in the laydown areas, causing compaction as well.

Arable land is heavily cultivated, and the compaction of soil may reduce the size of available land during the construction phase. The possibility of soil compaction diminishes during the operational phase of the project.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

Compaction of soil because of the construction activities will cause modifications of a local extent (i.e. LOW). The existence of compacted soil is of a medium-term, i.e. MODERATE in terms of duration. The intensity can be rated as MODERATE, as arable land might be modified and reduced, causing discomfort.

Consequence

The consequence of the impact is MODERATE for the unmitigated and LOW for the mitigated scenario.

Probability

It is possible that soil compaction can be created because of the construction activities, therefore the rating is MODERATE under the unmitigated scenario. With the necessary mitigation measures in place the rating can be reduced to LOW.

Significance

The significance of the impact is rated as **MODERATE** for the unmitigated scenario and **LOW** for the mitigated scenario.

Tabulated summary of the assessed impact – artificial pooling

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**M**	**M**	**L**	**M**	**M**	**M**
Mitigated	**L**	**M**	**L**	**L**	**L**	**L**

Management and mitigation measures

Key actions include the following:

- Demarcate work areas, taking cognisance of possible arable land and avoid these areas.
- In addition to do backfilling of all excavations and trenches the work areas must be reworked and profiled to eliminate possible compaction.

Monitoring Recommendations

- During the construction phase daily inspections must be conducted to prevent possible compaction outside the allowable work areas.

- After the construction phase (after all excavations and trenches are backfilled) the work areas must be inspected to confirm that no compacted areas remain behind.

8.1.4 ISSUE: SOIL CONTAMINATION

Several activities associated with the construction and operation phase (including maintenance of equipment, vehicles and infrastructure) have the potential to create contamination risks to soil through discharges of sewage and dirty water and leaks and spills of hazardous substances. Soil contamination is closely related to the potential contamination of surface and groundwater, in turn. It is noteworthy to mention that waste management is a common problem in the Cuvelai Basin, where Okahao is located, contaminating soil and surface water in many places already.

During the construction phase contamination of soil – through discharges of sewage and dirty water, spills and leak of hazardous substances and improper waste management can happen, but this possibility diminishes during the operational phase of the project.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

Though the extent of the impact depends on the volume of the discharge, spill or leak it will not exceed the local scale, i.e. the risk is LOW in terms of extent. The risk of discharges, spills or leaks will persist for the duration of the construction phase, i.e. only short-term, which means a LOW risk in terms of duration. The intensity of this impact is rated MODERATE as some modifications with discomforting results are implied.

Consequence

The consequence of this impact is rated as LOW under the unmitigated scenario and LOW under the mitigated scenario.

Probability

With proper site management measures in place, waste management can be done properly and the likelihood of a spill, leak or discharge to occur is LOW.

Significance

The significance of the impact is rated as **LOW**.

Tabulated summary of the assessed impact – soil contamination

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**M**	**L**	**L**	**L**	**L**	**L**
Mitigated	**L**	**L**	**L**	**L**	**L**	**L**

Management and mitigation measures

Key actions include the following:

- Manage the handling of sewage and waste according to specifications and conditions as stipulated by the applicable authorities (by-laws of the Okahao Town Council, and the Directorate of Water Affairs).
- Implement proper site management and measures to enforce the proper handling of waste and to prevent and manage spills, leaks and discharges.
- Follow the waste management hierarchy with emphasis on avoidance and recycling.
- Store hazardous substances (including hydrocarbons) in bunded areas able to accommodate 110% of the largest container or tank, equip parked vehicles and generators with spill trays.
- Train employees in the importance of waste management and spill emergency response to avoid littering and to clean up spills immediately.

Recommended Monitoring

- Contractors must carry out regular inspections to detect spills, leaks and improper waste management, including illegal discharges for immediate clean-up.
- Contractors must keep a record of the various waste volumes (recycled, disposed, hydrocarbons, hazardous) and disposal certificates.

8.2 HYDROLOGY

8.2.1 INTRODUCTION

Hydrology is discussed in Section 6.3. and the hydrological links to environmental sensitivity are described in Section 6.3.2.

(Partial) blocking, channelling and redirection of surface water through man-made interferences (excavations, earthworks, the placement of infrastructure, dumping of redundant material, etc.) can cause artificial pooling, enhance the flooding potential and enhance the fluvial erosion

potential. Although the activities associated with the construction phase are temporary and the impacts related to them have a limited duration, it is the placement of the connection road that pose impacts with a longer duration during the operational phase.

The following hydrological impacts are assessed:

- Artificial pooling of the water can influence the recharge of the groundwater on which the "omithima" depends and can lead to knock-on effects such as the spread of water-borne diseases and mosquito breeding grounds.
- Episodic flooding and flash floods can be enhanced by man-made interferences, causing the inundation of residences, damage of infrastructure, disrupt operations and even drownings of humans and animals.
- Redirecting surface flow through man-made interferences can enhance the fluvial erosion potential.
- Surface water can be contaminated through discharges (of sewage and dirty water), waste and discarded items, and leaks and spills (of hazardous substances), which may lead to groundwater contamination in turn.
- Surface water can spread alien invasive aquatic organisms when accidentally released into the channels of the Cuvelai Basin.

8.2.2 ISSUE: ARTIFICIAL POOLING

Temporary (partial) blocking of the channels by means of man-made interferences and the permanent blocking of surface flow by means of the connection road across the drainage channel(s) can cause artificial pooling, which pose consequences for the recharge of the aquifer on which the "omithima" depends. Pooling can also lead to knock-on effects such as water-borne diseases and mosquito breeding grounds.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

Temporary artificial pooling of the surface water because of the construction activities will cause modifications of a local extent but the permanent blocking because of the connection road is of a regional extent (i.e. MODERATE). The existence of such an artificial pool is medium-term, i.e. MODERATE in terms of duration. The intensity can be rated as MODERATE however, as the drainage channel will function in a modified way, the recharge regime is modified, and water-borne diseases and mosquitoes can cause discomfort.

Consequence

The consequence of the impact is MODERATE for the unmitigated and LOW for the mitigated scenario.

Probability

It is possible that artificial pooling can be created because of man-made interferences, therefore the rating is MODERATE under the unmitigated scenario. With the necessary mitigation measures in place the rating can be reduced to LOW.

Significance

The significance of the impact is rated as **MODERATE** for the unmitigated scenario and **LOW** for the mitigated scenario.

Tabulated summary of the assessed impact – artificial pooling

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**M**	**M**	**M**	**M**	**M**	**M**
Mitigated	**L**	**M**	**L**	**L**	**L**	**L**

Management and mitigation measures

Key actions include the following:

- Select and schedule some of the construction activities during the dry season to prevent that man-made interferences can cause artificial pooling.
- Align the placement of linear infrastructure in accordance with the general gradient and direction of the surface flow to prevent possible artificial pooling.
- The engineering and design team must plan the connection road with appropriate culverts and pipes not to create artificial pooling.
- It is recommended to consider the findings of previous flood studies to identify the possible risks of artificial pooling related to the connection road.

Monitoring Recommendations

- During the construction phase daily inspections must be conducted to prevent artificial pooling because of man-made interferences.

- After the construction phase (after all excavations and trenches are backfilled) the work areas as well as the connection road must be inspected to confirm that no artificial pooling occurs.

8.2.3 ISSUE: FLOODING

Episodic flooding and flash floods in the Cuvelai Basin can occur during any wet season – either from local rainfall or from surface water flow deriving from upstream. Many structures are built in the way of the surface water flow and when the drainage channels overflow, many residences are inundated, damages of infrastructure are caused, operations are disrupted and even drownings of humans and animals can happen. Blocking of the drainage channels by means of man-made interferences because of the project can exacerbate this flooding potential.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

Exacerbating the flooding potential of the drainage channels by means of construction activities can cause local impacts (LOW) of a temporary (LOW) nature, while the flood potential during the operational phase will not be enhanced because of the existence of the permanent infrastructure components. The intensity of the impact can be rated as MODERATE as some modifications with discomforting results are implied by the construction phase.

Consequence

The consequence is LOW for both the unmitigated and the mitigated scenario.

Probability

The probability of exacerbating the flooding potential because of the man-made interferences during the construction phase is unlikely, therefore the rating is LOW.

Significance

The significance of the impact is rated as **LOW** for both the unmitigated and mitigated scenarios.

Tabulated summary of the assessed impact – flooding

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**M**	**L**	**L**	**L**	**L**	**L**
Mitigated	**L**	**L**	**L**	**L**	**L**	**L**

Management and mitigation measures

Key actions include the following:

- Select and schedule some construction activities during the dry season to avoid man-made interferences with the natural functioning of the drainage channels which can cause flooding.
- The placement of linear infrastructure must be done in accordance with the general gradient and direction of the surface flow to prevent possible flooding.
- Provision must be made for stormwater management and flood and erosion control measures, despite the long dry periods in between.

Monitoring Recommendations

- During the construction phase daily inspections must be conducted to prevent enhanced flooding because of man-made interferences.
- Consider weather forecasts and early warnings regarding potential flooding during construction activities in the wet season to avoid man-made disasters due to the obstructions caused by construction activities.
- After the construction phase (after all excavations and trenches are backfilled) the work areas must be inspected finally for potential enhanced flooding because of the project.

8.2.4 ISSUE: FLUVIAL EROSION

Man-made interferences can have a profound effect on the flow regime and the direction of the surface water flow on the flat landscape of the Cuvelai Basin. These interferences can include small topographical changes because of excavations, trenching and digging, partial blocking because of the placement of equipment, the placement of permanent man-made obstructions (such as the connection road) across the flow direction of the drainage channels, and channelling of the surface water through culverts and pipes underneath the connection road. Through activities such as earthworks, roadbuilding, excavation, trenching or digging the soil can be loosened, which makes it prone to erosion. By blocking, redirecting and channelling the surface flow by man-made interferences, the natural velocity is changed, which may enhance fluvial transport and thus fluvial erosion at places where the velocity of water is increased.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

The potential of fluvial erosion during the construction phase is confined to a local extent (LOW), having short-term consequences which can be reversed easily. However, the potential of fluvial

erosion because of the redirection of flowing water and faster flowing water through the culverts and pipes underneath the connection road can gradually increase in intensity and extent, causing medium-term impacts in terms of duration (MODERATE) and cause modifications to the natural functioning of the channels, which means that its intensity can be rated as MODERATE.

Consequence

The consequence of the impact is MODERATE for the unmitigated scenario, but it can be reduced to LOW under a mitigated scenario.

Probability

It is unlikely that construction activities can enhance the potential of fluvial erosion. However, if the soil is loosened because of construction activities (earthworks, roadbuilding, excavation, trenching or digging), the soil can become prone to erosion if the water flow is redirected or its velocity increases. It is possible that the culverts and pipes underneath the road can redirect the flow of water and increase its velocity, which can cause fluvial erosion.

The probability of enhancing the erosion potential through man-made obstructions can be rated as MODERATE thus under an unmitigated scenario and LOW under a mitigated scenario.

Significance

The significance of the impact is rated as **MODERATE** for the unmitigated scenario, which can be reduced to **LOW** for the mitigated scenario.

Tabulated summary of the assessed impact – fluvial erosion

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**M**	**M**	**L**	**M**	**M**	**M**
Mitigated	**L**	**M**	**L**	**L**	**L**	**L**

Management and mitigation measures

Key actions include the following:

- By scheduling the construction activities during the dry season, the potential man-made interferences with the natural functioning of drainage channels can be avoided and will minimize the potential of fluvial erosion.
- By aligning the placement of linear infrastructure in accordance with the general gradient and direction of the surface flow, potential man-made interferences with the drainage channels will be mitigated and thus minimize the risk of causing fluvial erosion.

- The engineering and design team must plan the connection road with appropriate culverts and pipes not to enhance fluvial erosion.
- It is recommended to consider the findings of previous flood studies to identify the possible risks of fluvial erosion related to the connection road.

Monitoring Recommendations

- Daily inspections can be conducted during the construction phase to prevent that man-made obstructions can enhance potential fluvial erosion.
- After the backfilling of excavations and trenches, the disturbed areas must be monitored for potential fluvial erosion.

8.2.5 ISSUE: WATER CONTAMINATION

Several activities associated with the construction and operation phase (including maintenance of equipment, vehicles and infrastructure) have the potential to create contamination risks to surface water through discharges of sewage and dirty water and leaks and spills of hazardous substances. Surface water contamination is closely related to the potential contamination of groundwater, in turn. It is noteworthy to mention that waste management is a common problem in the Cuvelai Basin, where Okahao is located, contaminating the surface water in many places already.

During the construction phase contamination of surface water (and indirectly groundwater) – through discharges of sewage and dirty water, spills and leak of hazardous substances and improper waste management can happen, but this possibility diminishes during the operational phase of the project.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

Though the extent of the impact depends on the volume of the discharge, spill or leak it will not exceed the local scale, even though open water bodies are present during the wet season, i.e. the risk is LOW in terms of extent. The risk of discharges, spills or leaks will persist for the duration of the construction phase, i.e. only short-term, which means a LOW risk in terms of duration. The intensity of this impact is rated MODERATE as some modifications with discomforting results are implied.

Consequence

The consequence of this impact is rated as LOW under the unmitigated scenario and LOW under the mitigated scenario.

Probability

With proper site management measures in place, waste management can be done properly and the likelihood of a big spill, leak or discharge to occur is LOW, even with open water bodies present.

Significance

The significance of the impact is rated as **LOW**.

Tabulated summary of the assessed impact – water contamination

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**M**	**L**	**L**	**L**	**L**	**L**
Mitigated	**L**	**L**	**L**	**L**	**L**	**L**

Management and mitigation measures

Key actions include the following:

- Manage the handling of sewage and waste according to specifications and conditions as stipulated by the applicable authorities (by-laws of the Okahao Town Council, and the Directorate of Water Affairs).
- Implement proper site management and measures to enforce the proper handling of waste and to prevent and manage spills, leaks and discharges.
- Follow the waste management hierarchy with emphasis on avoidance and recycling.
- Store hazardous substances (including hydrocarbons) in bunded areas able to accommodate 110% of the largest container or tank, equip parked vehicles and generators with spill trays.
- Train employees in the importance of waste management and spill emergency response to avoid littering and to clean up spills immediately.

Recommended Monitoring

- Carry out regular inspections to detect spills, leaks and improper waste management, including illegal discharges for immediate clean-up

- Keep a record of the various waste volumes (recycled, disposed, hydrocarbons, hazardous) and disposal certificates.

8.2.6 ISSUE: AQUATIC ALIEN INVASIVE SPECIES

Alien invasive aquatic organisms can be spread when accidentally introduced into the channels of the Cuvelai Basin during the construction phase of this project.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

The extent of the impact depends on type and quantity of organisms released, but it will not exceed the local scale, even though open water bodies are present during the wet season, i.e. the risk is LOW in terms of extent. The risk of this impact will persist for the duration of the construction phase, i.e. only short-term, which means a LOW risk in terms of duration. The intensity of this impact is rated MODERATE as some modifications with discomforting results are implied.

Although the introduction and spread of alien invasive species can happen during the construction phase, this possibility diminishes during the operational phase of the project.

Consequence

The consequence of this potential impact is LOW.

Probability

The probability of introducing and the spread of alien invasive species is LOW.

Significance

The significance of this impact is rated as **LOW**.

Tabulated summary of the assessed impact – aquatic alien invasive species

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**M**	**L**	**L**	**L**	**L**	**L**
Mitigated	**L**	**L**	**L**	**L**	**L**	**L**

Management and mitigation measures

Key actions include the following:

- Implement proper site management and measures.

- Train employees in the importance of alien invasive species to avoid its release and spread.

Recommended Monitoring

- Carry out regular inspections to detect alien invasive species.
- Remove alien invasive species as soon as they are detected.

8.3 BIODIVERSITY

8.3.1 INTRODUCTION

Biodiversity is discussed in Section 6.4. and the biodiversity links to environmental sensitivity are described in Section 6.4.2.

With reference to Table 13, several activities implied by the construction as well as the operational phase of the Bulk Infrastructure Project can have impacts on the biodiversity, despite the severe degraded state of the environment:

- Direct loss of biodiversity because of the development of the Bulk Infrastructure Project (removal of vegetation, road kills, etc.)
- Change, fragmentation or loss of the (modified) habitats due to the construction and operation of the Bulk Infrastructure Project.
- Opportunistic, less usable plants, or even alien plants, can invade the land, especially the overutilized and disturbed areas.
- Temporary or permanent blockage, channelling or redirecting of surface water through man-made interferences may interfere with the seasonal flow of surface water in the channels of the Cuvelai Basin, inhibiting its important role as ecological driver to distribute aquatic organisms (such as fish and frogs) and limit the rejuvenation role of water (redistribution of seeds and nutrients, availability of moisture, decomposing, etc.) in the channels.

8.3.2 ISSUE: LOSS OF BIODIVERSITY

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

Although the Cuvelai Basin is characterized by severe environmental degradation, direct loss of biodiversity is possible during the construction phase. Construction activities such as land clearance and earthworks, roadbuilding, excavation, trenching or digging can damage or destroy

plants and during the movement of vehicles road kills are possible. With reference to section 6.4.2, wildlife in the Project area is almost completely absent.

Impacts because of a loss of biodiversity will be of a local extent, i.e. of a LOW risk. The existence of such impact is of medium-term and can be reversed over time, i.e. MODERATE in terms of duration. However, the small losses of biodiversity can contribute to continuous modifications and growing discomfort because of the severe environmental degradation. The intensity can be rated as MODERATE thus.

Consequence

The consequence of the impact is considered as MODERATE for the unmitigated scenario and LOW for the mitigated scenario.

Probability

It is possible that the construction activities of the project can cause direct biodiversity loss, therefore the probability is rated as MODERATE under an unmitigated scenario and LOW under a mitigated scenario.

Significance

The significance of the impact is rated as **MODERATE** for the unmitigated scenario and **LOW** with mitigation.

Tabulated summary of the assessed impact – loss of biodiversity

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**M**	**M**	**L**	**M**	**M**	**M**
Mitigated	**L**	**M**	**L**	**L**	**L**	**L**

Management and mitigation measures

Key actions include the following:

- Identify the plants in the works areas prior to construction to avoid the loss or damage of key species during construction activities.
- Clear vegetation only where necessary.
- Avoid the cutting or removal of protected plant species, especially trees.
- With reference to any potential human-wildlife conflict or road kills, the construction teams must keep records of wildlife incidents.

- Should the final design of the proposed Project entail an overhead powerline, monitoring of avifauna impacts should be implemented during the operational phase.

8.3.3 ISSUE: HABITAT CHANGE, FRAGMENTATION OR LOSS

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

Due to the severe environmental degradation, all habitats are modified and the (original) natural habitat is not known. It is also not known which (key) plant species and wildlife species have been lost over time as only those remaining can be recorded. Regardless of this situation, the change, fragmentation or loss of habitats is possible during the construction phase. This possibility diminishes during the operational phase of the project.

Impacts causing habitat change, loss or fragmentation will be of a local extent, i.e. of a LOW risk. The existence of such impacts is of medium-term and can be reversed over time, i.e. MODERATE in terms of duration. However, these impacts can contribute to the continuous modification of habitats and cause growing discomfort because of the severe environmental degradation. The intensity can be rated as MODERATE thus.

Consequence

The consequence of the impact is considered as MODERATE for the unmitigated scenario and LOW for the mitigated scenario.

Probability

The likelihood of this impact is MODERATE, as it is possible. However, with mitigation it can be reduced to LOW.

Significance

The significance of the impact is rated as **MODERATE** for the unmitigated scenario and **LOW** with mitigation.

Tabulated summary of the assessed impact – change, fragmentation or loss of habitat

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**M**	**M**	**L**	**M**	**M**	**M**
Mitigated	**L**	**M**	**L**	**L**	**L**	**L**

Management and mitigation measures

Key actions include the following:

- Identify the plants present in the work areas prior to construction to avoid the loss or damage of possible key plant species during construction activities.
- Clear vegetation only where necessary.
- Avoid the cutting or removal of protected plant species, especially trees.
- Construction teams must keep record of biodiversity observations for reporting purposes.

8.3.4 ISSUE: INTRODUCTION OF OPPORTUNISTIC (AND ALIEN INVASIVE) PLANTS

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

Opportunistic, less usable plants, and alien invasive plants can establish in the overutilized and disturbed areas of the Cuvelai Basin. The most likely alien candidates are Mexican poppy *Argemone mexicana*, thorn apple *Datura* species, wild tobacco *Nicotiana glauca* and castor oil *Ricinus communis*. Stinkbush - *Pechuel-Loeschea leubnitziae* and sand Acacia – *Acacia arenaria* are common opportunistic species.

Although the introduction and spread of opportunistic and alien invasive plants can happen during the construction phase, this possibility diminishes during the operational phase of the project.

Impacts because of the introduction of opportunistic and alien invasive plants will be of a local extent, i.e. of a LOW risk. The risk of this impact will persist for the duration of the construction phase, i.e. only short-term, which means a LOW risk in terms of duration. However, the suppression of usable plants contributes to continuous modifications and growing discomfort because of the overall severe environmental degradation. The intensity can be rated as MODERATE thus.

Consequence

The consequence of the impact is considered as LOW for both the unmitigated and the mitigated scenario.

Probability

It is possible that opportunistic and alien invasive plants may be introduced on overutilized and disturbed areas – but it is unlikely that this will happen because of the construction activities associated with this project. The rating is thus LOW.

Significance

The significance of the impact is rated as **LOW** for both the unmitigated and mitigated scenario.

Tabulated summary of the assessed impact – introduction of opportunistic and alien invasive plants

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**M**	**L**	**L**	**L**	**L**	**L**
Mitigated	**L**	**L**	**L**	**L**	**L**	**L**

Management and mitigation measures

Key actions include the following:

- Implement proper site management and measures.
- Train employees in the importance of alien invasive species to avoid its release and spread.

Recommended Monitoring

- Construction teams must carry out regular inspections to detect alien invasive species.
- Construction teams must remove alien invasive species as soon as they are detected.

8.3.5 ISSUE: INHIBITED REJUVENATION

The seasonal availability of water is an important impulse for the ecological functioning of the Cuvelai landscape – a variety of aquatic organisms (including fish and frogs) are delivered seasonally via the channels of the Cuvelai Basin. Also, the rejuvenating role of water as ecological driver (for the redistribution of seeds and nutrients, and the availability of moisture) is important for the ecological functioning of the Cuvelai Basin.

Temporary or permanent blocking of the channels by means of man-made interferences and the blocking of surface flow by means of the connection road across the drainage channel(s) pose consequences for the rejuvenation role of flowing water flow in the channels – to make water available to humans and animals, to create fishing grounds and to renew pastures.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

Temporary blocking of the surface water because of the construction activities will cause modifications of a local extent but the permanent blocking because of the connection road is of a regional extent (i.e. MODERATE). The existence of the blocking because of the road is medium-term, i.e. MODERATE in terms of duration. The intensity can be rated as MODERATE however,

as the drainage channel will function in a modified way, and the rejuvenating role of water as ecological driver is inhibited.

Consequence

The consequence of the impact is MODERATE for both the unmitigated and mitigated scenarios.

Probability

It is possible that artificial pooling can be created because of man-made interferences, therefore the rating is MODERATE under the unmitigated scenario. With the necessary mitigation measures in place the rating can be reduced to LOW.

Significance

The significance of the impact is rated as **MODERATE** for the unmitigated scenario and **LOW** for the mitigated scenario.

Tabulated summary of the assessed impact – inhibited rejuvenation

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**M**	**M**	**M**	**M**	**M**	**M**
Mitigated	**L**	**M**	**L**	**L**	**L**	**L**

Management and mitigation measures

Key actions include the following:

- Select and schedule some of the construction activities during the dry season to prevent that man-made interferences can cause blocking of the surface water flow.
- Align the placement of linear infrastructure in accordance with the general gradient and direction of the surface flow to prevent possible artificial pooling.
- The engineering and design team must plan the connection road with appropriate culverts and pipes not to create the inhibition of water as an ecological driver.
- It is recommended to consider the findings of previous flood studies to identify the possible risks related to the rejuvenation role of water.

Monitoring Recommendations

- During the construction phase daily inspections must be conducted to prevent inhibited water flow because of man-made interferences.

- After the construction phase (after all excavations and trenches are backfilled) the work areas as well as the connection road must be inspected to confirm that no inhibited water flow occurs.

8.4 NOISE

8.4.1 INTRODUCTION

With reference to Table 13, there are various activities that will cause noise.

The qualitative assessment below referred to the baseline descriptions provided in Sections 6.1., 6.2. and 6.6.

8.4.2 ISSUE: NOISE DISTURBANCE TO THIRD PARTIES (CLOSEST SENSITIVE NOISE RECEPTORS)

Assessment of Impact

Construction phase

Several activities associated with the construction phase will generate noise. Noise will be emitted by construction equipment including all related activities such as land clearing, site preparation, excavation, roadbuilding, etc. Noise generated during construction will be highly variable. Besides having daily variations in activities, construction projects are generally executed in several different phases where each phase has a specific equipment mix depending on the phase.

The noise impact is defined as the difference between expected cumulative noise levels and existing noise levels for the area. Reference is made to the 3 dBA increase guideline by the IFC for human receptors (see Section 6.6.1). A person with average hearing acuity may be able to detect an increase of 3 dBA in ambient noise.

Noise generating equipment can be divided into distinct categories. These are:

f. Earthmoving equipment.

g. Materials handling equipment.

h. Stationary equipment.

i. Impact equipment.

j. Other types of equipment.

The first few categories include machines that are powered by internal combustion engines. Machines in the latter two categories are powered pneumatically, hydraulically, or electrically. Exhaust noise tends to account for most of the noise emitted by machines in the first three categories (those that use internal combustion engines) whereas engine-related noise is usually

secondary to the noise produced by the impact between impact equipment and the material on which it acts. Noise generated by mechanical equipment, including electric motors (drive units), gearboxes, pumps, fans etc. is dependent on the portion of total mechanical or electrical energy that is transformed into acoustical energy (Soundscape, 2022).

During the construction phase, erratic increases in noise levels can thus be expected, but during daytime only. This increase will also be temporary as it will stop at the end of the construction period. It is not expected to exceed 60 dBA during daytime – i.e. typical for an urban district with workshops, business premises and main roads.

Operational phase

During the operational phase the additional contribution of ambient noise by the road and the pump station are not expected to exceed the thresholds for an urban district with workshops, business premises and main roads, i.e. 60 dBA during daytime and 50 dBA during nighttime.

In the area where the road is planned, it is expected that the increase in noise from vehicles on the road will be erratic and not limited to daytime. Yet, it is not expected that the ambient noise in this area will exceed 50 dBA during the day and 40 dBA at night, i.e. corresponding to a suburban district with little road traffic.

Nature and intensity, duration of impact and geographical extent

Taking the above into consideration, the impact intensity for the operations phase is rated as LOW. The duration of the impacts is MODERATE (i.e. life of the project). The extent of the impacts would be confined to within the project area and its nearby surroundings and is rated as LOW.

Consequence

The determining consequence of the impact is therefore LOW.

Probability

Although noise will be generated during both the construction and operational phase, it is unlikely that it will impact on the largest portion of Okahao's residents (i.e. receptors). However, the proximity of receptors along the connection road implies a possibility that they can be affected, i.e. making the rating MODERATE under both an unmitigated and mitigated scenario.

Significance

The significance of the impact is rated as **LOW**.

Tabulated summary of the assessed impact – Noise disturbance

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**L**	**M**	**L**	**L**	**M**	**L**
Mitigated	**L**	**M**	**L**	**L**	**M**	**L**

Management and mitigation measures

Key actions include the following:

- Establish and maintain a complaint register where interested and affected parties can lodge noise-related complaints during the construction phase.
- In response to a complaint, investigate possible causes and if required make use of a specialist to determine the likely source through monitoring and or a site inspection. Remedial actions to prevent such events in future should then be taken.
- Do not allow construction and operations activities during nighttime that can generate noise.

8.5 AIR QUALITY

8.5.1 INTRODUCTION

With reference to Table 13, there are various air pollution sources (i.e. largely dust) from the proposed project activities. The qualitative assessment below referred to the baseline descriptions provided in Sections 6.1., 6.2. and 6.8.

8.5.2 ISSUE: AIR POLLUTION, DUST NUISANCE

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

Construction phase

Construction activities associated with the development of the individual components of the project are likely to have the most significant impact on air quality due to land clearance, earthworks, roadbuilding, excavation, trenching and digging and the movement of vehicles and equipment.

Windblown dust will typically only occur when winds exceed 5.4 m/s. Accurate scientific data about wind is absent for Okahao. It can be generalized that the predominant wind direction is from the east for most of the year (>7 months) and from the south (<5 months). Wind speeds are normally low, seldomly exceeds 6-8 m/s, which equates to a moderate breeze. Calms dominate almost 60% of the time (SPC, 2024).

Vehicle-entrained dust is a constant nuisance in the Okahao Townlands during the dry season, as people stated during the focus group meeting. Several unpaved roads and tracks exist in and around Okahao Townlands, also in vicinity of the area where the connection road is proposed. Two gravel roads, the D3635 and the D3626 branch off from the section of the C41 tar road within the townlands. As a rule of thumb, more traffic make use of the C41 than the two gravel roads while less traffic occurs on the other unpaved roads than on the D3635 and the D3626 roads. The concerns about dust are perceptual and not based on empiric data, in the end. It is not expected that dustfall will exceed the residential limit of 600 mg/m²/day – without the project being developed. Exceedance of the residential limit during the construction phase is also unlikely.

On average, air quality impacts from construction activities are likely to be localised and limited to the work sites. Gaseous emission from the construction equipment and vehicles are also likely to be localised impacting mainly onsite. Restricting construction activities to daytime, reduces the risk of increased ground level concentrations, which are more likely to occur during the stable atmospheric conditions prevalent, especially at night. Also, the potential to create excessive fugitive dust is unlikely if the development takes place during the wet season.

Operational phase

Vehicle-entrained dust from the connection road is expected to be the main source of air pollution during the operational phase of the project, with tail (exhaust) emissions from vehicles to a lesser extent responsible. The dust contribution from the connection road during the operational phase will not make a big difference from the existing situation as the proposed road will be in an area where several tracks already exist, already generating vehicle-entrained dust. It is not expected that dustfall will exceed the residential limit of 600 mg/m²/day during the operational phase.

Nature and intensity, duration of impact and geographical extent

Taking the above information into consideration, the impact intensity for the operations phase is rated as LOW in the unmitigated and mitigated scenario. The duration of the impact will be medium-term, i.e. MODERATE. The extent is rated as LOW.

Consequence

The consequence of the impact is therefore LOW, for both the unmitigated and mitigated scenario.

Probability

The probability of increased $PM_{2.5}$ and PM_{10} is possible without mitigation, i.e. MODERATE under the unmitigated scenario. With mitigation the potential for an increase in dust generation reduces, i.e. to LOW.

Significance

The significance of the impact is rated as **LOW** for both the unmitigated scenario and mitigated scenario.

Tabulated summary of the assessed impact – Air pollution, dust nuisance

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**L**	**L**	**M**	**L**	**M**	**L**
Mitigated	**L**	**L**	**M**	**L**	**L**	**L**

Management and mitigation measures

Key actions include the following:

- Visually inspect the dust generation sources regularly. Keep photographic record.
- Apply dust suppression on dusty areas during construction.
- Avoid construction activities during windy conditions.

8.6 SOCIO-ECONOMIC IMPACTS

8.6.1 INTRODUCTION

The Omusati Region, including Okahao, faces several developmental challenges. The population is youthful, economic dependency is significant, and a substantial portion of the workforce is unemployed. The region and town are characterized by ongoing urbanization and the need for enhanced infrastructure and services to support the growing population and to improve overall community welfare is inevitable. Essential services such as water, sanitation, housing, and electricity are not necessarily in place or accessible to residents. Okahao Town Council must contend with numerous issues related to sustainable development, enhancing community welfare, and establishing a resilient economy, thus. Although these challenges are evident, they are not insurmountable, and development initiatives can positively impact the socio-economic conditions of residents both within the townlands and beyond (SPC, 2024).

Direct positive economic and social benefits as well as negative socio-economic impacts can arise from the development of the Okahao Bulk Infrastructure Project. In addition to these direct

impacts, indirect impacts can also be expected – advancing the town through infrastructure development can offer alternative livelihoods for people relying on the dwindling natural resources of the severely degraded environment of the Cuvelai Basin – i.e. creating positive biodiversity impacts.

To the contrary, there is a possibility that a development project like this can generate negative socio-economic ills (increased crime, illicit activities etc.)

The information in this Section refers to the baseline description provided in Section 6.9. and must be read against this background.

8.6.2 ISSUE: ECONOMIC IMPACTS

Assessment of Impact

During the construction phase some direct economic benefits (employment, investment, and capital spending and procurement) can be created. Induced economic benefits can derive from the spending of the construction workers and the contractor(s). Indirect benefits relate to tax that will be paid – by individuals, corporate and business as well as Value Added Tax (VAT) on goods and services.

Some cumulative impacts on the (local) economy are expected through the project – boosting upstream, downstream and sideways linkages. Every job counts in a country with high unemployment, and employment provides incomes to the employees, their immediate household members and to others living elsewhere in Namibia who depend on cash remittances.

By enabling future residents to have access to basic infrastructure, potential income through rates and taxes and municipal services become possible – eventually benefitting the Okahao Town Council, i.e. during the operational phase.

Nature and intensity, duration of impact and geographical extent

The project will generate new and positive contributions to the local economy during the construction as well as the operational phase and these positive impacts are rated HIGH in terms of intensity.

Consequence

Based on the above assessment the determining consequence is HIGH (positive).

Probability

The probability of the impacts occurring are most likely, i.e. HIGH.

Significance

The significance of this potential impact is **HIGH POSITIVE**.

Tabulated summary of the assessed impact – economic impacts

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**H+**	**M**	**L**	**H+**	**H**	**H+**
Mitigated (Enhancement)	**H+**	**M**	**L**	**H+**	**H**	**H+**

Enhancement measures

Key actions include the following:

- Implement a procurement policy which promotes the use of local service providers and SMEs.
- Purchase Namibian-made goods and services whenever possible or those from businesses within the South African Development Community.
- Promote local recruitment.
- Support service providers which demonstrate their use of the local labour force.

8.6.3 ISSUE: SOCIAL IMPACTS

Assessment of Impact

In addition to the positive economic impacts during the construction phase (employment, investment, and capital spending and procurement, taxes) and the economic multiplier effect, employment and income trigger several social benefits. Skills development is such a direct positive social benefit.

By enabling future residents to have access to basic infrastructure (water, sanitation, power and a connection road), the positive social gains are more indirect, but long-term.

Implementation of this project will advance Okahao and it will be possible for people living in the surrounding rural areas of the townland to relocate to the town, benefitting from the infrastructure. Although this may be seen as urbanization – and can even be perceived in a negative way – the outcome is positive. The concentrated supply of essential services such as water, sanitation, power and a connection road comes at a lower cost in comparison to the supply of individual rural households with the same services. Moreover, people in the rural areas of the Cuvelai Basin will be offered a residing option different from relying on a severely degraded environment with dwindling natural resources – and in this way the biodiversity can benefit.

Nature and intensity, duration of impact and geographical extent

The project will generate new and positive social impacts (skills development of employed people) during the construction phase. In addition, the project will generate new, long-term social benefits

to residents by creating access to basic infrastructure (water, sanitation, power and a connection road) during the operational phase. The extent is thus more than local , i.e. MODERATE, the duration is long-term, i.e. HIGH and these positive impacts can be rated HIGH in terms of intensity

Consequence

The determining consequence is HIGH positive.

Probability

The probability to create positive social impacts is HIGH.

Significance

The overall significance of the impact is thus assessed as **HIGH POSITIVE**.

Tabulated summary of the assessed impact – social impacts

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**H+**	**H**	**M**	**H+**	**H**	**H+**
Mitigated (Enhancement)	**H+**	**H**	**M**	**H+**	**H**	**H+**

Management and mitigation measures

Key actions include the following:

- Promote local recruitment.
- Encourage skills development through training, on the job learning and advanced courses.
- Be gender sensitive and select women for interview, training and recruitment, where possible.
- Translate the positive social impacts as benefactors that can be used in strategies such as the Okahao Structure Plan.

8.6.4 ISSUE: SOCIAL ILLS

Assessment of Impact

Community health, safety and security issues of concern can be raised during the construction phase. The presence of construction workers could lead to an increase in crime and illicit activities such as theft, prostitution and rape, drug dealing and spreading sexually transmitted diseases. It is the responsibility of contractors to recognise that project activities, equipment, and infrastructure can increase community exposure to risks and impacts avoid or minimize the risks

and impacts to community health, safety and security that may arise from project-related activities, with particular attention to vulnerable groups.

The objectives of the IFC's Performance Standard PS-4: Community Health, Safety and Security PS-4 are:

- To anticipate and avoid adverse impacts on the health and safety of the potentially affected community during the project life, from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the affected communities.

Accordingly, contractors must conform to the abovementioned standard. The project design and management plan must be compliant with health and safety regulations. Of relevance here is the need to minimise community and employee exposure to disease – particularly sexually transmitted diseases. PS-4 states "The client will avoid or minimize transmission of communicable diseases that may be associated with the influx of temporary or permanent project labour".

The project is , however, a relatively small-scale operation, localized and with a relatively small number of people involved during the construction phase. After construction, the project will be under the auspices of the Okahao Town Council to operate, meaning that the potential impact will diminish.

Nature and intensity, duration of impact and geographical extent

Taking the abovementioned into consideration, the intensity is HIGH under the unmitigated scenario but can be reduced to LOW with the implementation of proper management measures. The duration of the potential impact is only for the construction phase, i.e. LOW while it is confined to the local area only, i.e. LOW.

Consequence

Based on the above assessment the determining consequence of the impact is MODERATE in the unmitigated scenario and LOW in the mitigated scenario.

Probability

The possibility of negative impacts occurring is ranked as MODERATE (i.e. possible) in the unmitigated scenario and LOW in the mitigated scenario.

Significance

The significance of the potential impacts on community health, safety and security is **MODERATE** in the unmitigated scenario and **LOW** in the mitigated scenario.

Tabulated summary of the assessed impact – social ills

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**H**	**L**	**L**	**M**	**M**	**M**
Mitigated (Enhancement)	**L**	**L**	**L**	**L**	**L**	**L**

Management and mitigation measures

Key actions include the following:

- Contractors must inform all employees / contractors of the detailed consequences of anyone found in breach of the Community Health, Safety and Security measures (i.e. IFC's Performance Standard PS-4).
- Provision must be made for a contingency plan to protect the local community if labourers go on strike.
- Workers will remain within the work areas during daytime.

9. WAY FORWARD

The way forward is as follows:

- MURD and MEFT review the documentation and provide record of decision.

10. ENVIRONMENTAL IMPACT STATEMENT AND CONCLUSION

It is Namisun's opinion that the environmental aspects and potential impacts relating to the proposed Okahao Bulk Infrastructure Project activities and the associated facilities have been successfully identified. The following environmental aspects and their overall cumulative impacts associated with the proposed Project had to be assessed, taking the baseline environmental conditions and the proposed project activities (amongst others) into consideration:

- Soil:
  - Loss of soil because of disturbance and subsequent (aeolian) erosion.
  - Compaction of soil because of heavy vehicles, equipment and structures.
  - Contamination of soils because of sewage and dirty water discharges, waste and because of leaks and spills of hazardous substances.
- Hydrology:
  - Enhancement of pooling of water (e.g. through man-made obstructions) can influence the recharge of the groundwater on which the "omithima" depends and cause knock-on effects such as water-borne diseases and mosquito breeding grounds.
  - Blocking of the water flow can exacerbate potential flooding causing the inundation of residences, damages to infrastructure, disrupt operations and cause drownings of humans and animals.
  - Fluvial erosion can be increased due to the redirecting (e.g. through excavations), partial blocking and channelling of surface water through man-made interferences in the drainage channels.
  - Surface water can be contaminated through discharges (of sewage and dirty water), waste and discarded items, and leaks and spills (of hazardous substances), which may in turn lead to contamination of groundwater.
  - Surface water can spread aquatic alien invasive organisms when accidentally released into the channels of the Cuvelai Basin.
- Biodiversity:
  - Loss of biodiversity (e.g. removal of vegetation, road kills, etc.)
  - Change, fragmentation or loss of the (modified) habitats.
  - Introduction and spread of opportunistic, less usable plants, or even alien invasive plants.

- Temporary or permanent blockage, channelling or redirecting the surface water can interfere with water's vital role as ecological driver by:
  - inhibiting the spread of aquatic organisms through water
  - limiting the rejuvenation role of water by not distributing seeds and nutrients, not wetting the soil, decomposing organic matter, etc.
  - reducing the recharge rates of the groundwater supplies abstractable through the "omithima
- By advancing the town through the development and implementation of the project, people can be attracted to an urban area and by doing so relieve the pressure on biodiversity in the degraded areas of the Cuvelai Basin

- Noise:
  - Daytime erratic increases in noise levels during construction to third parties is possible.
- Air quality:
  - Although ambient atmospheric impurities can increase during construction, it is not going to exceed industry-related thresholds.
  - The increase of ambient atmospheric impurities during the operations is not expected to be much different from the current situation.
- Socio-economic:
  - Economic impacts during construction and operations (positive).
  - Job creation and skills development during construction and operations (positive).
  - Potential negative social impacts associated with the construction workers in the area.

The results of this impact assessment present the potential for negative environmental impacts and positive socio-economic benefits that can all be mitigated to acceptable levels, by implementing the ESMP. Refer to Table for a summary of the impact assessment findings. Furthermore, DWN should gain praise for implementing a project of this magnitude to drive sustainable urban development and reduce urban poverty.

TABLE 17: SUMMARY OF IMPACT ASSESSMENT FINDINGS

Potential Impact	Significance	
	Before mitigation	After mitigation
Soil:		
Loss of soil because of disturbance and subsequent (aeolian) erosion	**L**	**L**
Compaction of soil because of heavy vehicles, equipment and structures	**M**	**L**
Contamination of soils because of sewage and dirty water discharges, waste and because of leaks and spills of hazardous substances	**L**	**L**
Hydrology:		
Artificial pooling of the water can influence the recharge of the groundwater on which the "omithima" depends and can lead to knock-on effects such as the spread of water-borne diseases and mosquito breeding grounds	**M**	**L**
Episodic flooding and flash floods can be enhanced by man-made interferences, causing the inundation of residences, damage of infrastructure, disrupt operations and even drownings of humans and animals	**L**	**L**
Redirecting surface flow through man-made interferences can enhance the fluvial erosion potential	**M**	**L**
Surface water can be contaminated through discharges (of sewage and dirty water), waste and discarded items, and leaks and spills (of hazardous substances)	**L**	**L**
Surface water can spread alien invasive aquatic organisms when accidentally released into the channels of the Cuvelai Basin	**L**	**L**
Biodiversity:		
Loss of biodiversity (e.g. removal of vegetation, road kills, etc.)	**M**	**L**
Change, fragmentation or loss of the (modified) habitats	**M**	**L**

Potential Impact	Significance	
	Before mitigation	After mitigation
Introduction and spread of opportunistic, less usable plants, or even alien invasive plants	**L**	**L**
Temporary or permanent blockage, channelling or redirecting the surface water can interfere with water's vital role as ecological driver	**M**	**L**
Noise:		
Noise disturbance to third parties (closest sensitive noise receptors)	**L**	**L**
Air quality:		
Air pollution, dust nuisance and increased risk of health impact to third parties (closest receptors)	**L**	**L**
Socio-economic:		
Economic impacts – construction and operational phases	**H+**	**H+**
Job Creation And Skills Development	**H+**	**H+**
Potential negative social impacts associated with the construction workers in the area	**M**	**L**

Taking the above-mentioned into consideration, Namisun believes that all environmental and social aspects and potential impacts associated with the proposed Okahao Bulk Infrastructure Project were identified, described and appropriately assessed.

It is recommended that, if MEFT provides a positive decision on the application for the proposed Okahao Bulk Infrastructure Project, they should include a condition to the clearance that DWN must implement all commitments in the ESMP.

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