LANGER HEINRICH URANIUM'S RETURN TO PRODUCTION ENVIRONMENTAL SCOPING (INCLUDING IMPACT ASSESSMENT) REPORT

FOR

LANGER HEINRICH MINE ECC RENEWAL APPLICATION

AND

LANGER HEINRICH MINE WATER SUPPLY SCHEME AMENDMENT APPLICATION

July 2023

Report prepared for:

Langer Heinrich Uranium (Pty) Ltd

Namibia Water Corporation Ltd

DOCUMENT CONTROL

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EXECUTIVE SUMMARY

1. GENERAL INTRODUCTION

Langer Heinrich Uranium (Pty) Ltd (LHU) operates the Langer Heinrich Mine (LHU), situated in the Namib Naukluft National Park (NNNP) approximately 80 km to the east of Swakopmund in the Erongo Region of Namibia (see Figure 1). The mining, processing and associated activities are approved under the mining licenses (ML140 and ML172). LHU is 75% owned by Paladin Energy Australia, with CNNC Overseas Uranium Holding Limited, a subsidiary of China Nuclear Corporation, holding the remaining 25%.

Namibia Water Corporation Ltd (NamWater) owns and operates the bulk water supply pipeline (i.e. the "Swakopmund-Langer Heinrich Water Supply Scheme") to LHU. The pipeline is routed from the Swakopmund Base Reservoir, following the C28 Road (aboveground) to the LHU access road, where it is underground. There is also an above ground water pipeline and associated gravel track between the Swakop River boreholes and the mine, running alongside the Langer Heinrich Mountain towards the operations area.

LHU was placed under Care and Maintenance in June 2018 due to the prevailing low uranium price. A pre-feasibility study to restart the mine and Return to Production was completed in June 2020 followed by a valued add study in June 2021. In July 2022 Paladin Energy announced the final investment decision to restart LHU, planned in the first quarter of 2024. According to the Mine Restart Plan, mining and processing is envisioned for a further 17 years - i.e. a Life of Mine (LOM) until 2041. The first two years of operation will be from existing ore stockpiles, whereafter mining will recommence in 2025.

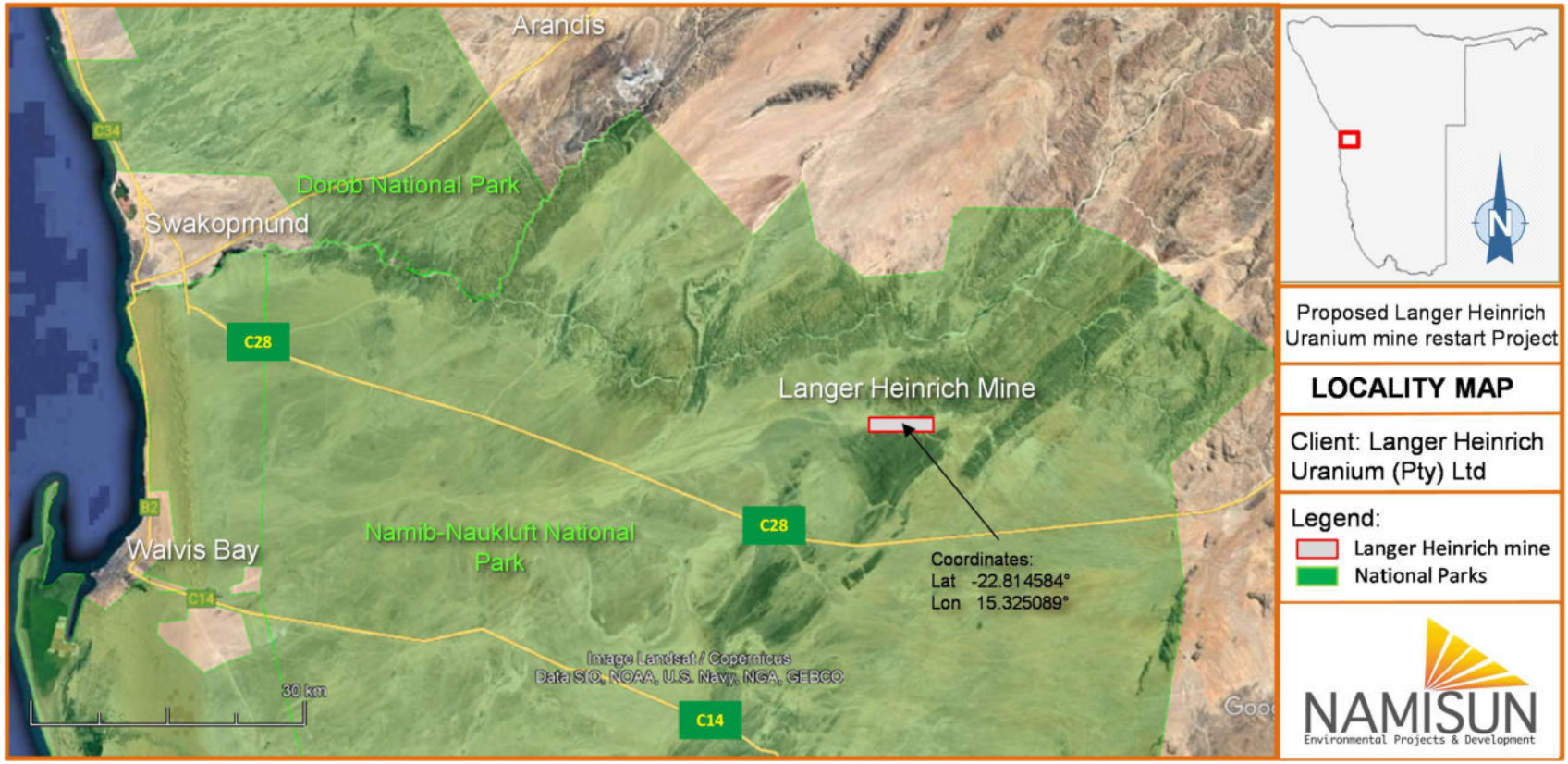

FIGURE 1: REGIONAL MAP TO SHOW THE LOCATION OF LHU IN THE ERONGO REGION

Various Environmental Impact Assessment (EIA) processes were previously conducted for LHU's activities and approved by the Ministry of Environment, Forestry and Tourism (MEFT) - Directorate of Environmental Affairs (DEA). The current ECC for the mining, processing and associated activities expires in August 2023. The ECC for the NamWater Water Supply Scheme is valid until 29 January 2024.

LHU is in the process of renewing its ECC. Namisun Environmental Projects & Development (Namisun) has been appointed by LHU as the independent Environmental Assessment Practitioner to assist with the ECC renewal application for LHU.

Along with the recommencing of the operation, the proposed changes to the activities and the associated key environmental impacts will be 're-assessed' and, where relevant, the approved LHU Environmental Management Plan (EMP) reviewed and amended as part of the renewal application of the current valid ECC.

Furthermore, the pump stations of the existing NamWater Water Supply Scheme to the mine will be upgraded to allow for increased water supply to the mine. An application for an amendment to NamWater's ECC, will be submitted to the MEFT (Environmental Commissioner) in terms of the Environmental Management Act, 7 of 2007 and Regulations 19 and 21 of the EIA Regulations (January 2012). The associated Environmental aspects and potential impacts are also addressed in this report.

2. ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

Environmental Impact Assessments (EIAs), renewal applications and amendment applications 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 Environmental Management Act, No. 7 of 2007.

Key changes implied by the Return to Productions of LHU, that require (re)assessment, are the following:

- The existing Final Product Recovery (FPR) is dismantled and replaced with an upgraded facility. The refurbished FPR is planned to have two stacks.
- The three pump stations of the existing NamWater bulk water supply pipeline to the mine will be upgraded to increase water supply to LHU.
- An additional (third) bladder reservoir for water is planned to secure water supply to LHU.
- An 11 kV powerline will be installed to supply electricity to the pump station at the borehole where water is abstracted from the Swakop River. In addition, a booster pump station will be installed approximately halfway between the borehole and the mine. This booster station will also be supplied with electricity from the powerline. Between the mine site and the booster station the powerline will be aboveground, between the booster station and the Swakop River the powerline will be underground. (Note: An above ground powerline was however previously assessed and approved by MEFT (Metago, 2009).

The impacts of these proposed changes are described and assessed in this Scoping (including impact assessment) Report. The EIA process includes an internal screening phase and a scoping phase, which includes an impact assessment. Two parallel Application processes are being conducted, as described below:

- An application for the renewal of the existing (approved) ECC for LHU will be submitted to the regulatory authority, the DEA of the MEFT. The existing (approved) EMP for LHU will be amended and accompany this report and application. Other relevant support documents, as required by MEFT, will also be submitted with the application to MEFT.

- An application for an Amendment to NamWater's ECC for the pipeline between Swakopmund and LHU. The existing (approved) EMP for the pipeline will be amended and submitted with this report and application to MEFT.

A final decision relating to the above-mentioned applications will be made by the DEA of the MEFT.

The EIA process and corresponding activities which have been undertaken for the ECC applications are outlined in Table 1 (in accordance with the requirements outlined in the EIA Regulations of 2012, where relevant).

2.1 Opportunity to comment

This Scoping (including impact assessment) Report was distributed for public / authority review. I&APs are invited to comment on these documents, which were available for a review and comment period from **12 July to 25 July 2023**. Comments need to be sent to Namisun at the telephone e-mail address shown below by no later than **25 July 2023**.

Namisun
Attention: Werner Petrick
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3. PROJECT DESCRIPTION RETURN TO PRODUCTION PROJECT DESCRIPTION – CURRENT AND FUTURE ACTIVITIES

As part of the Return to Production plans, a pre-feasibility study was completed in June 2020 followed by a valued add study in June 2021. In July 2022 Paladin Energy announced the final investment decision to restart LHU. Return to Production is planned to commence in the first quarter of 2024. The first two years of operation will be from existing ore stockpiles, where after mining will recommence in 2025. The LOM is envisioned for a further 17 years - i.e. until 2041.

Various refurbishment activities and process upgrades are being undertaken at the process plant for increased process efficiency and throughput. Section 4.2 of the Main Report provide a description of the current and proposed plans undertaken as part of the Return to Production of LHU. It also provides further information relating to the proposed upgrades of the bulk water supply scheme to the mine. Where relevant, the proposed new activities and infrastructure are compared with those assessed / approved in the original EIAs, i.e. the Stage 3 Expansion as well as the stage 4 Expansion EIAs. Table 1 contains the details about this comparison. Note: Detailed project descriptions (i.e. mining, processing and associated activities and facilities) can be found in the original / approved EIAs and will not be repeated here. Key activities considered as part of this EIA process are summarised in the sections below.

TABLE 1: SUMMARY OF THE PROPOSED RESTART ACTIVITIES COMPARED WITH EARLIER EIAS

FACILITY / ACTIVITY	PREVIOUS APPROVED EIA(S) (Considering both Stage 3 and Stage 4 EIAs)	PROPOSED RESTART PLANS
LOM	~17 years	Remaining LOM is 17 years from Q1 2024
Mining	Conventional open pit mining methods. Currently, no change in mining planned. Refer to Figure 3 for the total planned mined area.	
Processing method	Alkali (tank) leaching	
Processing rate (Production of uranium oxide)	Up to 10 Mlbpa	~5.5 Mlbpa at restart, working towards 5.9 Mlbpa.
Mine residues (waste rock)	No current changes planned for the previous assessed / approved Waste Rock Dumps (WRDs)	
Processing residues (i.e. tailings)	No change currently planned for the in-pit tailings deposition activities.	
Water requirements and supply	NamWater supply: 1.5 million m^3/a (Stage 3) and up to ~7.5 m^3/a (Stage 4). Swakop River abstraction:	NamWater supply: 2.2 Mm3/a. Swakop River abstraction: ~0.330 Mm^3 per annum

FACILITY / ACTIVITY	PREVIOUS APPROVED EIA(S) (Considering both Stage 3 and Stage 4 EIAs)	PROPOSED RESTART PLANS
	0.5 Mm^3 per year.	
Power supply	Electricity supply from the NamPower Kuiseb Substation connecting to the mine via a 50 km 66 kV power line will remain. A diesel generator facility is used to augment the NamPower supply.	
Mine access	Gravel access road from the C28 to LHU. Improvements to the road condition would be required as part of the mine restart.	

3.1 Processing

As before, alkali leach processing is proposed, with upgrades to increase the U_3O_8 production by ~15% above historical capacity. Restart production targets have been increased to 5.5 Mlbpa (at restart, working towards 5.9 Mlbpa) from the previous 3.4 Mlbpa. This will be achieved by increasing the runtime from 85% to 90% and the mill feed rate from 448 tons per hour (tph) to 700 tph. Upgrades in the front-end of the process include improved chute designs, a second teeter bed classifier and cyclone modernisation. A dust extraction system will be installed to address previously problematic dust generating areas.

Leach feed surge tanks will be installed prior to the leach circuit to improve process stability. The alkali tank leach circuit will remain unchanged. The solids washing thickener circuit will be upgraded with minor feed well retrofits. The tailings dewatering system will be upgraded to improve water recovery within the process. The recovering and recirculating of recovered tailings solution remain unchanged. A final product thickener is being installed to improve product quality. The existing FPR building and associated equipment is being dismantled and replaced with a fit for purpose building with upgraded process equipment.

Historically LHU produced UO_4. The existing FPR will be dismantled and replaced with an upgraded facility with two separate stacks. The first stack will emit filtered air from the final product packaging unit and the second stack will vent treated off gas from the FPR process. The upgraded facility will produce higher quality product in the form of U_3O_8 via an improved product washing and calcination process. Further details of the two stacks are provided in Table 2.

TABLE 2: DETAILS OF THE TWO STACK AT THE NEW FPR

DESCRIPTION	STACK 1	STACK 2
Technology	Wet scrubber with packed bed followed by hepa filter	Drum packaging unit dust extraction system consisting of bag house followed by hepa filter and stack.
Stack height	~20 m	~20 m
Stack diameter	150 mm	150 mm
Exist velocity	~15 m/h	~10-20 m/h
Exist temperature	25-35 degC	25-35 degC
Emission / off gasses - description / composition	Water vapour with negligible $CO_2/SO_2/SO_3$ content.	Air with particulate concentration of <50 mg/m^3

3.2 Water supply to LHU

Water requirements will increase from 1.84 Mm^3/a (i.e. operations prior to care and maintenance) to 2.2 Mm^3/a. Historically, water usage was typically in the range of 0.45-0.50 m^3/t of Run of Mine (ROM) feed. Restart unit water consumption is envisaged to be ~0.40 m^3/t as a result of the process changes. The primary drivers for the increased water consumption include reagent make-up and consumption, reverse osmosis (RO) permeate production and process water balance stability.

3.2.1 NamWater supply

NamWater owns and operates the bulk water supply pipeline (i.e. the "Swakopmund-Langer Heinrich Water Supply Scheme") to LHU. The current water pipeline along the C28 Road to the LHU access road, the aboveground section, as well as the underground section from the LHU turnoff to the mine site will remain as is (i.e. the pipe diameter is big enough). However, the height of the pump station buildings will be made higher to accommodate the larger pumps and associated infrastructure necessary for the increase in supply from the current 1.84 Mm^3 /a to the future 2.2 Mm^3/a. The footprint of these pump stations will stay unchanged.

The height of the pump stations will increase from ~7.5 m to ~5.4 m. Access to the pump stations will be from the C28 road and it is expected that the construction activities will be confined to the already disturbed reserve between the C28 road and the pipeline. NamWater has a valid ECC for the Swakopmund-Langer Heinrich Water Supply Scheme which expires on 29 January 2024. NamWater will submit an application (i.e. amendment application) to the DEA for the proposed upgrades to the pump stations.

3.2.2 Swakop River water abstraction and associated infrastructure (including a new 11 KV powerline)

Water abstraction from the Swakop River will resume from the existing abstraction boreholes in the river. The same pipeline will be used, but an additional (electric) booster pump station will be installed approximately halfway between the boreholes and the mine (refer to Figure 2 for the existing route). The booster pump station will be located on a small hill, ~100 m north-west of the pipeline. An 11 kV powerline[1] will be installed along the pipeline towards the pumpstation at the abstraction boreholes in the Swakop River. The pumpstation at the Swakop River will become electric as a result. The length of the existing pipeline and future powerline is ~15 km. Water abstraction from the Swakop River will remain within the limit of the permit, i.e. <332,000 m^3/a. Renewal of the water abstraction permit is not part of the scope of work of this report (and associated assessments) and is the task of LHU.

Between the mine site and the booster station the powerline will be aboveground. Between the booster station and the Swakop River the powerline will be underground. A standard single monopole HLPCD (Horizontal Line Post Compact Delta) structure is proposed for the above-ground section of the powerline. The HLPCD structure has a single wooden pole ~ 9 m high above ground level, maximum span length 120 m. An A-frame structure may be used as a strain structure. This structure comprises a single wooden pole with steel A-frame. The A-frame pole is also earthed by means of a vertical cable mounted on the pole; the earth should be gapped, as above. For either of the above structures, step-down/transformer structures would be needed at the end of the power line, to step down the current before distribution on site.

A single electrical cable will be installed.

[1] Note: An above ground powerline assessed and approved by MEFT as part of LHU's Stage 3 Expansion EIA process It was stated that "if a power line is used to supply power to the additional Swakop River abstraction boreholes, this line will follow the existing pipeline and associated gravel track. Wooden poles (9m in height) will be erected approximately every 100m in 1.5m deep holes of approximately 250mm diameter. These holes are drilled by truck mounted rig that will have to drive along the existing gravel road" (Metago, 2009).

FIGURE 2: SWAKOP RIVER PIPELINE ROUTE

3.2.3 Water storage at the mine

LHU is planning to convert an existing brine pond to a new (3rd) water storage bladder next to the existing two bladders with the intension to increase onsite water storage to cater for supply interruptions. The existing two bladders' joined capacity is 50 000 m^3. The new bladder will have a capacity of 12 000 m^3.

3.3 Employment

Employment at LHU is summarized in Table 3.

TABLE 3: EMPLOYMENT AT LHU

PHASE	PERMANENT EMPLOYEES	CONTRACTORS	COMMENTS
Care and Maintenance Phase	15	50	As of end June 2022
Refurbishment of process plant (current phase)	23	755	As of end June 2023
LHU restart production phase	306	~279	Based on December 2027 information

3.4 Mine restart schedule

LHU has commenced with the repair and refurbishment of existing infrastructure and equipment at LHU. Construction completion is due in October 2023. Completion of equipment energisation and no-load testing is planned for November 2023. Cold and hot commissioning activities are expected to commence in December 2023 with first product production targeted for Q1 2024.

Production will resume from existing ore stockpiles for the first 18 months as production rates are gradually ramped up. Mining operations are planned to commence in 2025.

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

Table 4 provides a summary of the activities associated with the 'Return to Production project' and the associated key 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 the Main Report. The relevance of the potential impacts ("screening") is presented in Table 4 to determine which aspects / potential impacts need to be assessed in further detail (Chapter 8 of the Main Report).

TABLE 4: KEY ENVIRONMENTAL IMPACTS AND ASPECTS ASSOCIATED WITH THE RETURN TO PRODUCTION PROJECT

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
Construction: • Refurbishments of the process plant. • Dismantling of FPR building. • Clearing of vegetation, site preparation, use of earthmoving equipment and machinery. • Establishing of working areas and laydown areas, waste handling facilities and construction staff amenities. • Materials delivery and laydown / storage. • Trenching, excavation. *Operations phase*: • Use of vehicles and equipment to do maintenance.	Construction activities can be disturbing / destroying **fauna (including avifauna) and flora** and habitats.	***General to all:*** In the broadest sense, biodiversity provides value for ecosystem functionality, aesthetic, spiritual, cultural, and recreational reasons. LHU and associated infrastructure fall within the NNNP. Construction activities related to the new powerline (i.e. sleeved powerline when placed underground or on ground surface) between the LHU site and the pump station at the Swakop River, the new booster pump station for the Swakop River Pipeline, the third bladder reservoir and the upgrade of the pump stations on the NamWater pipeline could cumulatively cause a loss of natural vegetation and could lead to habitat fragmentation and degradation. All of the expected construction work is not large-scale and is confined to small work areas though. The potential impacts on biodiversity (physical impacts and general disturbance), therefore include: • Loss of vegetation and associated fauna due to construction activities. • Impact on fauna movement. • Disturbance to habitats. ***Refurbishments of the LHU process plant and related activities and infrastructure, including the third water storage bladder:*** Most of the activities will be undertaken within the disturbed areas associated with the process plant, no additional impacts to biodiversity are expected. The proposed third bladder will be adjacent to the existing two bladders in an area with some level of disturbance. Taking the (relatively) small additional areas of disturbance into account, limited additional disturbance to biodiversity is expected. Also taking the commitments in the amended LHU EMP into account (relating to the above mentioned biodiversity impacts), no further assessment is required. ***Swakop River pipeline – new booster pump station and 11 kV powerline:*** With reference to Section 6.2, the booster pump station will be located on a small hill near the pipeline, previously disturbed. The limited disturbance of the proposed powerline infrastructure, (i.e. using the existing service track next to the pipeline during installation) will also cause limited additional disturbance to biodiversity. However, the assessment findings from the Stage 3 EIA (Metago, 2009) need to be taken into account during the implementation of the powerline, with the commitments in the EMP remaining relevant. In this regard "proposed power line that will follow the route of the existing pipeline and associated gravel track between the ML and the Swakop River. Parts of

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
• Operations of refurbished FPR area *Decommissioning and closure*		this pipeline route are situated in irreplaceable habitats. Despite this, the amount of disturbance that can be caused by the placement of a low voltage power line along the existing gravel track is limited, particularly in the managed scenario" (Metago, 2009). Taking the above into account and the commitments in the amended LHU EMP (relating to the above mentioned biodiversity impacts), no further assessment is required.
		Amendment to NamWater's Swakopmund - LHU Water Supply Scheme - increased height of the pump stations: With reference to Section 4.6.2.1, the footprint of the pump stations will stay unchanged. Access to the pump stations will be from the C28 road and it is expected that the construction activities will be confined to the already disturbed reserve between the C28 road and the pipeline. Therefore, limited additional disturbance to biodiversity is expected. Taking the commitments in the amended NamWater EMP into account, no further assessment is required.
	Activities and infrastructure disturbing / killing **avifauna** (specifically)	***Swakop River pipeline – new booster pump station and 11 kV powerline:*** Potential impacts on avifauna related to the aboveground section of the powerline (i.e. between the mine site and the booster pump station) include the following: • Bird collisions with infrastructure. • Bird electrocutions on power line infrastructure. With reference to Section 6.2, twelve priority species are at risk mainly due to collision impacts, and electrocutions in some cases, in the event of the powerline being aboveground. Refer to Section 8 for the assessment of the potential impacts on avifauna.
	Air quality can worsen	***Refurbishments of the LHU process plant and related activities and infrastructure*** Emissions from the stacks of the refurbished FPR can result in air pollution and lead to an increased risk of health impacts to third parties. Also, the six (6) diesel generators with a total generation capacity of 10MW, will be used as back-up power generation for approximately 18 hours per year. Refer to Section 8 for the assessment of the potential impacts on air quality.

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
	New structures and infrastructure can contribute to overall **visual** impacts	***General to all:*** Visual impacts on this receiving environment may be caused by activities and infrastructure in all mine phases. Potential visual impacts therefore include: • General visual impacts and sense of place.
		Refurbishments of the LHU process plant and related activities and infrastructure, including the third water storage bladder: The activities (and infrastructure) are all being conducted within the footprint of the current operations at LHU and will not add cumulatively to the visual impacts to third parties (i.e. from Bloedkoppie). No further assessment is required.
		Swakop River pipeline – new booster pump station and 11 KV Powerline: The existing pipeline follows a route (north of the Langer Heinrich Mountain) where no tourism activities are allowed / undertaken. The only visual receptor is Farm Riet, located near the Swakop River abstraction boreholes. The powerline will be at ground level, next to the existing pipeline and would cause very limited additional (cumulative) visual disturbance near the Swakop River. No further assessment is required.
		Amendment to NamWater's Swakopmund - LHU Water Supply Scheme - increased height of the pump stations: Due to the increased height of the pump station buildings along the NamWater pipeline the potential cumulative visual impacts can increase during operations, along the C28 road. Refer to Section 8 for the assessment of the potential visual impacts.
	Archaeological / heritage sites can be damaged during construction, operational and	***General to all:*** The construction, operational (maintenance) and decommissioning activities have the potential to encroach upon, disturb, damage or destroy archaeological remains protected under the National Heritage Act (27 of 2004). This risk remains, even though all known archaeological are outside of the expected work areas.

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
	decommissioning activities.	***Refurbishments of the LHU process plant and related activities and infrastructure, including the third water storage bladder:*** Most of the activities will be undertaken within the disturbed areas associated with the process plant, no additional impacts to archaeology are expected. The proposed third bladder will be adjacent to the existing two bladders in an area with some level of disturbance with no previously identified archaeological / heritage sites. Taking the (relatively) small additional areas of disturbance into account, no disturbance to archaeological / heritage sites is expected. Taking the commitments in the amended LHU EMP into account (including a standard Chance Find Procedure for the managing of discoveries made), no further assessment is required.
		Swakop River pipeline – new booster pump station and 11 kV powerline: With reference to Section 6.4, various archaeological sites are situated near the existing pipeline. Further construction activities associated with the booster pump station and the new powerline have the potential to encroach upon, disturb, damage or destroy these sites. The Stage 3 EIA (Metago, 2009 with Kinahan 2009) already assessed the overall Archaeological impacts at LHU, including a proposed powerline along the Swakop River. However, due to the sensitivities and LHU's proposal to possibly install the powerline underground in certain sections, this issue was re-assessed, Refer to Section 8 for the assessment of the potential archaeological / heritage impacts.
		Amendment to NamWater's Swakopmund - LHU Water Supply Scheme - increased height of the pump stations: With reference to Section 4.6.2.1, the footprint of the pump stations will stay unchanged. Access to the pump stations will be from the C28 road and it is expected that the construction activities will be confined to the already disturbed reserve between the C28 road and the pipeline. Therefore, no disturbance to archaeological / heritage sites is expected. Taking the commitments in the amended NamWater EMP into account (including a standard Chance Find Procedure for the managing of discoveries made), no further assessment is required.

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
	Waste management	With reference to Section 4, the following relating to waste management: • Various 'construction related' waste of a diverse nature (i.e. general waste, hazardous (non-radioactive) and radioactive waste is generated – as part of the refurbishment activities. • The FPR is being dismantled and replaced with an upgraded facility. The waste being generated from these activities are largely radio-active contaminated and disposed / 'stored' in dedicated areas on TSF 2. Waste management commitments at LHU are included in the approved EMP. No further assessment is required, however, additional management and mitigation measure are included in the amended LHU EMP, specifically related to the future radio-active contaminated waste storage / disposal on site. LHU have already engaged with a Radiological Specialist to provide specialist input.
	Employment of people and **socio-economic** aspects.	The proposed Return to Production of LHU brings economic benefits, jobs and new skills to Erongo Region and Namibia. To the contrary, it is likely to induce negative social impacts such as in-migration and significant additional pressures on state services such as education and health. The potential impacts that were previously identified and assessment (as part of the original EIAs) include the following: • Economic impacts during construction, operations, decommissioning and closure. • Job creation and skills development during construction and operations. • Loss of jobs and livelihoods on decommissioning and closure. The return to production of the LHU, will ensure new employment opportunities and the above mentioned impacts (both positive and negative) remain relevant. However, the changes proposed will not cumulatively add to the previously assessed impacts and therefore no further assessment is required. The commitments in the LHU EMP remain valid.

The issues that were identified as requiring further assessment; and the assessment findings are summarised in Table 5.

TABLE 5: SUMMARY OF POTENTIAL IMPACTS WITH (RE) ASSESSMENT

Potential Impact	Significance	
	Before mitigation	After mitigation
Refurbishments of the LHU process plant and related activities and infrastructure:		
Air pollution and increased risk of health impact to third parties relating to the stacks of the refurbished FPR.	**L**	**L**
Swakop River pipeline – new booster pump station and 11 kV powerline:		
Bird collisions and electrocutions with the proposed new 11 kV powerline infrastructure for the Swakop River pipeline.	**M**	**L**
Damage or destruction of archaeological sites during the construction (and maintenance / decommission) activities of the 11 kV powerline and booster pumpstation.	**H**	**L-M**
Amendment to NamWater's Swakopmund - LHU Water Supply Scheme - increased height of the pump stations:		
Potential cumulative visual impacts as a results of the higher pump station buildings.	**M**	**M**

Management and mitigation measures and monitoring requirements are presented in the (amended) EMPS.

5. WAY FORWARD

The way forward is as follows:

- Distribute the EIA Amendment Report and a summary thereof for review by the IAPs and authorities.
- Receive comments from IAPs and authorities by (latest) 25 July 2023.
- Consider all comments received, update reports (where relevant) and submit the final report to the MEFT.
- MEFT review the documentation and provide record of decision.

6. ENVIRONMENTAL IMPACT STATEMENT AND CONCLUSIONS

It is Namisun's opinion that the environmental aspects and potential impacts relating to the 'Return to Production project' and associated activities, including the increased water requirements to the mine have been successfully identified. The following environmental aspects and their overall cumulative impacts associated with the proposed activates had to be assessed / re-assessed, taking the assessment findings of the original / approved EIAs (where relevant); the baseline environmental conditions; and the proposed project changes into consideration:

Refurbishments of the LHU process plant and related activities and infrastructure:

- Air quality:
    - Air pollution and increased risk of health impact to third parties relating to the stacks of the refurbished FPR.

Swakop River pipeline – new booster pump station and 11 kV powerline:

- Avifauna:
    - Bird collisions with powerline infrastructure.
    - Bird electrocutions on power line infrastructure.
- Archaeology:
    - Damage or destruction of archaeological sites.

Amendment to NamWater's Swakopmund - LHU Water Supply Scheme - increased height of the pump stations:

- Visual and sense of place :
    - Potential cumulative visual impacts as a result of the increased height of the pump station buildings.

The results of this impact assessment present the potential for additional negative environmental impacts. The return to production of the LHU, will however ensure new employment opportunities and the potential socio-economic impacts (both positive and negative) previous assessed for the LHU operations remain relevant.

The commitments in the LHU EMP and the NamWater EMP were both review and updated, where relevant.

Namisun therefore believes that all environmental aspects and potential impacts associated with the proposed 'Return to Production project' for LHU were identified, described and appropriately assessed. However, any future changes proposed by LHU relating to mining, processing (including handling and disposal of tailings and associated tailings storage facilities (TSFs), etc.) will be subject to further assessments and an amendment application of the LHU ECC. The associated activities / facilities and potential impacts associated with such changes were therefore not considered in this report.

It is recommended that, if MEFT provides a positive decision on the two applications for the proposed project changes, they should include a condition to the clearances that both LHU and NamWater must implement all commitments in the two amended EMPs.

LANGER HEINRICH MINE'S RETURN TO PRODUCTION ENVIRONMENTAL SCOPING (INCLUDING IMPACT ASSESSMENT) REPORT

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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
amsl	Above mean sea level
AQO	Air quality objectives
CV	Curriculum vitae
DEA	Department Environmental Affairs
EAP	Environmental Assessment Practitioner
EAPAN	Environmental Assessment Professionals Association of Namibia
ECC	Environmental Clearance Certificate
EIA	Environmental Impacts Assessment
EMP	Environmental Management Plan
EMS	Environmental Management System
EPL	Exclusive Prospecting License
FPR	Final Product Recovery
ha	Hectares
HFO	Heavy Fuel Oil
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
I&APs	Interested and / or affected parties
IBA	Important Bird Area
IFC	International Finance Corporation
km	kilometre
kV	Kilo Volt
LOM	Life of Mine
LHU	Langer Heinrich Mine
LHU	Langer Heinrich Uranium
m	Metre
m^3/t	Cubic metre per ton
MEFT	Ministry of Environment, Forestry and Tourism
ML	Mining Licence
mlbpa	million pounds per annum
MME	Ministry of Mines and Energy
Mm^3/a	Million cubic meters per annum
MoHSS	Ministry of Health and Social Services
MTPA	Million tons per annum
NDP	National Development Plan
NGO	Non-governmental organisation
NNNP	Namib-Naukluft National Park
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NPC	National Planning Commission
NSA	Namibia Statistics Agency

O_2	Oxygen
PM	Particulate matter
(Pty) Ltd	Proprietary Limited
ROM	Run of Mine
SEMP	Strategic Environmental Management Plan
SO_2	Sulphur dioxide
TSF	Tailings storage facility
TSP	Total suspended particles
WHO	World Health Organization
WRD	Waste Rock Dump

1 INTRODUCTION

This chapter describes the purpose of this report, briefly describes the background to the ECC amendment and renewal processes, summarizes the applicable legislative requirements, explains the report structure, summarizes the assumptions and limitations relevant to this report, and explains how the input from Interested and Affected Parties (I&APs) was included.

1.1 BACKGROUND

Langer Heinrich Uranium (Pty) Ltd (LHU) operates the Langer Heinrich Mine, situated in the Namib Naukluft National Park (NNNP) approximately 80 km to the east of Swakopmund in the Erongo Region of Namibia (see Figure 1). The mining, processing and associated activities are approved under the mining licenses (ML140 and ML172).

LHU is 75% owned by Paladin Energy Australia, with CNNC Overseas Uranium Holding Limited, a subsidiary of China Nuclear Corporation, holding the remaining 25%.

The existing mine access road joins the C28 road to Swakopmund and the site has an existing water pipeline and power connection (see Figure 2). The power line servitude to LHU runs from the Kuiseb Substation straight to the access road, from where it runs parallel with this road to the mine. There is also an above ground water pipeline and associated gravel track between the Swakop River boreholes and the mine, running alongside the Langer Heinrich Mountain towards the operations area. Namibia Water Corporation Ltd (NamWater) owns and operates the bulk water supply pipeline (i.e. the “Swakopmund-Langer Heinrich Water Supply Scheme”) to LHU. The pipeline is routed from the Swakopmund Base Reservoir, following the C28 Road (aboveground) to the LHU access road, where it is underground.

LHU was placed under Care and Maintenance in June 2018 due to the prevailing low uranium price. A pre-feasibility study to restart the mine and Return to Production was completed in June 2020 followed by a valued add study in June 2021. In July 2022 Paladin Energy announced the final investment decision to restart LHU, planned in the first quarter of 2024. According to the Mine Restart Plan, mining and processing is envisioned for a further 17 years - i.e. a Life of Mine (LOM) until 2041. The first two years of operation will be from existing ore stockpiles, whereafter mining will recommence in 2025.

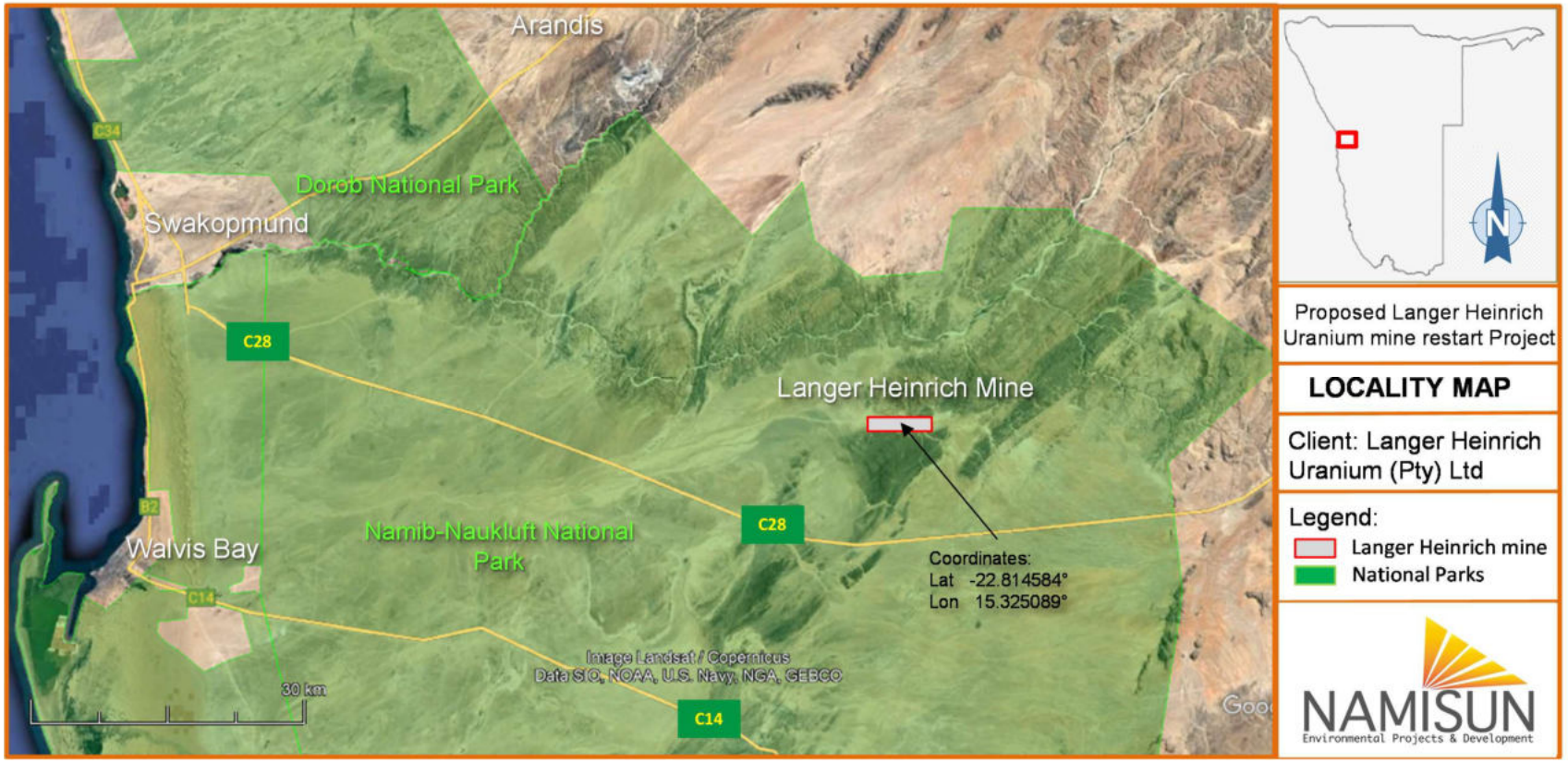

FIGURE 1: REGIONAL MAP TO SHOW THE LOCATION OF LHU IN THE ERONGO REGION

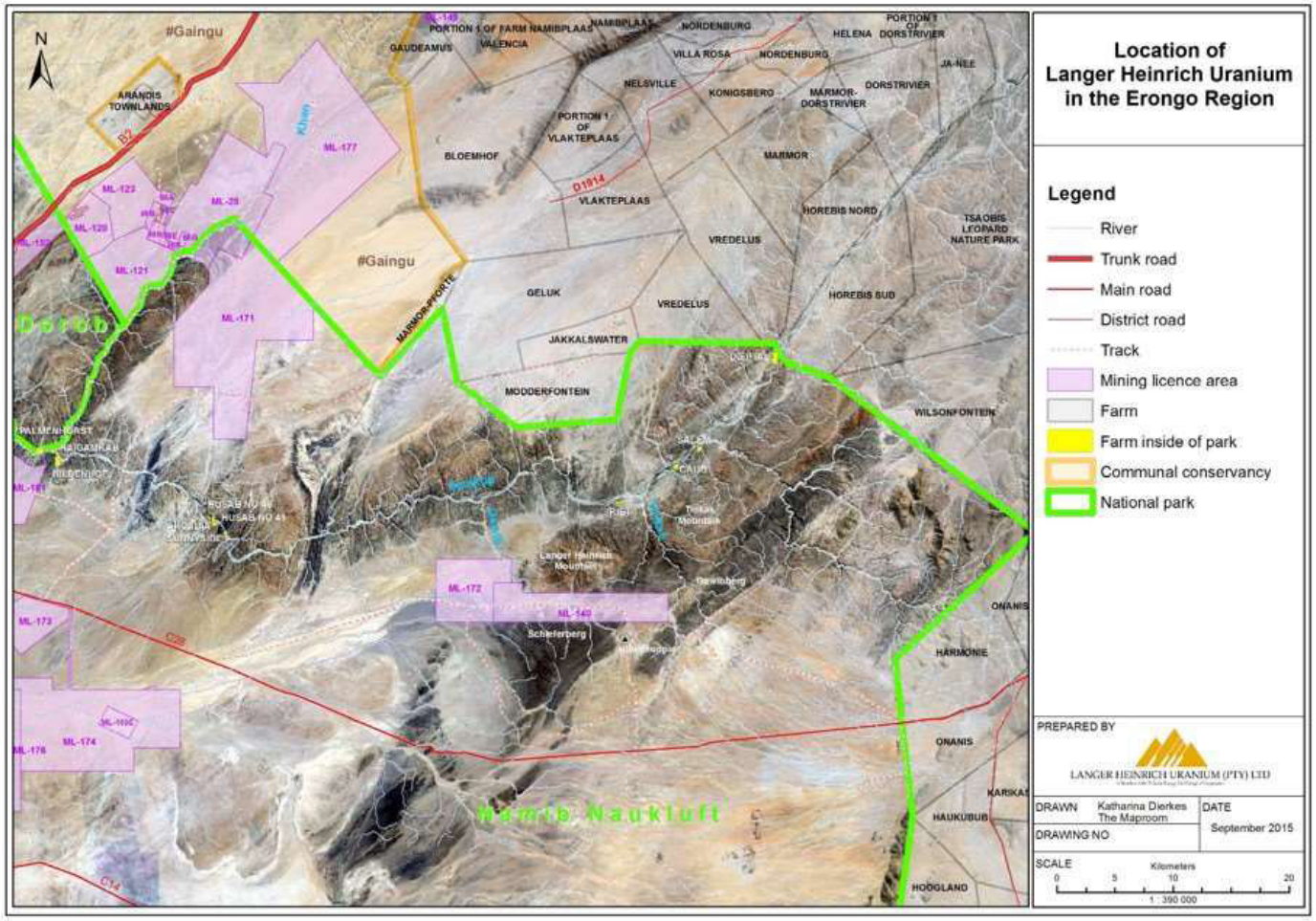

FIGURE 2: LOCATIONAL SETTING OF LHU

Various Environmental Impact Assessment (EIA) processes were previously conducted for LHU's activities and approved by the Ministry of Environment, Forestry and Tourism (MEFT) - Directorate of Environmental Affairs (DEA). The current ECC for the mining, processing and associated activities expires in August 2023. The ECC for the NamWater Water Supply Scheme is valid until 29 January 2024.

LHU is in the process of renewing its ECC. Namisun Environmental Projects & Development (Namisun) has been appointed by LHU as the independent Environmental Assessment Practitioner to assist with the ECC renewal application for LHU.

Along with the recommencing of the operation, the proposed changes to the activities and the associated key environmental impacts will be 're-assessed' and, where relevant, the approved LHU Environmental Management Plan (EMP) reviewed and amended as part of the renewal application of the current valid ECC.

Furthermore, the pump stations of the existing NamWater Water Supply Scheme to the mine will be upgraded to allow for increased water supply to the mine. An application for an amendment to NamWater's ECC, will be submitted to the MEFT (Environmental Commissioner) in terms of the Environmental Management Act, 7 of 2007 and Regulations 19 and 21 of the EIA Regulations (January 2012). The associated Environmental aspects and potential impacts are also addressed in this report.

1.2 Purpose of this Report

The main purpose of this Scoping (including impact assessment) Report is to provide background and context to some of the proposed changes associated with the Return to Production plans of LHU and to provide additional support to the ECC renewal application process. The potential impacts of the proposed changes are described and assessed in this Scoping (including impact assessment) Report (for more details about the proposed changes, see Section 1.4.1 and Chapter 4). Based on the proposed changes, the existing (approved) EMP for LHU and the existing (approved) EMP for NamWater's pipeline are reviewed and where relevant, changes / additional management and mitigation measures will be included in the amended EMPs.

At the same time this report provides relevant information in support of the application process for the renewal of the current ECC for LHU, which expires on 27 August 2023.

The report therefore includes (amongst other) a summary of the following tasks undertaken by Namisun:

- The identification of aspects and assessment of impacts related to the proposed changes at LHU and the subsequent amendment to its EMP.
- The identification of aspects and assessment of impacts related to the proposed changes to the Swakopmund-Langer Heinrich Water Supply Scheme and the subsequent amendment to its EMP. Note: The water supply and associated activities will be addressed through the relevant agreements between LHU and NamWater and the implied permits / authorisations and not part of the scope of this report.
- The LHU ECC renewal application (on behalf of LHU).
- The Swakopmund-LHU Water Supply Scheme Amendment application (on behalf of NamWater).

It is thought that this Scoping (including impact assessment) Report together with the amended EMPs for LHU and the Swakopmund-Langer Heinrich Mine Water Supply Scheme (and other support documents required by MEFT) will provide sufficient information for MEFT to make an informed decision regarding the two applications.

1.3 Motivation (Need and Desirability) for the applications

Construction of the LHU, process plant and associated infrastructure commenced in 2005, and staged commissioning of the plant began in August 2006. The mine was officially opened in March 2007. With reference to section 1.1, on 25 May 2018, Paladin announced that the LHU was to be placed on care and maintenance and stopped presenting ore to the plant. The mine was then placed under Care and Maintenance the following month. Prior to this, LHU conducted the mining, processing and associated activities, producing up to 5.2 million pounds per annum (Mlbpa) uranium oxide (U_3O_8).

With reference to section 1.1, Paladin Energy announced the final investment decision to restart LHU. Various refurbishment activities and process upgrades are being undertaken at the process plant for increased process efficiency and throughput. To ensure their ongoing compliance, LHU need to renew their current ECC, taking the 'Return to Production project' and associated activities, including the increased water requirements to the mine, into account.

1.4 Introduction to the Assessment Process

Environmental Impact Assessments (EIAs), renewal applications and amendment applications 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 Environmental Management Act, No. 7 of 2007.

Considering the Return to Production plans of LHU, the overall objectives of this assessment process are to:

- Provide information on the proposed changes because of the recommencement of LHU's activities.
- Describe the current environment by updating relevant information from the previous (approved) EIAs.
- Identify / update, in consultation with interested and affected parties (I&APs) the potential environmental (and social) aspects associated with the proposed changes.
- (Re-)assess the potential impacts associated with the 'return to production project'.
- Review management and mitigation measures required to avoid impacts or to mitigate such impacts to acceptable levels by updating the approved EMPs, where required.
- Provide information in support of the application for the renewal of the ECC for LHU and the amendment of NamWater's ECC for the LHU Water Supply Scheme.

1.4.1 Key considerations that require (re-)assessment

Key changes implied by the Return to Productions of LHU are the following:

- The existing Final Product Recovery (FPR) is dismantled and replaced with an upgraded facility. The refurbished FPR is planned to have two stacks.
- The three pump stations of the existing NamWater bulk water supply pipeline to the mine will be upgraded to increase water supply to LHU.
- An additional (third) bladder reservoir for water is planned to secure water supply to LHU.
- An 11 kV powerline will be installed to supply electricity to the pump station at the borehole where water is abstracted from the Swakop River. In addition, a booster pump station will be installed approximately halfway between the borehole and the mine. This booster station will also be supplied with electricity from the powerline. Between the mine site and the booster station the powerline will be aboveground, between the booster station and the Swakop River the powerline will be underground. (Note: An above ground powerline was however previously assessed and approved by MEFT (Metago, 2009).

More details are provided in Section 4.

The impacts of these proposed changes are described and assessed in this Scoping (including impact assessment) Report. The EIA process includes an internal screening phase and a scoping phase, which includes an impact assessment.

During the internal screening exercise, Namisun identified the need for an Avifauna Specialist Study and an Air Quality Specialist Study. Furthermore, the need for specialist input from a Geo-hydrologist to review the current EMP commitments was identified as part of the review application.

Existing information was used in this report and has been further augmented by a site visits, the additional specialist studies / input and input from I&APs. The potential cumulative impacts of the activities associated with the project could therefore be (re)assessed.

Based on the assessment of the proposed changes, the existing (approved) EMP for LHU as well as the existing EMP for the (NamWater) LHU Water Supply Scheme will be reviewed and where relevant, changes / additional management and mitigation measures are included in the two amended EMPs.

1.4.2 APPLICATION PROCESSES

Two parallel Application processes are being conducted, as described below:

- An application for the renewal of the existing (approved) ECC for LHU will be submitted to the regulatory authority, the DEA of the MEFT. The existing (approved) EMP for LHU will be amended and accompany this report and application. Other relevant support documents, as required by MEFT, will also be submitted with the application to MEFT.
- An application for an Amendment to NamWater's ECC for the pipeline between Swakopmund and LHU. The existing (approved) EMP for the pipeline will be amended and submitted with this report and application to MEFT.

A final decision relating to the above-mentioned applications will be made by the DEA of the MEFT.

The EIA process and corresponding activities which have been undertaken for the ECC applications are outlined in Table 1 (in accordance with the requirements outlined in the EIA Regulations of 2012, where relevant).

TABLE 1: THE EIA PROCESS RELATING TO THE TWO APPLICATIONS

Objectives	Corresponding activities
Project initiation and screening phase (March - May 2023)	
• Information requirements • Initiate the EIA scoping process.	• Project initiation meetings and site visits with the LHU team to discuss the proposed changes. • Early identification of environmental aspects and potential impacts that might result from the changes and determine additional legal requirements and application. • Meeting with the Environmental Commissioner (MEFT: DEA) to discussed the 'return to production project' and the process to be followed relating to the respective applications. • Decision on EIA process to be followed and specialists to be used in the process. • Identify key stakeholders and compose I&AP database.
Scoping (including assessment) phase (June – July 2023)	
• Involve I&APs in the scoping process through information sharing. • Identify further potential environmental issues. • Determine the terms of reference for additional assessment work. • Consider alternatives. • Provide further details associated with the potentially affected environment. • Assessment of potential environmental impacts • Develop management and mitigation measures. • ECC applications. • Receive feedback on the application.	• Notify authorities and I&APs of the proposed EIA process calls, newspaper advertisements and site notice). • I&AP registration and initial comments. • Conduct specialist studies (avifauna, air quality and geo-hydrology input). • Compilation of a Scoping (including impact assessment) Report and two amended EMPs. • Distribute the report and amended EMPs to key authorities and I&APs (registered) for review. • Update and finalise the report and EMPs • Submit the application for LHU's ECC renewal and NamWater's ECC amendment, the finalised Scoping (including impact assessment) Report, with the two amended EMPs, and I&APs comments to MEFT for decision-making. • Online submission of the relevant documents onto the MEFTs portal. • Communicate feedback to I&APs.

1.4.3 OUTLINE OF THIS REPORT

Table 2 outlines the content of the Scoping (including impact assessment) Report.

TABLE 2: REPORT OUTLINE

Chapter	Objective
Chapter 1: Introduction	Describes the background and the purpose of the report, the proposed amendments and process, explains the report structure, summarizes the assumptions and limitations, and explains how I&APs can comment.
Chapter 2: EIA process and methodology	Outlines the EIA (scoping and impact assessment) methodology and I&AP consultation process followed in the process for the two ECC applications.
Chapter 3: Legal framework	Provides an overview of relevant Namibian policies and applicable Namibian legislation and international conventions / treaties relevant to the LHU operations and the associated two applications.
Chapter 4: Overall project description, including the proposed changes	Provides a description of the past operations as well as the proposed changes implied by the Return to Production of LHU and related activities, including the upgrades to the existing LHU Water Supply Scheme and the subsequent considerations for (re)assessment that are necessary.
Chapter 5: Alternatives	Summarizes the alternatives.
Chapter 6: Description of the current environment	Provides a general overview of the current baseline conditions, against the context of the proposed project, also drawing from the baseline information provided in existing literature. Additional specialist studies were conducted to increase the baseline knowledge, where relevant.
Chapter 7: Identification and description of potential impacts	Outlines the environmental aspects and potential impacts that could change because of the proposed changes as a result of the Return to Production of LHU and related activities, including the upgrades to the existing LHU Water Supply Scheme. It reasons potential cumulative impacts, and which environmental aspects and potential impacts need further assessment.
Chapter 8: Impact Assessment	Assess / re-assess the key potential impacts (as identified in Section 7).
Chapter 9: Way forward	Explain the way forward in term of completing the EIA process and final submission of the applications to MEFT.
Chapter 10: Conclusion and recommendations	EIA conclusion and impact statement.
References	Reference list.

1.4.4 EIA TEAM

Namisun Environmental Projects and Development (Namisun) is an independent environmental consultancy firm appointed by LHU to undertake the application process for the renewal of LHUs' ECC for LHU and the amendment of NamWater's ECC for the LHU Water Supply Scheme.

Werner Petrick, the EIA project manager, has more than twenty-four years of relevant experience in conducting / managing EIAs, compiling EMPs and implementing EMPs and Environmental Management Systems (EMSs). 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 EIA 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 EMPs and EMSs in Namibia.

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

The environmental project team and proponent details for the EIA amendment process relating to the project is outlined in Table 3.

TABLE 3: EIA TEAM AND PROPONENT DETAILS

Team	Name	Designation	Tasks and roles	Company
Project proponent	Michael Binneman	ESG Practitioner	Technical input Implementation of the (amended) EMP for LHU	LHU
EIA Project Management Team	Werner Petrick	Lead EIA Practitioner	Management of the EIA process and reporting	Namisun
	Pierré Smit	EIA Project Assistant		
Avifauna	Ann and Mike Scott	Avifauna specialists	Specialist input incorporated into this report: Avifauna study and assessment	African Conservation Services cc
Air quality	Hanlie Liebenberg-Enslin	Air quality specialist	Specialist input incorporated into this report: Air Quality study and assessment	Airshed Planning Professionals
Groundwater and Surface Water	Arnold Bittner	Water Specialist	Review of current EMP commitments only	SLR Environmental Consulting (Namibia) (Pty) Ltd

1.5 Assumptions and Limitations

Refer to the Specialist Studies in Appendices D and E for specific assumptions and limitations. Some general assumptions are described below.

1.5.1 Previous assessments and technical information

It is assumed that the technical (project) information provided by the LHU-team is accurate. Furthermore, it is assumed that the baseline descriptions and assessments conducted as part previous studies, including the EIAs, are accurate.

1.5.2 Environmental assessment limit

The application process for the renewal of the LHU ECC focuses on the relevant changes (proposed) by LHU, as described in Chapters 4 (only).

Any future changes proposed by LHU relating to mining, processing (including handling and disposal of tailings and associated tailings storage facilities (TSFs), etc.) will be subject to further assessments and an amendment application of the LHU ECC. The associated activities / facilities and potential impacts are therefore not considered in this report.

1.6 Opportunity to Comment

This Scoping (including impact assessment) Report was distributed for public / authority review. I&APs are invited to comment on these documents, which were available for a review and comment period from **12 July to 25 July 2023**. Comments need to be sent to Namisun at the telephone e-mail address shown below by no later than **25 July 2023**.

Namisun
Attention: Werner Petrick
E-mail address: wpetrick@namisun.com
Cell number: +264 (0)81 739 4591

2 EIA PROCESS (SCOPING AND ASSESSMENT) METHODOLOGY

This chapter outlines the EIA (scoping and impact assessment) methodology and I&AP consultation process followed in the process for the two ECC applications.

2.1 INFORMATION COLLECTION

Namisun obtained baseline information relating to the changes implied by LHU's proposed Return to Production to identify the environmental aspects and potential impacts associated with the changes; and to assess the consequent impacts.

Information for the preparation of this Scoping (including impact assessment) Report was sourced from:

- EIA Report for the proposed Stage 4 expansion project and conversion of EPL 3500 to a ML at LHU (Metago, 2012).
- The current (approved) EMP for LHU (Metago, 2012).
- The current (approved) EMP for the Swakopmund-Langer Heinrich Mine Water Supply Scheme (NamWater, 2020).
- Mine Closure Plan for LHU.
- Bi-annual environmental management progress report for LHU July – December 2022.
- Quarterly groundwater monitoring report for LHU – January 2023 (SLR, 2023).
- An avifauna specialist study and assessment conducted by African Conservation Services cc (Dr Ann and Mike Scott) (refer to Appendix E for the Avifauna Specialist Report).
- An air quality specialist study and assessment conducted by Airshed (Hanlie Liebenberg-Enslin) (refer to Appendix D for the Air Quality Specialist Report).
- Atlas of Namibia (Mendelsohn et al., 2002).
- Technical information provided by LHU.
- Site visits by Namisun, relevant specialists and technical team.
- Consultations / input from I&APs.
- Google Earth.
- Additional references in the list of reference (see Chapter 11).

2.2 REPORT STRUCTURE

The content of this report is outlined in Table 3, 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 explains how the content relates to the required structure components described in the regulations.

TABLE 4: REPORT STRUCTURE

Component	Report reference
(a) Details of the Environmental Assessment Practitioner (EAP) who prepared the report	Section 1.4.4 and Appendix A
(b) A description of the proposed activity (i.e., proposed amendments)	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 2.3
(i) steps that were taken to notify potentially interested and affected parties of the proposed application;	Section 2.3.2 and Appendix B
(ii) proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the proposed application have been displayed, placed or given;	
(iii) a list of all persons, organisations and organs of state that were registered in terms of Regulation 22 as interested and affected parties in relation to the application; and	Section 2.3.1 and Appendix D
(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 2.3.3 and Appendix C
(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

Component	Report reference
(i) A description of all environmental 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 M
(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

2.3 Public Participation Process

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

Registered I&APs are being provided with the opportunity to comment on this report (see Section 1.6). 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 MEFT for decision-making.

Section 2.3.1 provides a summary of I&APs consulted, Section 2.3.2 describes the process that was followed and the issues that were identified are summarized in Section 2.3.3.

2.3.1 INTERESTED AND AFFECTED PARTIES

The broad list of persons, group of persons or organisations that will be informed about the project and receive a copy of this (Scoping) Report include:

- Government and parastatals – National, Regional and Local, including (amongst others) the following:
  - The Directorate of Mines at the MME.
  - The DEA at the MEFT.
  - The Directorate of Wildlife and National Parks at the MEFT.
  - NamPower.
  - NamWater.
- Namibian Uranium Association.
- Other I&APs that registered on the project.

These stakeholders were informed about the proposed Return to Production of LHU and the implied changes, the application process for the amendment of the existing (approved) ECC, the public consultation process, as well as the outcomes of the assessment by means of sharing this report for review and comments (see Appendix B).

The stakeholder database is included in Appendix D of this report.

2.3.2 STEPS IN THE CONSULTATION PROCESS

Table 5 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		
Notification meeting with MEFT	Meeting with the Environmental Commissioner (MEFT: DEA) to discuss the 'Return to Production project', previous EIAs and ECC in place; and the application process to be followed (i.e. linking to the ECC renewal Application).	March 2023
I&AP identification	The key stakeholder database was developed. This database is updated as and when required. A copy of the I&AP database is attached in Appendix D.	April 2023 – ongoing
Site notices	Site notices were placed at the LHU entrance to notify employees, workers and visitors of the proposed project, and the EIA process being following. Photos of the site notice that were displayed are attached in Appendix B.	May - June 2023
Newspaper Advertisements	Block advertisements were placed in the Market Watch (on the 5th of June and again the 12th of June 2023) as part of the following newspapers:	June 2023

TASK	DESCRIPTION	DATE
	• The Namibian Sun • Die Republikein • Allgemeine Zeitung Copies of the advertisements are attached in Appendix B.	
Key stakeholder and focus group meetings and submission of comments		
Focus group meetings	The abovementioned notifications and adverts stated the following: "Focus group meetings will be arranged. Please contact Namisun should you wish to either participate in one of them or to schedule a separate meeting." Furthermore I&APs were invited for comment: "If you would like your comments to be addressed in the application process, please submit them to Namisun by no later than 14 June 2023.". Specific Key Focus Group meetings will be arranged during review period of the report. The outcomes of these meetings will be summarised and attached as part of the final submission to MEFT.	July 2022
Comments and responses	All comments received will be considered and incorporated into the (final) report, where relevant – for submission to MEFT. A summary of all comments received will also be submitted to MEFT (as part of the final submission).	July 2023
Review of the report by I&APs and authorities and submission of application to MME and MEFT		
I&APs and authorities review the report and amended EMPs (Addendum)	An electronic copy of the report with the amended EMPs are available for review on request from Namisun. Summaries of the report will be distributed to the relevant authorities and I&APs via e-mail (see Appendix B). Authorities and I&APs have the opportunity to review the draft report and submit comments in writing to Namisun. The comments period commenced on the 12th of July 2023 and the closing date for comments is 25 July 2023.	July 2023
MEFT review of the applications and decision making	Namisun (and the appointed environmental specialists) will consider all the comments received during the review period. A copy of the final Scoping (including impact assessment) Report with the two application forms (i.e. renewal of LHU's ECC and Amendment of the Swakopmund-LHU Water Supply Scheme ECC); the existing (approved) ECCs; the two amended EMPs; the comments from authorities and I&APs; and other support documents required by MEFT will be submitted to MEFT for their final review for decision-making.	July 2023

2.3.3 SUMMARY OF THE ISSUES RAISED

The comments received from I&APs as a results of the newspaper adverts, are summarised in Table 7. All comments that will be received during the review period of the EIA Scoping (including Impacts Assessment) Report (this report), as well as the key stakeholder meetings, will be considered and incorporated into the (final) report, where relevant – for submission to MEFT.

A summary of all comments received will also be submitted to MEFT (as part of the final submission). Refer to Appendix I for correspondence from I&APs.

TABLE 6: SUMMARY OF COMMENTS BY I&APS WITH REPONSES

COMMENT / QUESTIONS / ISSUE RAISED	NAME / ORGANISATION	METHOD	RESPONSE
General			
Tumas Granite CC is the registered holder of EPL 7909, which directly borders or adjoins ML 140 and ML 172 over certain portions in the northern areas.	J. Hoffman	Letter dated 9 June 2023 (send per e-mail on the same date)	Noted.

3 LEGAL FRAMEWORK

This chapter provides an overview of relevant Namibian policies and applicable Namibian legislation and international conventions / treaties relevant to the LHU operations and the associated two applications.

The Republic of Namibia has five tiers of law and a few guiding policies relevant to environmental assessment 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 environment and mitigate against adverse environmental impacts.

3.1 RELEVANT ACTS

The following acts are relevant to environmental assessments in Namibia:

- The Public Health Act 36 of 1919.
- The Water Act, No. 54 of 1956 and Water Resources Management Act, No. 11 of 2013.
- National Monuments Act 28 of 1969.
- Soil Conservation Act, No. 76 of 1969 and the Soil Conservation Amendment Act, No. 38 of 1971.
- Hazardous Substance Ordinance, No. 14 of 1974.
- 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.
- Minerals (Prospecting and Mining) Act, No. 33 of 1992:

The management and regulation of mining activities are guided by the Minerals (Prospecting and Mining) Act, No. 33 of 1992 as well as the Minerals Policy of Namibia (2004), and fall within the jurisdiction of the MME, while the proposed generation of power also fall under the MME's mandate. Appropriate power generation licencing for this project is required.

- Namibian Water Corporation Act, No. 12 of 1997.
- Road Traffic and Transport Act, 1999 (No. 22 of 1999).
- The Forestry Act, No. 12 of 2001 as amended by the Forest Amendment Act, No. 13 of 2005 and its regulations of 2015.
- National Heritage Act, No. 27 of 2004.
- Electricity Act, No. 4 of 2007
- Labour Act, 2007 (No. 11 of 2007).
- Minerals (Prospecting and Mining) Amendment Act, 8 of 2008.
- Draft Protected Areas and Wildlife Management Bill (2009).
- Environmental Management Act, No. 7 of 2007 and its regulations of 2012.

3.2 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, 201/2018 – 2021/2022, guided by Vision 2030.
- Policy for the Conservation of Biotic Diversity and Habitat Protection, 1994.
- Policy for Prospecting and Mining in Protected Areas and National Monuments, 1999.
- Minerals Policy of Namibia (2004).
- Namibia's Second National Biodiversity Strategy and Action Plan (2013-2022).
- SADC Environmental Policy and Regulatory Framework for Mining (2001).
- SADC: Protocol on Mining.
- SADC: Protocol on Energy.
- National Environmental Health Policy (2002).
- National Waste Management Policy (2010).

- The National Climate Change Policy of Namibia (September 2010).
- New Equitable Economic Empowerment Framework Policy, 2011.
- National Rangeland Management Policy and Strategy of 2012
- National Agriculture Policy (2015).
- The National Policy on Prospecting and Mining in Protected Areas (2018).

Further discussion of the National Policy on Prospecting and Mining in Protected Areas is relevant to this particular case.

The MEFT and the MME released the "National Policy on Prospecting and Mining in Protected Areas" in June 2018. This Policy guides decision making with regards to exploration and mining in protected areas. The vision of the Policy is to "develop integrated and sustainable prospecting and mining in Namibia to support economic growth, whilst maintaining the integrity of ecosystems and natural resources, and avoiding degradation of areas highly sensitive for their ecological, social and/or cultural heritage value". The Policy provides, amongst others "protected areas with specific zones to be excluded from Prospecting and Mining".

The mine lease, as well as the NamWater pipeline are located within the NNNP, at 49,768 km^2 the largest game park in Africa and the fourth largest in the world.

MEFT developed a new Management Plan for the NNNP which provides guidelines in terms of revised management areas and management measures (MEFT, 2021). This Management Plan provides, amongst others, an overview of the NNNP; guidelines on the park management objectives, zonation and landscape-level conservation and development. It also describes conservation and management of biodiversity principles, cultural and historical, archaeological and paleontological assets and refers to adaptive management concepts and relevant infrastructure in the park.

3.3 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.
- United Nations Framework Convention on Climate Change (1992).
- 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).
- Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal (1989).
- United Nation Framework Convention on Climate Change, 1992.
- United Nations Convention on Biological Diversity (1992).
- 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.

3.3.1 Important Bird Areas

Important Bird Areas (IBAs) are sites of international significance for the conservation of birds at the global, regional (continental) or sub-regional (southern African) level, selected according to stringent criteria.

ML 140 and ML 172 fall within the NNNP, which is an IBA, and therefore potentially sensitive.

3.3.2 RECOMMENDED AIR QUALITY GUIDELINES AND TARGETS

Namibia does not have air quality guidelines or limits and reference is usually made to international ambient air quality guidelines and standards. The World Health Organisation (WHO) is widely referenced, including regional neighbours such as South Africa (SA) and Botswana who have air quality standards. As part of the Air Quality Management Plan (AQMP) developed for the Strategic Environmental Management Plan (SEMP) update in 2019, ambient guidelines for PM_{10} and $PM_{2.5}$ were determined to provide the necessary performance indicators for mines and industries within the Erongo Region. These guidelines were adopted in the Best Practice Guide for the Mining Sector in Namibia (Airshed, 2023 – refer to further refefnce in this report).

In the absence of guidelines on ambient air concentrations for Namibia, reference is made to the Air Quality Objectives (AQO) recommended as part of the SEMP AQMP. These objectives are based on the WHO interim targets and SA NAAQSs as listed in Table 7 (Airshed, 2023).

TABLE 7: PROPOSED AIR QUALITY OBJECTIVES FOR THE PROJECT

Pollutant	Averaging Period	Criteria	Reference
NO_2	1-hour average (µg/m³)	200[(a)]	WHO AQG & EC & SA NAAQS
	Annual average (µg/m³)	40	WHO IT1 & EC & SA NAAQS
SO_2	1-hour average (µg/m³)	350[(a)]	EC Limit & SA NAAQS (no WHO guideline)
	24-hour average (µg/m³)	50[(b)]	WHO IT2 (seen as a per 40% of the SA and EC limits)
	Annual average (µg/m³)	50	SA NAAQS (no WHO guideline)
Benzene	Annual Mean (µg/m³)	5	SA NAAQS (no WHO guideline)
Particulate matter (PM_{10})	24-hour average (µg/m³)	75[(b)]	WHO IT3 & SA NAAQS (as per SEMP AQMP)
	Annual average (µg/m³)	40	SA NAAQS (as per SEMP AQMP)
Particulate matter ($PM_{2.5}$)	24-hour average (µg/m³)	37.5[(b)]	WHO IT3 (as per SEMP AQMP)
	Annual average (µg/m³)	15	WHO IT3 & SA NAAQS (as per SEMP AQMP)
Dustfall	30-day average (mg/m²/day)	600[(c)]	SA NDCR & Botswana residential limit
		1 200[(c)]	SA NDCR & Botswana industrial limit
		2 400	Botswana Alert Threshold

Notes: [(a)] Not to be exceeded more than 88 hours per year (SA)

[(b)] Not to be exceeded more than 4 times per year (SA)

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

The criteria were 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 the arid environment of 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. Also, studies found that desert dust with an aerodynamic diameter 2.5 µm cause premature mortality.
- For SO_2, there is no IT3, and the IT2 was selected since the WHO states: “This would be a reasonable and feasible goal for some developing countries (it could be achieved within a few years) which would lead to significant health improvements that, in turn, would justify further improvements (such as aiming for the AQG value)”.
- The WHO provides no interim targets for NOx. The AQGs are in line with the SA NAAQSs and therefore regarded as achievable limits.
- The Botswana and South African criteria for dust fallout are the same and with limited international criteria for dust fallout, these were regarded applicable.

4 RETURN TO PRODUCTION PROJECT DESCRIPTION – CURRENT AND FUTURE ACTIVITIES

Provides a description of the past operations as well as the proposed changes implied by the Return to Production of LHU and related activities, including the upgrades to the existing LHU Water Supply Scheme and the subsequent considerations for (re)assessment that are necessary.

4.1 General Project Information

4.1.1 Details of the applicant relating to the LHU ECC Renewal

Company name:	Langer Heinrich Uranium (Pty) Ltd
Contact (responsible) person:	Mr. Johan Roux (Managing Director)
Tel no:	+264 64 410 6219
E-mail:	Johan.Roux@lhupl.com
Contact (responsible) person:	Mr. Michael Binneman (ESG Practitioner)
Tel no:	+264 64 410 6207
E-mail:	Michael.Binneman@lhupl.com

4.1.2 Details of the Applicant relating to the amendment of the Swakopmund - LHU Water Supply Scheme ECC

Company name:	Namibia Water Corporation Ltd
Contact (responsible) person:	Ms. Kamburona Jolanda
Tel no::	+264 61 712105
E-mail:	KamburonaJ@namwater.com.na

4.1.3 Mine infrastructure

Most of the mine infrastructure is located within the broad, flat valley of the ephemeral Gawib River, at a section between the Langer Heinrich Mountain and Schieferberg (Figure 3).

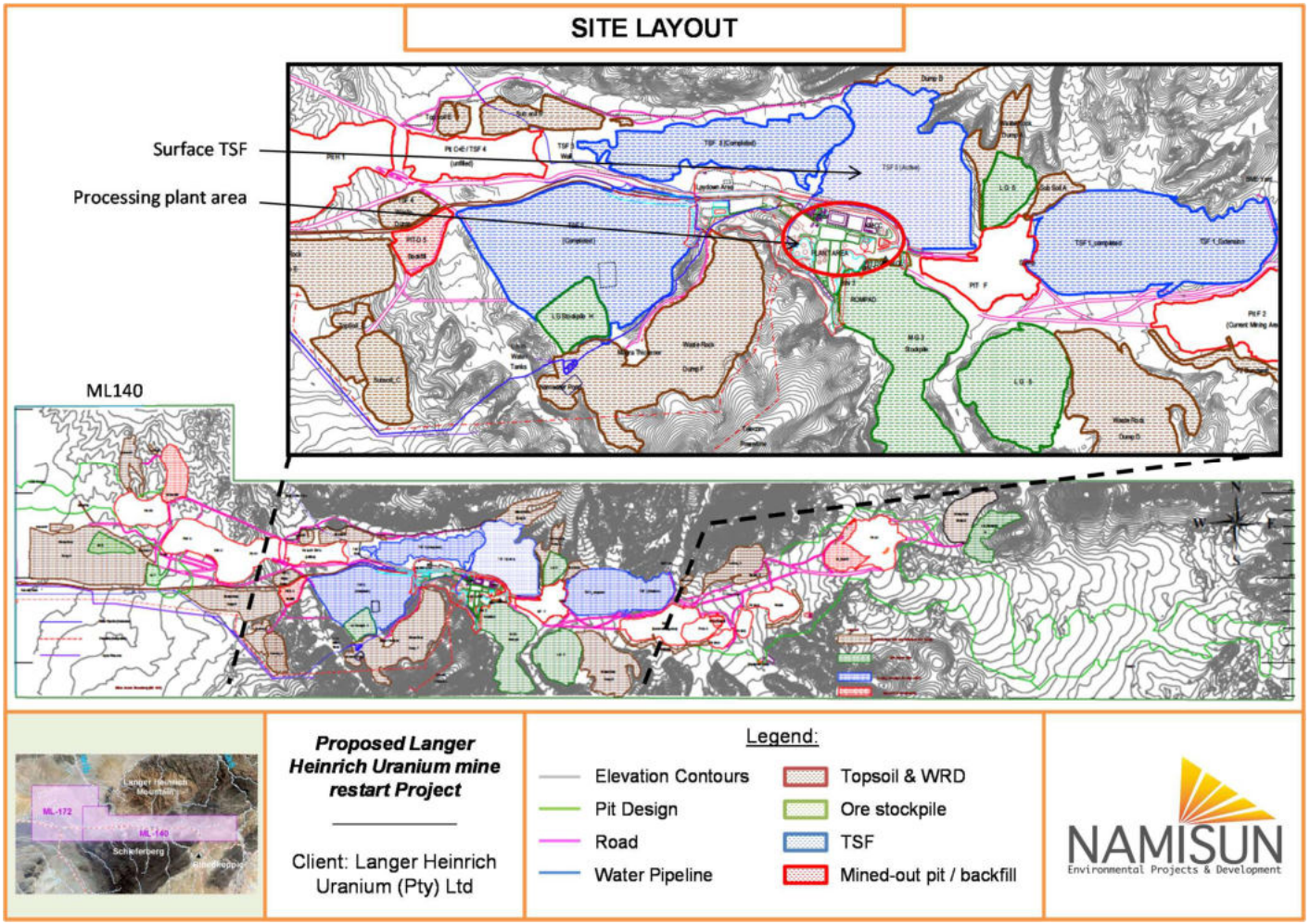

FIGURE 3: SITE PLAN OF LHU

The key infrastructure and activities within ML140 and ML172 implemented before the care and maintenance phase are shown on Figure 3 and are summarised below:

- Open pit mine.
- Ore stockpiles.
- Waste rock dumps.
- Processing plant.
- Tailing storage facilities.
- Internal haul roads.
- Sewage and water plants.
- Fuel storage facilities.
- Offices, stores and workshops.
- Laboratory.
- Explosives store.
- Exploration site camp.
- Mine access road.
- Power lines, pipelines and generators.

4.1.4 MINE DEVELOPMENT AND ENVIRONMENTAL APPROVALS

The first EIA process was conducted in 2004 / 2005, prior to mining activities commencing at LHU. MME granted ML 140 covering the Langer Heinrich deposit for a 25-year term, commencing 26 July 2005. Construction at LHU commenced in September 2005 and staged commissioning of the plant began in August 2006. Mining commenced in 2007 with a proposed 27-year LOM (2034), which was extended with five more years (2039) in 2016. The operation was officially opened on 14 March 2007 and the first commercial product shipment occurred in the same month. The operation had an initial uranium oxide (U_3O_8) production target of 2.6 million pounds per annum (Mlbpa) of (LHU, 2016).

In 2008 the operations were expanded. A detailed cumulative assessment of the existing (Stage 1 and 2) operations was conducted and the original ecological baseline studies were extended through external specialists at the same time. The EMP was amended to take cognisance of the original EIA requirements and the additional ecological specialist studies. This was approved by the Office of the Environmental Commissioner in the DEA at the MEFT. Stage 2 construction commenced in May 2008 and was completed in August 2009, resulting in an increased production capacity of 3.7 Mlb U_3O_8.

In 2009 an EIA process was conducted for the Stage 3 Expansion Project at LHU, which was approved by the DEA in the same year. Construction commenced in January 2010 and was completed in 2012, bringing the production rate to 5.2 Mlb U_3O_8 per annum.

LHU conducted another EIA for their proposed Stage 4 Expansion in 2011/2012. Stage 4 proposed an increase of production capacity to 10 Mlb U_3O_8 per annum. Despite the fact that LHU gained Stage 4 approval, the holding company decided not to proceed with the ramp-up. This decision was solely based on the negative uranium market conditions. However, the ECC that was issued by MEFT for Stage 4 remains the current / valid ECC, allowing for this increased production and associated activities at LHU.

In summary, LHU has gained the following environmental approvals (i.e. ECCs) for its activities:

- 2005: ML 140 and ECC granted.
- 2006: Approved EMP and Radiation Management Plan, and pro-forma contract signed.
- 2007: EPL 3500 approved.
- 2008: Stage 2 approval granted, EMP revised.
- 2009: Stage 3 expansion approval granted, EIA and EMP updated and approved; ISO 14001:2004 certified.
- 2011: Stage 4 expansion approval granted.
- 2012: EIA and EMP updated and approved; ISO 14001:2004 re-certified.
- 2015: ISO 14001:2004 re-certified.

As stated in Section 1.1, LHU was placed under Care and Maintenance in June 2018 due to the prevailing low uranium price. Prior to this, LHU produced up to 5.2 Mlbpa U_3O_8, aligned with the Stage 3 expansions.

The latest (valid) ECC for the Swakopmund - LHU Water Supply Scheme was issued by MEFT to NamWater in January 2021.

4.2 CURRENT ACTIVITIES AND LHU'S RETURN TO PRODUCTION

As part of the Return to Production plans, a pre-feasibility study was completed in June 2020 followed by a valued add study in June 2021. In July 2022 Paladin Energy announced the final investment decision to restart LHU. Return to Production is planned to commence in the first quarter of 2024. The first two years of operation will be from existing ore stockpiles, where after mining will recommence in 2025. The LOM is envisioned for a further 17 years - i.e. until 2041.

Various refurbishment activities and process upgrades are being undertaken at the process plant for increased process efficiency and throughput.

The following sections provide a description of the current and proposed plans undertaken as part of the Return to Production of LHU. It also provides further information relating to the proposed upgrades of the bulk water supply scheme to the mine.

Where relevant, the proposed new activities and infrastructure are compared with those assessed / approved in the original EIAs, i.e. the Stage 3 Expansion as well as the stage 4 Expansion EIAs (see Section 4.1.3 for further details). Table 8 contains the details about this comparison. Note: Detailed project descriptions (i.e. mining, processing and associated activities and facilities) can be found in the original / approved EIAs and will not be repeated here.

TABLE 8: SUMMARY OF THE PROPOSED RESTART ACTIVITIES COMPARED WITH EARLIER EIAS

FACILITY / ACTIVITY	PREVIOUS APPROVED EIA(S) (Considering both Stage 3 and Stage 4 EIAs)	PROPOSED RESTART PLANS
LOM	~17 years	Remaining LOM is 17 years from Q1 2024
Mining	Conventional open pit mining methods. Currently, no change in mining planned. Refer to Figure 3 for the total planned mined area.	
Processing method	Alkali (tank) leaching	
Processing rate (Production of uranium oxide)	Up to 10 Mlbpa	~5.5 Mlbpa at restart, working towards 5.9 Mlbpa.
Mine residues (waste rock)	No current changes planned for the previous assessed / approved Waste Rock Dumps (WRDs)	
Processing residues (i.e. tailings)	No change currently planned for the in-pit tailings deposition activities.	
Water requirements and supply	NamWater supply: 1.5 million m^3/a (Stage 3) and up to ~7.5 m^3/a (Stage 4). Swakop River abstraction: 0.5 Mm^3 per year.	NamWater supply: 2.2 Mm3/a. Swakop River abstraction: ~0.330 Mm^3 per annum
Power supply	Electricity supply from the NamPower Kuiseb Substation connecting to the mine via a 50 km 66 kV power line will remain. A diesel generator facility is used to augment the NamPower supply.	
Mine access	Gravel access road from the C28 to LHU. Improvements to the road condition would be required as part of the mine restart.	

As stated in Section 1.4.1, the key activities considered during the application process and related impact assessment and amendment of the EMPs are summarised in the following sections.

4.2.1 MINING

As per the original / approved EIAs, conventional open pit mining, i.e. load and haul activities, are proposed and will restart. Both waste rock and ore material will be hauled from the mining area to a specific WRD and ore stockpile locations in the project's mining area respectively. However, mining is planned to commence only in 2025 with the first 18 months of production being fed from existing stockpiles using a small reclaim fleet.

LHU is still undertaking additional studies for their future mine plan, as well as waste rock and tailings material (i.e. from the process plant) handling and final deposition. This current (re-) assessment and renewal application therefore consider the status quo in terms of (future) mining activities, as well as the mineralised waste disposal. Any future changes in the mine plan will be subject to further re-assessments and authorisation.

4.2.2 PROCESSING

As before, alkali leach processing is proposed, with upgrades to increase the U_3O_8 production by ~15% above historical capacity. Restart production targets have been increased to 5.5 Mlbpa (at restart, working towards 5.9 Mlbpa) from the previous 3.4 Mlbpa. This will be achieved by increasing the runtime from 85% to 90% and the mill feed rate from 448 tons per hour (tph) to 700 tph.

Upgrades in the front-end of the process include improved chute designs, a second teeter bed classifier and cyclone modernisation. A dust extraction system will be installed to address previously problematic dust generating areas.

Leach feed surge tanks will be installed prior to the leach circuit to improve process stability. The alkali tank leach circuit will remain unchanged. The solids washing thickener circuit will be upgraded with minor feed well retrofits. The tailings dewatering system will be upgraded to improve water recovery within the process.

The recovering and recirculating of recovered tailings solution remain unchanged. A final product thickener is being installed to improve product quality. The existing FPR building and associated equipment is being dismantled and replaced with a fit for purpose building with upgraded process equipment.

Historically LHU produced UO_4. The existing FPR will be dismantled and replaced with an upgraded facility with two separate stacks. The first stack will emit filtered air from the final product packaging unit and the second stack will vent treated off gas from the FPR process. The upgraded facility will produce higher quality product in the form of U_3O_8 via an improved product washing and calcination process. Further details of the two stacks are provided in Table 9.

TABLE 9: DETAILS OF THE TWO STACK AT THE NEW FPR

DESCRIPTION	STACK 1	STACK 2
Technology	Wet scrubber with packed bed followed by hepa filter	Drum packaging unit dust extraction system consisting of bag house followed by hepa filter and stack.
Stack height	~20 m	~20 m
Stack diameter	150 mm	150 mm
Exist velocity	~15 m/h	~10-20 m/h
Exist temperature	25-35 degC	25-35 degC
Emission / off gasses - description / composition	Water vapour with negligible $CO_2/SO_2/SO_3$ content.	Air with particulate concentration of <50 mg/m^3

The type of reagents used in the process will remain unchanged however, consumption rates are expected to increase by approximately 10-30% depending on reagent type and process area. Two separate stacks will be installed in the FPR building. The first stack will emit filtered air from the final product packaging unit. The second stack will vent treated off gas from the final product recovery process. Both stacks will be fitted with a sampling port to monitor vented gases.

The mine has a Heavy Fuel Oil (HFO) Plant for steam generation in the leaching process, comprising of three (3) HFO boilers which will be refurbished for use in the future.

The seven (7) burners used in the past to heat demineralised water for the heat exchangers, have been decommissioned.

4.2.3 MINERALISED WASTE FACILITIES

Waste rock which includes barren material and mineralised material with a grade lower than the cut-off grade will be dumped at dedicated WRDs. There are WRDs located to the north and east of Pit A and adjacent to TSF2 to the west. A number of additional WRDs will be required as future mining expands, as per the approved LOM plan.

LHU will continue with the approved in-pit tailings deposition activities. However, LHU is considering potential amendment to the current and proposed future facilities. These are however still being investigated. Any future changes will be subject to further re-assessments and authorisation.

4.2.4 ROAD MAINTENANCE

The current gravel access road to the mine has deteriorated. This is being repaired and will be maintained to ensure sustainable future use.

4.2.5 POWER SUPPLY TO LHU

The existing 66 kV powerline from the Kuiseb substation will remain as is for the supply to the mine, with the future power demand being 10 to 12 MW.

There are six (6) existing identical generators with a total generation capacity of 10 MW located in the process plant area. These generators will be used as co-generation and back-up power generation when power supply from NamPower is interrupted.

LHU is exploring renewable power options. This will, however, be subject to further studies.

4.2.6 WATER SUPPLY TO LHU

Water requirements will increase from 1.84 Mm^3/a (i.e. operations prior to care and maintenance) to 2.2 Mm^3/a. Historically, water usage was typically in the range of 0.45-0.50 m^3/t of Run of Mine (ROM) feed. Restart unit water consumption is envisaged to be ~0.40 m^3/t as a result of the process changes. The primary drivers for the increased water consumption include reagent make-up and consumption, reverse osmosis (RO) permeate production and process water balance stability.

4.2.6.1 NAMWATER SUPPLY

NamWater owns and operates the bulk water supply pipeline (i.e. the "Swakopmund-Langer Heinrich Water Supply Scheme") to LHU.

The current water pipeline along the C28 Road to the LHU access road, the aboveground section, as well as the underground section from the LHU turnoff to the mine site will remain as is (i.e. the pipe diameter is big enough). However, the height of the pump station buildings will be made higher to accommodate the larger pumps and associated infrastructure necessary for the increase in supply from the current 1.84 Mm^3/a to the future 2.2 Mm^3/a. The footprint of these pump stations will stay unchanged.

The height of the pump stations will increase from ~7.5 m to ~5.4 m. Access to the pump stations will be from the C28 road and it is expected that the construction activities will be confined to the already disturbed reserve between the C28 road and the pipeline.

NamWater has a valid ECC for the Swakopmund-Langer Heinrich Water Supply Scheme which expires on 29 January 2024. NamWater will submit an application (i.e. amendment application) to the DEA for the proposed upgrades to the pump stations.

4.2.6.2 SWAKOP RIVER WATER ABSTRACTION AND ASSOCIATED INFRASTRUCTURE (INCLUDING A NEW 11 KV POWERLINE)

Water abstraction from the Swakop River will resume from the existing abstraction boreholes in the river. The same pipeline will be used, but an additional (electric) booster pump station will be installed approximately halfway between the boreholes and the mine (refer to Figure 4 for the existing route). The booster pump station will be located on a small hill, ~100 m north-west of the pipeline. Refer to Appendix H for the design of the booster pump station, which would entail two x 6 m long containers. The one container will incorporate the pump infrastructure and the second container will act as the holding tank. The containers will be painted with natural colours to blend into the environment.

An 11 kV powerline[2] will be installed along the pipeline towards the pumpstation at the abstraction boreholes in the Swakop River. The pumpstation at the Swakop River will become electric as a result. The length of the existing pipeline and future powerline is ~15 km.

Water abstraction from the Swakop River will remain within the limit of the permit, i.e. <332,000 m^3/a. Renewal of the water abstraction permit is not part of the scope of work of this report (and associated assessments) and is the task of LHU.

Between the mine site and the booster station the powerline will be aboveground. Between the booster station and the Swakop River the (sleeved) powerline will be underground. A standard single monopole HLPCD (Horizontal Line Post Compact Delta) structure is proposed for the above-ground section of the powerline.

The HLPCD structure has a single wooden pole ~ 9 m high above ground level, maximum span length 120 m. An A-frame structure may be used as a strain structure. This structure comprises a single wooden pole with steel A-frame. The A-frame pole is also earthed by means of a vertical cable mounted on the pole; the earth should be gapped, as above. For either of the above structures, step-down/transformer structures would be needed at the end of the power line, to step down the current before distribution on site. (African Conservation Services CC, 2023).

A single electrical cable will be installed.

[2] Note: An above ground powerline assessed and approved by MEFT as part of LHU's Stage 3 Expansion EIA process It was stated that "if a power line is used to supply power to the additional Swakop River abstraction boreholes, this line will follow the existing pipeline and associated gravel track. Wooden poles (9 m in height) will be erected approximately every 100 m in 1.5 m deep holes of approximately 250 mm diameter. These holes are drilled by truck mounted rig that will have to drive along the existing gravel road" (Metago, 2009).

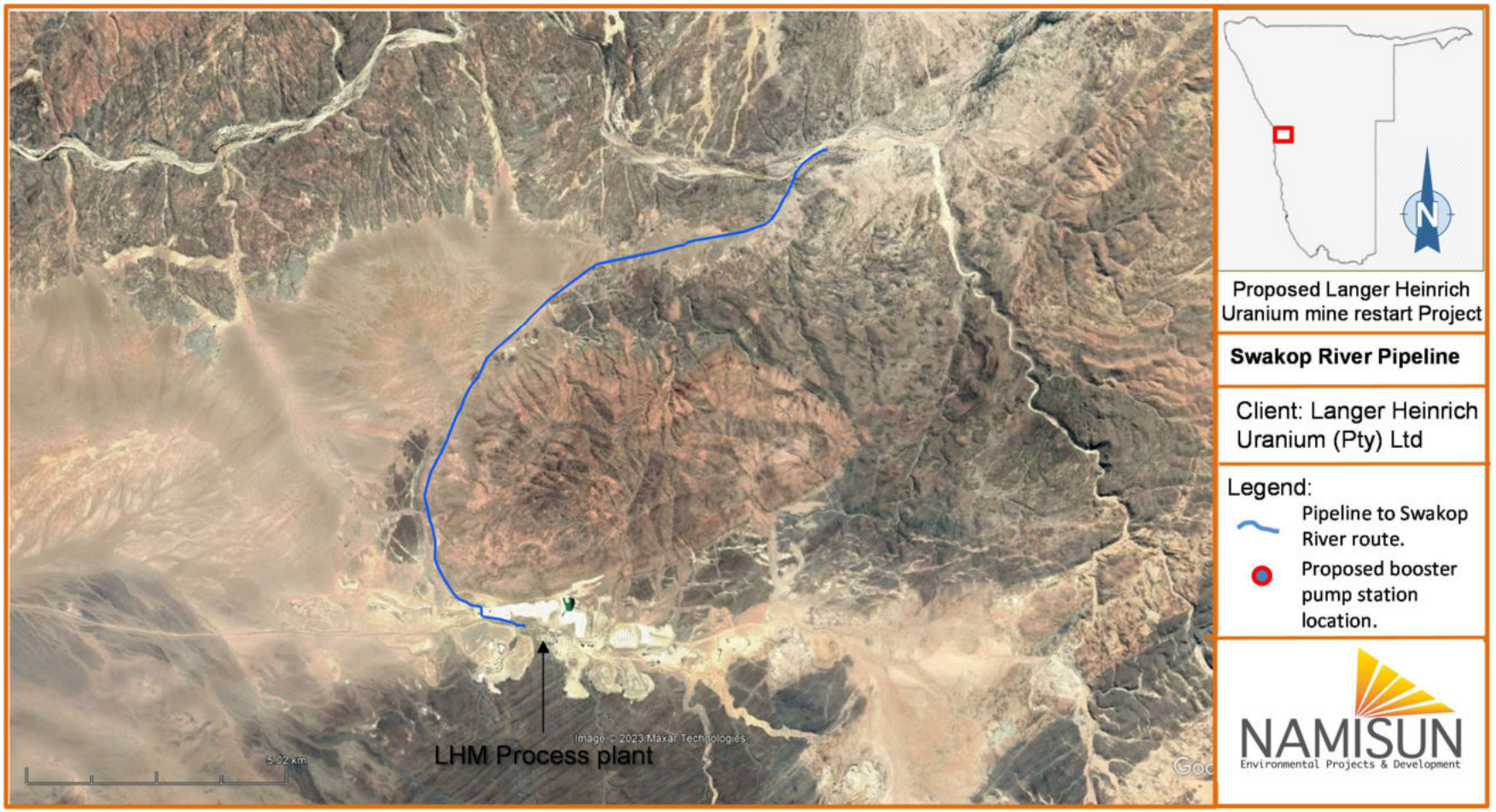

FIGURE 4: SWAKOP RIVER PIPELINE ROUTE

4.2.6.3 *WATER STORAGE AT THE MINE*

LHU is planning to convert an existing brine pond to a new (3rd) water storage bladder next to the existing two bladders with the intension to increase onsite water storage to cater for supply interruptions. The existing two bladders' joined capacity is 50 000 m^3. The new bladder will have a capacity of 12 000 m^3.

4.2.7 EMPLOYMENT

Employment at LHU is summarized in Table 10.

TABLE 10: EMPLOYMENT AT LHU

PHASE	PERMANENT EMPLOYEES	CONTRACTORS	COMMENTS
Care and Maintenance Phase	15	50	As of end June 2022
Refurbishment of process plant (current phase)	23	755	As of end June 2023
LHU restart production phase	306	~279	Based on December 2027 information

4.2.8 MINE RESTART SCHEDULE

LHU has commenced with the repair and refurbishment of existing infrastructure and equipment at LHU. Construction completion is due in October 2023. Completion of equipment energisation and no-load testing is planned for November 2023. Cold and hot commissioning activities are expected to commence in December 2023 with first product production targeted for Q1 2024.

Production will resume from existing ore stockpiles for the first 18 months as production rates are gradually ramped up. Mining operations are planned to commence in 2025.

4.2.9 DECOMMISSIONING AND CLOSURE

Closure objectives and criteria have been drafted as part of the EIA for Stage 4 (Metago, 2012), and it was stated that these will be refined as part of ongoing detailed closure planning and costing during the LOM. The following closure criteria have been set in 2012:

- Remove as much infrastructure as possible.
- Re-establish a landscape that can over time regenerate sustainable endemic vegetation communities.
- Ensure that an ecologically functioning (fauna and flora) environment is left behind.
- Ensure natural and unpolluted groundwater and surface water flow through the Gawib River valley – such that it is able to support the appropriate desert ecosystem, (also some of the drainage lines that feed into the Gawib River valley).
- Re-establish (as far as possible) the sense of place.
- Entire area (as far as possible) to be reintegrated with NNNP (fauna, flora and visual).
- Socio-economic factors (employees, suppliers, community) – careful planning and preparation for closure.

A Closure Management Plan (CMP) has been developed and implemented accordingly. The purpose of the CMP is to demonstrate specifically how mine completion will be achieved in a manner that meets the applicable legislative and regulatory obligations, stakeholder expectations and business commitments through standards and sustainable development objectives. Ultimately the CMP provides the basis for developing and implementing a specific management approach and work plans relevant to the key closure issues and to accomplish the Closure Vision (LHU, 2016).

5 ALTERNATIVES

This chapter describes the various alternatives that were considered.

5.1 POWERLINE ALONG THE SWAKOP RIVER PIPELINE – ABOVE GROUND VS UNDERGROUND OPTIONS

With reference to section 4.2.6.2, the section of the proposed new 11 kV powerline between the mine site and the booster station will be aboveground. Between the booster station and the Swakop River the powerline will be underground. The options of the entire powerline above ground and the entire line below ground were also considered by LHU and final decision is still pending, depending further geotechnical considerations.

The rocky terrain along the first section of the powerline might make it more challenging to excavate small trenches for burring the powerline. It would also require blasting and would cause additional associated environmental disturbance (and associated impacts – see Chapters 7 and 8)) and would be more costly.

Keeping the powerline above ground the entire route (i.e. all the way to the river) would cause additional risks to birds (see chapter 7 for further details).

5.2 NO-GO OPTION

The “No-Go alternative” relates to LHU restarting, however, the various refurbishment activities and process upgrades would not be undertaken at the process plant and the additional water supply options would not be implemented. The opportunity for increased process efficiency and throughput would then be lost. In this case, the residual impacts (i.e. impacts after implementation of mitigation measures) of the proposed Return to Production will not occur. Refer to Chapters 7 and 8 for the potential impacts relating to the return to production and associated activities.

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

An understanding of the environment and the sensitivity of the site and surroundings is important to understand the potential impacts of the project. This chapter provides a general overview of the current baseline conditions relevant to LHU and the water pipelines to the mine, drawing on the baseline information provided in the EIA Report for Stage 4 as well as the additional investigations and specialist inputs.

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

- EIA Report for the proposed (stage 3) Expansion Project at LHU (Metago, 2009).
- EIA Report for the proposed Stage 4 expansion project and conversion of EPL 3500 to a ML at LHU (Metago, 2021).
- The EMP for LHU (Metago, 2012).
- EMP for the Swakopmund-Langer Heinrich Mine Water Supply Scheme (NamWater, 2020).
- Mine Closure Plan for LHU.
- Bi-annual environmental management progress report for LHU July – December 2022
- Quarterly groundwater monitoring report for LHU – January 2023 (SLR, 2023)
- An avifauna specialist study and assessment conducted by African Conservation Services cc (Dr Ann and Mike Scott) (refer to Appendix E for the Avifauna Specialist Report).
- An air quality specialist study and assessment conducted by Airshed (Hanlie Liebenberg-Enslin) (refer to Appendix D for the Air Quality Specialist Report).
- Atlas of Namibia (Mendelsohn et al., 2002).
- Technical information provided by LHU.
- Site visits by Namisun, relevant specialists and technical team.
- Consultations and focus group meetings with I&APs.
- Google Earth.
- Additional references in the list of reference (see Chapter 11)

A good understanding of the biophysical environment is essential to understand the context against which the changes are proposed. The knowledge base in this regard has been improved markedly over time, as the result of previous EIAs, and LHU was enabled to assess the potential impacts of its infrastructure and operational activities and to ensure that mitigation and management measures were developed and implemented (see also Section 4.1.2). The existing knowledge base was used and further developed during the EIA for Stage 4 in 2011, providing a comprehensive description of all the aspects likely to be impacted and an evaluation of alternatives.

For this report, only the biophysical components relevant to the proposed changes are highlighted and described here. A more comprehensive description of the biophysical environment is presented in the EIA report for Stage 4 (Metago, 2012) and later reports such as the Mine Closure Plan for LHU (2016).

6.1 CLIMATE

Rainfall in the Namib is spatially and temporally highly variable. Generally, rainfall increases from the west (10 mm at the coast) to the east (about 60 mm at a distance of 100 km inland). Storms may be isolated events at times, but large-scale circulation systems may temporarily create wider instability and provide significant precipitation. At Gobabeb, 60 km to the south of the Project area, April tends to be the wettest month, March the month with the most extreme rain events and September the driest month in the 49-year record analysed. The area receives significant amounts of moisture from fog or dew, particularly near the coast. The area receives, on average, as much or more precipitation from fog than from rainfall. The average humidity for the region ranges from around 32% in June to around 58% in February (Namisun, 2023).

Insolation at the mine is high. As a result, diurnal ranges of temperatures are wide, especially during late autumn and early spring. In September, the mean maximum and mean minimum temperatures vary the most. This range demands particular adaptation from living organisms. The lowest temperatures are normally recorded during August, but frost is rare. The highest temperatures are recorded between October and March with the highest daily averages recorded between March and May. The recorded annual average temperate is 24˚C, but the typical range is from 5˚C to 45˚C. Variation between summer and winter temperatures is approximately 7˚C for both maxima and minima. The highest maximum temperature is recorded in November (38.4˚C) and the lowest is 5.7˚C in August (LHU, 2016).

Average daily evaporation can vary between 6 and 15 mm and monthly totals range between 140 mm and 350 mm, reaching a maximum in summer. Considering the low annual average rainfall, it is clear that LHU is located in a zone of extreme water stress with an annual potential evaporation that frequently exceed 2,500 mm per year (LHU, 2016).

Predominant daytime wind is from the northwest, west and southwest. These winds derive from the static South-east Atlantic Anticyclone and blow over the cold surface of the ocean, becoming cold and moist. The cold conditions prevent convection, which means that the moisture causes fog but no rain. As the wind blows into the interior, it heats up. Predominant nighttime wind is from the southeast. In general, the stronger winds are from the eastern sector, during autumn and winter, and are associated with speeds in excess of 8 m/s. During the spring and summer months, strong winds of more than 8 m/s dominate from the westerly sector (LHU, 2016).

It is during the winter months that the highest wind speeds are recorded, and these are associated with “east wind” (Bergwind) conditions. The highest wind speed recorded at the mine is 17.2 m/s. These winds are adiabatically induced, i.e. caused by a combination of temperature and topographic differences, which means that they are mostly dry and hot. Strong airflows from the escarpment to the coastal areas occur between March and September, but the frequency and strength vary from place to place. These high velocity winds are accompanied by marked increases in temperature. They cause the anomaly that coastal areas frequently experience their highest temperatures during winter. East winds often carry large quantities of dust, and they can prevail from a few hours to a few days (LHU, 2016).

Combined, the low rainfall, big water deficit and wide temperature ranges result in a water-stressed environment with adapted biota that largely depends on fog as moisture. Wind erosion is not uncommon, implying precautionary measures – also in terms of airborne dust.

6.2 BIODIVERSITY

LHU forms part of the gravel plains of the central Namib, and the vegetation on these plains is dominated by dwarf shrubs and grasses. The ephemeral Gawib River and associated tributaries support stands of Camel thorn (*Acacia erioloba*), while several other tree species also occur in the vicinity of the drainage lines, including False ebony (*Euclea pseudebenus*), Ringwood (*Maerua schinzii*) and Green-hair tree (*Parkinsonia africana*). The mountains, washes and ravines, as well as granite outcrops support more diverse vegetation than the plains and river valley, which includes two common species – Mustard bush (*Salvadora persica*) and Dollar bush (*Zygophyllum stapfii*). In addition to many short-lived plants and dwarf shrubs, the tall star chestnut (*Sterculia africana*) and quiver tree (*Aloe dichotoma*) are most noticeable in the mountain areas. The Gawib River forms an important corridor for wildlife, while the valley may harbour endemic invertebrates (LH, 2016).

Information relevant to biodiversity is summarised in a biodiversity sensitivity map (Figure 5). The map is based on comprehensive baseline studies (vegetation, vertebrate and invertebrate) during 2009 and 2011. Information from the baseline studies has been evaluated in terms of actual observations and IUCN status.

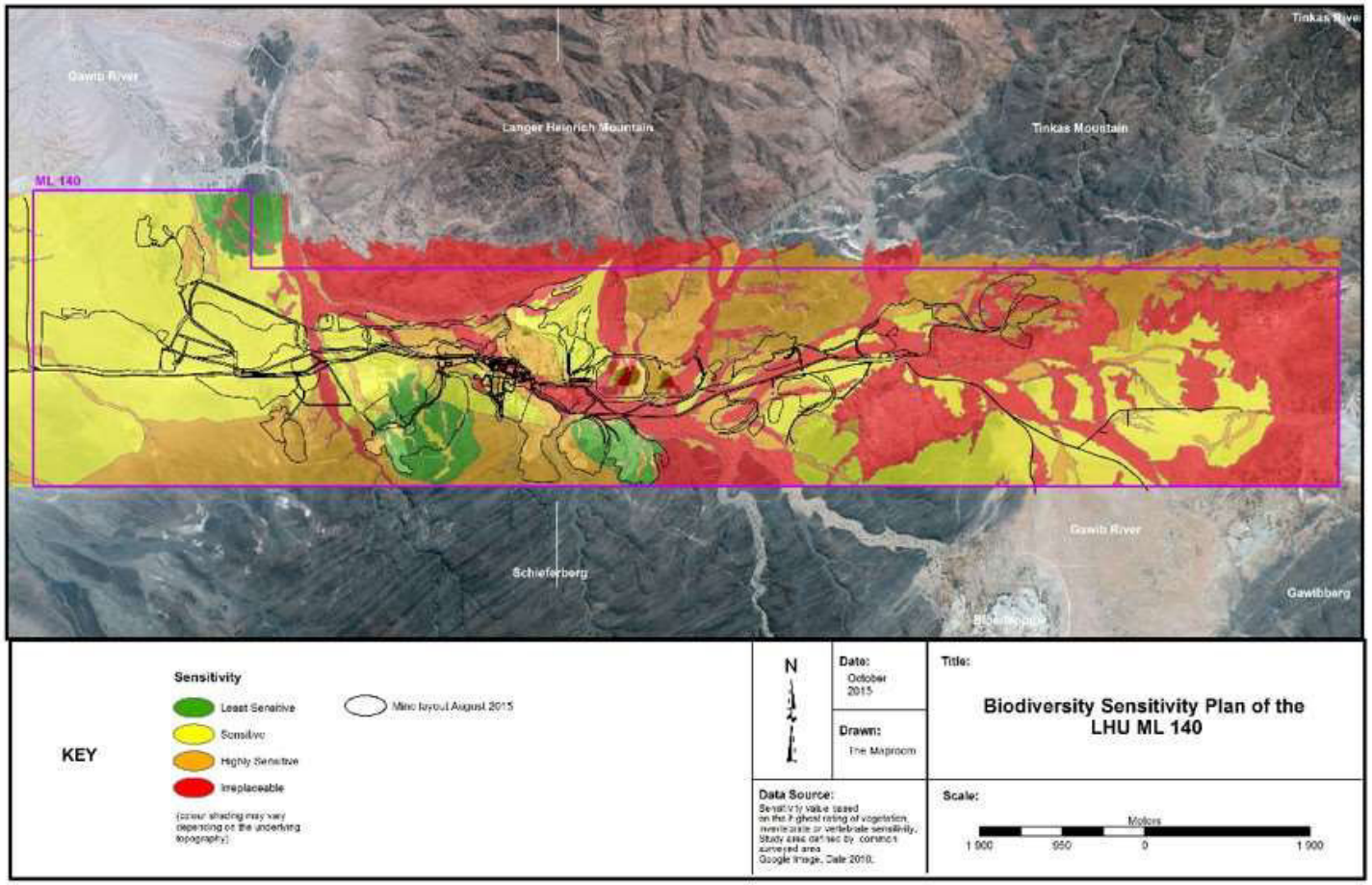

FIGURE 5: BIODIVERSITY SENSITIVITY AT LHU (Source: LHU, 2016)

From the environmental assessments it was indicated that over 200 plant species in 14 plant communities may occur at LHU. Diversity between communities varies greatly, with the highest diversity found on granite outcrops and in the deep, sandy river course of the Gawib River.

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Many of the mammal species observed, or expected to occur, in the area are not residents but regularly commute or are occasional transients. A list of >100 invertebrate taxa, expected to occur or encountered in the area, exists. Most taxa are identified to family or genus level only, therefore the number of species expected to occur in the area is larger. Endemism is believed to be high, as expected in areas in the proximity of mountains and an ephemeral river in the central Namib (LHU, 2016).

From the assessments a total of >110 bird species were identified that may occur in and around the area. The area and its vicinity are of high significance for reptiles, because it is located near the east-west and north-south biogeographical boundaries for several reptile species. The degree of endemism of Namibian reptiles is remarkably high, five species are endemic to the central Namib of which two are still subject to taxonomic investigation (LHU, 2016).

The habitat sensitivity map (Figure 5) reflects a composite evaluation of sensitivities based on all taxa and a sensitivity rating has been assigned to the various vegetation habitats / communities. The sensitivity ratings and definitions can be grouped into four categories (LHU, 2016):

- Least sensitive - partial loss of such habitats is not expected to have a significant impact on the ecosystem and habitats may be re-creatable.
- Sensitive - partial loss of such habitats is not expected to have a significant impact on the ecosystem. It may be difficult to recreate these habitats and species re-establishment will be variable.
- Highly sensitive - partial loss of such habitats is expected to have a significant impact on ecosystem functioning. The maintenance of patches will be critical for the long-term survival of the related ecosystem and for any chances of restoration success.

- Irreplaceable - partial loss of such habitats is expected to have a significant impact on ecosystem functioning and may impact on species diversity. Some of these habitats might be impossible to recreate once physically destroyed, whilst other habitats may be re-creatable to some extent.

Existing mining activities and facilities have the potential to impact on the land surface which may impact one or more of the following biodiversity parameters (LHU, 2016):

- Biodiversity composition in terms of species and their abundance.
- Biodiversity structure, which is the organisation of biological units in time and space.
- Key biodiversity processes in terms of functional linkages of parts or components of an ecosystem through a directed flow process.

Noteworthy is that specimen of *Welwitschia mirabilis* occur at some spots near the C28 road, along which the NamWater pipeline is located. However, these are isolated individuals, and they could be avoided when work on the pumpstations are conducted.

With reference to the Swakop River Pipeline route, much of the above mentioned descriptions remain relevant.

The major avifauna habitat components in the area comprise the large ephemeral Swakop River catchment, surrounded by deeply incised, rocky and mountainous habitats; and sandy-gravel plains to the south. The avifauna habitats in the greater study area may be considered as being of high sensitivity in terms of the high conservation status of two officially Protected Areas (within one of which the mine falls, i.e. the Namib-Naukluft Park), two Ramsar sites and five Important Bird Areas (sites of international significance for the conservation of birds at the Global, Regional or Sub-regional level). (African Conservation Services CC, 2023).

A bird species richness rated as medium-low has been recorded in the 'study area'[3] and surrounds, with a total of 134 species, or 20% of the 676 species currently recorded in Namibia. The area is relatively well atlased. The checklist includes 11 species (8% of the total) that are threatened in Namibia (and comprising 16% of the 71 species on the Namibian Red Data List); 8 of the species are also Globally Threatened. At least 5 species (4%) have some form of migrant status, and many are nomadic. Nomadic/migrant habits result in high mobility, and consequently increase the risk of impacts such as collisions on overhead structures, including power lines. (African Conservation Services CC, 2023).

[3] This study area relate specifically to the Swakop River Pipeline route

Risk assessment and mitigation efforts are directed towards priority species, defined as those that have a high biological significance, i.e. primarily Red Data species (including those with migrant status) and/or endemic or near-endemic species. Thirty-two priority species were initially identified as being potentially at higher risk in terms of the proposed project. Taking into account local abundance (and the likelihood of occurrence within the study area), this list was short-listed to twelve priority species. (African Conservation Services CC, 2023).

The process plant is located in an area, largely disturbed, barren of vegetation.

With reference to section 4.2.6.2, the booster pump station will be located on a small hill, north-west of the pipeline. An old tower (previously used by LHU as their frequency extension to linear infrastructure & EPLs), was constructed on the same hill, with the general area already (relatively) disturbed.

6.2.1 VEGETATION ALONG THE SWAKOP RIVER PIPELINE ROUTE (METGAO, 2009)

Vegetation associated with 4 sections of the pipeline is discussed below. This section should be read with reference to Figure 6.

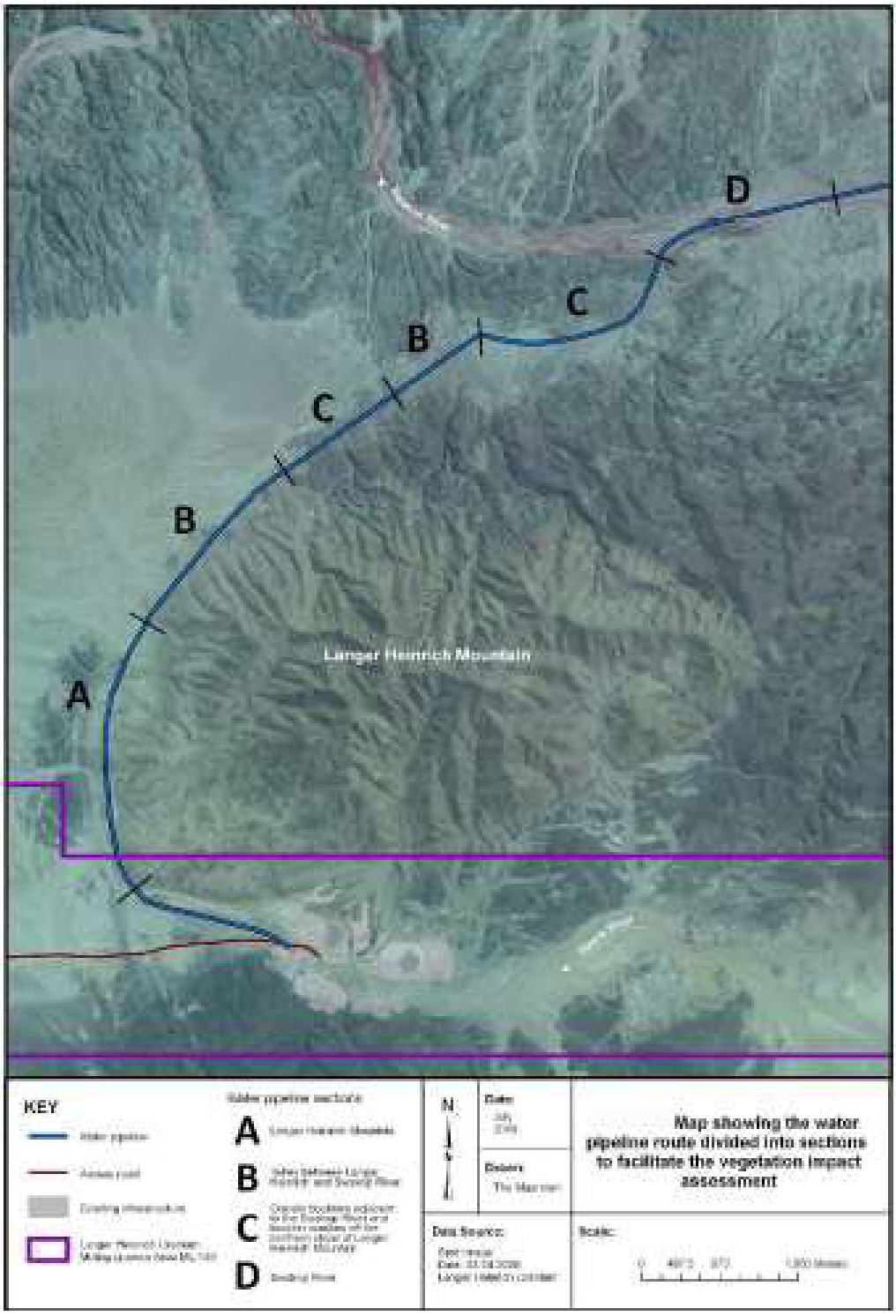

FIGURE 6: VEGETATION SECTIONS ALONG THE SWAKOP RIVER PIPELINE ROUTE (EXTRACT FROM METAGO, 2009)

6.2.1.1 PIPELINE SECTION A – SLOPES OF LANGER HEINRICH MOUNTAIN

The Langer Heinrich Mountain is represented primarily by the *Commiphora glaucescens – Aloe namibensis* association which comprises three vegetation types, namely *Commiphora virgata – Zygophyllum cylindrifolium* sparse shrublands on quartzite slopes, *Petalidium variabile – Aloe dichotoma* sparse shrublands on granites and *Sterculia africana – Enneapogon* sparse shrublands in quartzite ravines. This vegetation association has been rated as irreplaceable in terms of sensitivity rating. The main ecological drivers that maintain ecosystem functioning and determine the diversity of flora of these mountainous systems include a variety of niche sites in which to establish localised improved water retention, and thus increased water availability.

6.2.1.2 PIPELINE SECTION B - PLAINS

The plains located between the Langer Heinrich Mountain and the Swakop River hills are dominated by two communities, namely *Salsola tuberculata – Jamesbrittenia barbata* sparse grasslands on quartz gravel plains and *Adenolobus pechuelii – Stipagrostis ciliata* sparse shrublands with low trees in shallow washes. The *Salsola tuberculata – Jamesbrittenia barbata* community was rated as least sensitive and the *Adenolobus pechuelii – Stipagrostis ciliate* washes as highly sensitive. The main ecological drivers that maintain ecosystem processes / functioning of these plains and washes include: periodic flash floods and localised rain events that recharge shallow aquifers in the washes, regular winds that transport nutrients, seeds and pollinators into and out of the system, biological and chemical soil crusts that stabilise the soils and prevent erosion and scattered perennial shrubs that provide habitat for fauna and act as wind traps, allowing for the accumulation of nutrient-bearing sand and seeds.

6.2.1.3 PIPELINE SECTION C – GRANITE BOULDERS AND BOULDER WASHES

The granite boulders and quartzite washes found adjacent to the Swakop River and on the northern slopes of Langer Heinrich Mountain are indicated to be as species rich as those washes found on the southern side of Langer Heinrich Mountain (vegetation community is *Petalidium variabile – Stipagrostis hochstetteriana* sparse shrublands in boulder washes) and the granite boulders found on the eastern side of the ML (vegetation community is *Petalidium variabile – Aloe dichotoma* sparse shrublands on granites). Both of these vegetation communities were assessed as irreplaceable in terms of sensitivity rating. Like the quartzites of Langer Heinrich Mountain, the main ecological drivers that maintain ecosystem functioning and determine the diversity of flora of these granite boulder systems include a variety of niche sites in which to establish localised improved water retention, and thus increased water availability.

6.2.1.4 PIPELINE SECTION D – SWAKOP RIVER

The Swakop River is an ephemeral riverine system that includes the main flood channel and associated floodplains, a riparian fringe, seepage lines and river source sponge areas. A dense growth of *Sporobolus robustus* or more open communities of *Eragrostis spinosa* are found along dry riverbeds such as the Swakop River. Trees of *Acacia erioloba* (camel thorn) form dense stands with *Faidherbia albida* (ana tree), *Tamarix usneoides* (wild tamarisk), *Salvadora persica* (mustard tree), and the exotic *Nicotiana glauca* (wild tobacco) and *Presopis* sp (mesquite), native to South and Central America. The main ecological drivers that maintain ecosystem functioning of this river include the flow regime that governs the quantity of water coming into and leaving the system, the quality of the water, the geology and soil structure of the river channel and the establishment of vegetation islands.

6.2.2 FLORA ALONG THE SWAKOPMUND - LHU WATER SUPPLY SCHEME (NAMWATER PIPELINE)

Although the existing pipeline (and booster pump stations) are located in an existing service corridor, not all areas within this corridor are completely barren of vegetation. The western part of the service corridor along the C28 traverses an extensive lichen field. Washes (i.e. drainage lines) along the entire route, which receive run-off from the rare rain events, support denser and more diverse vegetation. Perennial vegetation (shrubs and multi-seasonal herbs) mostly grows in washes and depressions. Some *Welwitschia mirabilis* plants grow along the pipeline route, both north and south of the road and usually in washes, however, these are isolated individuals. The pencil bush (*Arthraerua leubnitziae*), a Namib Desert endemic, is the dominant shrub along the entire pipeline route. The dollar bush (*Zygophyllum stapffii*), another Namib Desert endemic, starts to become co-dominant in the eastern section of the route. (Namisun, 2023 and Enviroscience, 2022).

The section of the pipeline corridor between the LHU pipeline and the C28 road is however disturbed.

6.3 AIR QUALITY

LHU undertook and air quality impact assessment in 2016 to update to update the previous air quality study. This included the assessment of the baseline environment and the impacts from the then current mining operations (operational year 2015) on the surrounding environment and human health. Mining activities at the time included drilling and blasting, hauling of ore and waste rock (and other material handling activities), crushing and screening and processing of the ore at the processing plant. In addition, three (3) HFO Boilers were used for power generation (Airshed, 2023).

Sources of emission and associated pollutants considered in the emissions inventory in the 2016 study included (Airshed, 2023):

- Fugitive dust emissions (TSP, PM_{10} and $PM_{2.5}$):
  - Drilling;
  - Blasting;
  - Crushing and screening;
  - Materials handling;
  - Vehicle entrained dust as a result of ROM, topsoil, subsoil and waste transport, personnel vehicles and water bowser movement on the unpaved roads; and
  - Windblown dust from topsoil, subsoil, ROM, LG ore and MG ore stockpiles, WRDs and TSFs.
- Vehicle exhaust emissions – PM_{10}, $PM_{2.5}$, DPM, CO, NO_x, SO_2 and VOC.
- Stack emissions:
  - HFO boilers – TSP, PM_{10}, $PM_{2.5}$, CO, NO_x and SO_2.

The main findings from the 2016 study were (Airshed, 2023):

- There are approximately six Air quality sensitive receptors (AQSRs) in the region likely to be influenced by LHU, with the nearest AQSR being Bloedkoppie.
- The wind field was dominated by winds from the west, with high velocity winds from the east and northeast mostly during the winter months when the “east-wind” conditions prevail. For the year 2015, frequent winds also occur from the south-eastern and west-north-western sectors; likely resulting long term (annual) air quality impacts being the most significant to the east and north-west of operations. (See further details on climate in section 6.1).
- This area generally has a rainy season starting in December and ending in April, with maximum monthly rainfall occurring from February to April. The greatest amount of rain fell during December. (See further details on climate in section 6.1).

- The results of the ambient dust monitoring were:
    - Sampled PM_{10} concentrations from the 2011 sampling campaign indicated elevated levels above the selected evaluation criteria daily limit of 75 µg/m^3 for more than 4 days in the three months sampled (4 days exceedances are allowed within a calendar year).
    - The PM_{10} sampled with the three high volume samplers (HVSs) resulted in acceptable daily PM_{10} concentrations at the remote gate HVS to the west of the operations and at the eastern station HVS to the east of the operations. These were regarded as representative of ambient air quality. The HVS located at the Run of Mine (ROM) pad was more representative of occupational conditions and could not be used to evaluate ambient air quality.
    - Sampled dustfall rates at LHU over the five years (2011-2015) were often above the SA NDCR limit for industrial areas (1 200 mg/m²/day) on-site and residential areas (600 mg/m²/day) off-site – the residential limit is not applicable, even at the AQSRs. There was a clear reduction in dust fallout rates from 2013 to 2014, and again to 2015 with no exceedances of the residential dust fallout limit at the monitoring location at Bloedkoppie and the 'Drillers Camp site' in 2015. Also, the industrial limit was only exceeded three times at the 'Valley' monitoring location, (i.e. South CCD) in 2015.
    - The multi directional dust buckets were used to understand the main contributing sources, and not the actual dust fallout rates. The directions of the main dust contributions varied significantly between the months, with no clear source contribution noted.
    - The measurements taken at the three boiler stacks between September 2015 and April 2016 show compliance, on average, with the World Bank Group (WBG) emission limits for NOx and SO_2 – no emission limits exist for CO. In April 2016 the SO_2 emission rate at Boiler 1 and 3 were slightly above the WBG emission limit.

With reference to section 1.1 and chapter 4, the LHU was under care and maintenance since June 2018, where most of the above mentioned activities and associated air emission sources ceased and very limited dust was generated from onsite activities. Only recently, with the start of the refurbishment activities (as part of the 'return to production project), some activities cause air emissions. The air quality monitoring network is being upgraded and refined as part of the restart project. The information provided in the air quality study (refer to Appendix D) will be used to guide this process.

6.4 ARCHAEOLOGY

The distribution of archaeological sites around LHU is comparable to regional data from archaeological surveys in adjacent parts of the Namib Desert as a basis of comparison. These sites are widely scattered over southern and western Namibia and is proof for the first human occupation of Namibia, dating back 1.8 million years ago, mainly in response to climate trends. Since Namibia's climate has been arid for a few million years before present, these early occupants were nomadic hunters and gatherers that selected places with available water and food as temporary settlements. During the period 10,000 to 2,000 years before present the settlements became more sedentary and more frequently occupied, but still confined to southern and western Namibia (LHU, 2016).

Several archaeological surveys in the region around LHU have been conducted and most of the identified sites relate to the occupation of the Namib Desert in the second millennium AD by hunter-gatherer communities. These communities are believed to have existed in the area subject to water availability and conducted gathering of wild grass seed from the underground caches of harvester ants, hunting and honey harvesting (LHU, 2016).

A significant concentration of finds on the eastern boundary of ML 140 shows evidence of hunter gatherer occupation dating to the last 1,000 years. The variety of archaeological sites found is similar to that found in adjacent parts of the Namib, reflecting a number of highly specific human adaptations to this environment. Areas surrounding the mine contain some sites relating to military action in 1915 between the German forces and the South African forces. The identified sites include artillery positions made from stone walls, military dump sites, trenches and graves. Most of the more significant and sensitive sites are located outside ML 140 and ML 172. The rest of the sites are considered to have medium sensitivity which indicates that they are relatively minor sites which form a meaningful local distribution and may have associated research potential (LHU, 2016).

Archaeological sites in Namibia are protected under the National Heritage Act (27 of 2004). Existing mining activities and facilities have the potential to impact on the archaeological and historical sites and the main activities that could cause this disturbance are the placement of surface infrastructure, vehicle movement, mining, waste management and site development (LHU, 2016).

A few sites are located near the existing Swakop River pipeline route, as described in Table 11 and shown in Figure 7 (extract from Metago, 2012 and Quaternary Research Services, 2011)

TABLE 11: KEY ARCHEOLOGICAL SITES NEAR THE SWAKOP RIVER PIPELINE ROUTE

ARCHAEOLOGICAL SITE ID NUMBER	DESCRIPTION	SIGNIFICANCE RANKING (/5)	VULNERABILITY RANKING (/5)
QRS58/062	Suspected granary cairn.	3	2
QRS58/064	Seed digging.	2	2
QRS58/065	Seed digging with some caliche on exposed spalls.	2	3
QRS58/073	Stone artefact flaking scatter, all hydrothermal vein quartz.	2	3
QRS58/074	German infantry trenches March 1915, approximately 70 in number, roughly west-facing shallow excavations 2x1m with backdirt pile on western end. The trenches have been slightly damaged by a tracked vehicle during construction of the temporary pipeline.	3	4
QRS58/075	German artillery defences March 1915, approximately eight in number and aligned 260º.	3	2
QRS58/076	Colonial German artillery position consisting of two short lengths of drypacked stone walling.	3	2
QRS58/077	Pre-colonial marker cairn, on western foot-slope of Langer Heinrich Mountain.	4	3
QRS58/078	Rock shelter with wild fig tree bearing historical inscriptions of names, some with dates. The site is commonly referred to a field hospital used by German colonial forces during the action at Riet in 1915.	4	3
QRS58/079	Pre-colonial grave cairn, probably an elite burial, located on a colluvial terrace on the south side of the Swakop River and 100 m from the track to Riet. The cairn is approximately 3 m in diameter and 1 m high, built with flat slabs of local gneiss. The slabs forming the perimeter of the cairn are planted upright and lean inward; there is a fill of mixed rubble and a capping of flat slabs, interspersed with fist-sized river cobbles.	4	2
QRS58/080	Lines of cleared rubble lying parallel to the service road to Riet. These represent the edges of the 19th century Bay Road which was cleared by hand at the time. The entire service road in this area follows the track of the Bay Road, although these rubble lines seem to be the only visible remains of the road itself.	2	3
QRS58/081	Small rock shelter, with single stone pestle.	2	1
QRS58/082	Small rock shelter, with several stone pestles.	2	1
QRS58/083	Seed diggings.	2	2
QRS58/084	Seed diggings.	2	2

ARCHAEOLOGICAL SITE ID NUMBER	DESCRIPTION	SIGNIFICANCE RANKING (/5)	VULNERABILITY RANKING (/5)
QRS58/086	Colonial German artillery range marker consisting of stone cairn associated with German military ration tin. The site lies on bearing 276˚m from the artillery position at QRS 58/076.	3	3
QRS58/087	Pre-colonial grave cairn, lies 4m east of Riet service road.	3	4

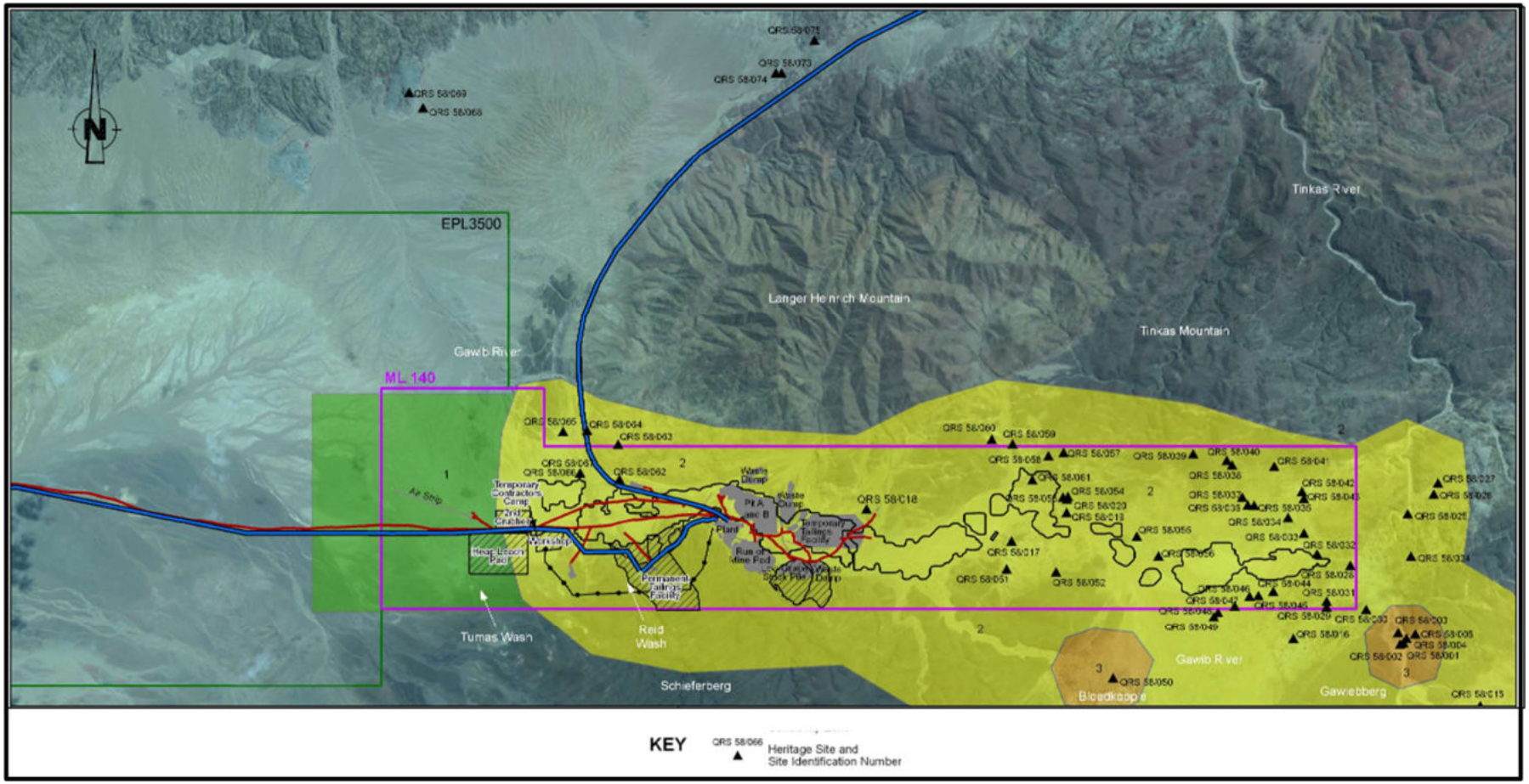

FIGURE 7: SOME OF THE KEY ARCHAEOLOGICAL SITES (METAGO, 2012 AND QUATERNARY RESEARCH SERVICES, 2011)

6.4.1 ARCHAEOLOGY ALONG THE SWAKOPMUND - LHU WATER SUPPLY SCHEME (NAMWATER PIPELINE)

Eight minor archaeological sites have been documented in the pipeline corridor along the C28 and no mitigation work is recommended for these sites (Namisun, 2023 and J. Kinahan, 2022). With reference to section 6.2.1, the section of the pipeline corridor between the LHU pipeline and the C28 road is however disturbed.

6.5 VISUAL ASPECTS AND CURRENT LANDFORMS

In describing the visual landscape, a number of factors are considered, including landscape character, sense of place, aesthetic value, sensitivity of the visual resource, and sensitive views. One of the major attractions to tourists visiting the NNNP is the scenic beauty of the park and the associated sense of place. This is primarily based on the lack of human activity and natural features inside the park, coupled with a sense of remoteness and the stark beauty of the landscape (LHU, 2016).

The bigger landscape is disturbed by the existing mining activities and infrastructure with the associated visual intrusions. It has been established that the region around the mine area has a special sense of place and is a unique and valuable visual resource but the potential for negative visual impacts already exists due to the current mining activities (LHU, 2016).

6.5.1 VISUAL ASPECTS ALONG THE SWAKOPMUND - LHU WATER SUPPLY SCHEME (NAMWATER PIPELINE)

The water pipeline also lies within the NNNP (except for the first section of the pipeline after it crosses the Swakop River, where it lies within the Dorob National Park). The landscape along the C28 primarily consists of light-coloured gravel plains with all their remarkable contrasts of light-coloured pegmatites and dark-coloured dolerite. However, the sense of place has been compromised along the investigated section of the C28 by the two existing water pipelines and booster pump stations, powerlines, the Walmund substation and the LHU communication line. Other land uses in the area include existing (small scale) Gypsum mining, historic and ongoing exploration activities and associated access tracks.

There are no communities living in the immediate vicinity of the pipeline along the C28. The pipeline(s) and booster pumps stations are visible to the public using the C28, adding to the cumulative negative visual impact of the existing linear infrastructure along this road (Namisun, 2023).

6.6 SOCIO-ECONOMIC SETTING

6.6.1 DEMOGRAPHIC PROFILE

Namibia is one of the least densely populated countries in the world (2.8 persons per km^2). Vast areas of the country are without people, in contrast to some fairly dense concentrations, such as the central-north and along the Kavango River. The last national census was conducted in 2011 and counted 2.1 million Namibians.

Windhoek, the capital, functions as a primate city – not only is it the urban area with the biggest population, but the concentration of private and public head offices attracts Namibians from all parts of the country in search for a better live. National population growth rate is estimated at less than 2%, lower than most African countries. Namibia's population is young - although 57% falls in the age group 15 – 59, 37% of the total population is younger than 15.

An inter-censal demographic survey was conducted in 2016 and estimated the total population of the country at 2.3 million and for the Erongo Region at 182,402, i.e., 7.8% of the national population total. The population is largely urban with over 87% residing in the urban areas of Swakopmund and Walvis Bay and the inland towns of Usakos, Karibib and Omaruru.

In 2018 it was estimated that 50% of all Namibians are urbanized, in other words living in an urban settlement. The Erongo Region covers a great part of the central Namib Desert, the main reason why this region has a small rural population and is the region with the second highest percentage of people living in an urban area – 92%. Only the Khomas Region (95%) has a more urbanized population, but due to the bigger size of the Erongo Region the population density is low and only marginally higher (2.9) than the national figure in 2016.

Living in an urban environment implies better living conditions – 98% of all households have access to safe water, only 13% have no toilet facility, 76% have electricity for lighting and only 15% of all household make use of open fires to prepare food. Oshiwambo is the most spoken language (44% of all households) in the region, followed by Afrikaans (19%). Average household size is 3.1 and the literacy rate is 96% for people older than 15. Compared to other regions in Namibia, the Erongo Region has the second highest level of development and the second lowest rate of human poverty. The region has a relatively young population, with a median age of 26 years and people of working age (between 15 and 59 years) make up over 68% of the urban population (Namisun, 2022). About 72% of the region's population aged 15 and above are estimated to have attained secondary education – the highest level in the country. The region is also estimated to have the second highest proportion (7.4%) of individuals with tertiary qualifications.

Swakopmund had 15 schools in 2015 of which four (4) were private schools and eleven (11) were government schools, educating a total of more than 11,000 learners. In 2022, Walvis Bay has 22 private and government schools offering education from aged 5 upwards as well as many early childhood development centers (kindergartens). The region's schools are better resourced compared with national figures, with approximately 70% of schools having laboratories and almost 80% having resource rooms e.g. libraries, compared to 33% and 43% nationally (Namisun, 2022).

6.6.2 ECONOMIC PROFILE

The Erongo Region, where the project is located, has a well-developed infrastructure, is the second most prosperous region in Namibia and includes Namibia's largest coastal towns of Walvis Bay and Swakopmund. Mining, fishing, tourism, transportation, and storage comprise the principal economic activities in the Erongo Region, with most of these taking place in the western and coastal parts.

Mining is a pronounced industry in the Erongo Region. The main commodities are uranium, gold, salt and dimension stones. Fishing is another prominent economic sector in the Erongo Region, while tourism is still on a road of recovery after the impacts of the global pandemic COVID-19.

Walvis Bay is about 70 km southwest from the project. The town is the principal home of Namibia's fishing industry and boasts also the only deep seaport of the country, with world-class port facilities and linkages with the rest of Namibia and its neighbours via the Trans-Kalahari and Trans-Caprivi Highways as a well as a railway. The Walvis International Airport ensures a direct link to the rest of the world. Key economic activities of Walvis Bay include fishing, fish processing, manufacturing, logistics, marine engineering, and storage.

The Port of Walvis Bay is Namibia's largest commercial port, receiving between 1,800 and 2,500 vessel calls each year and handling about 5 million tons of cargo, prior to the COVID-19 pandemic. Namport handles container imports, exports and trans-shipments, as well as bulk and breakbulk volumes of various commodities. The port serves a wide range of industries such as mining, petroleum, salt, and fishing. Namport is a major employer in the region, employing most of its 965 staff in Walvis Bay. The expanded container harbour at the port was in response to growth in port related activity serving the SADC region. Unfortunately, the growth has not been sustained, partly due to the impact of COVID-19 on world trade and perhaps over-ambitious targets (Namisun, 2022).

The current population of Walvis Bay is estimated at 115,000 and growing at a rate of 4.7%. It is unlikely that the town's continuous growth will slow in the short and medium term, with prospects for an increase in mining activity, increased trade of fuel and other products with the SADC region through the port, expanding manufacturing opportunities, and continuing rural-urban migration. Most of the town's population live in the low-income neighbourhoods, estimated at almost 80% in 2012 (Namisun, 2022). Although Walvis Bay is the biggest urban area in the Erongo Region, and the industrial hub of the region, the administrative capital of the region is Swakopmund and host most of the administrative and governmental headquarters of the region.

In a straight line Swakopmund is about 70 km west-northwest from LHU. It is Namibia's second largest coastal town with an estimated population of 66,000 in 2020 and a growth rate of 5.3%. Like Walvis Bay, most of the population live in low-income neighbourhoods, reflecting the severe income inequality in the country as a whole and highlight the need to explore different housing typologies to close the gap between the urban poor and middle-high income groups (Namisun, 2022). Mining and mining-related activities employ the highest proportion of the population, but Swakopmund is also a main tourism attraction, and this industry also employs a substantial proportion of the town's people.

6.6.3 EMPLOYMENT

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). More people aged between 15 and 65 years are active in the region's labour force than in any other region in Namibia (Namisun, 2022). The rate of labour force participation for the region was 80.9% compared to the average of 71.2% for Namibia in 2018.

In 2018, 53.4% of all working Namibians were employed in the private sector and 21.5% by the state. State-owned enterprises employ a further 7.6% and private individuals 16.6%. Agriculture (combined with forestry and fishing) is the economic sector with the most employees – 23% of all employed persons in Namibia work in this sector. Wages and salaries represented the main income source of 47.4% of households in Namibia.

Low education levels affect employability and prevents many households to earn a decent income. Of all employed people in Namibia, 63.5% are not higher qualified than junior secondary level (Grade 10 and lower). In total 11.8% of all employed people had no formal education. In total 29.1% of all employed people fall in the category “elementary occupation” and 15.2% in the category “skilled agriculture. Overall, the rate for unemployment is estimated at 33.4% for Namibia, using the broad definition of unemployment. The highest unemployment rates are found amongst persons with education levels lower that junior secondary. The unemployment rate of persons with no formal education is 28.6%, with primary education 34.6% and with junior secondary education 32.7%.

Although declining over time, the primary sector (agriculture, mining and fishing) employs most Namibians (23%) and is also the sector with the most employers. It is also the sector that employs the most informal workers in Namibia, calculated at 87.6%. Wages of employees in this sector are lower than all other sectors except for workers in accommodation and food services and domestic work in private households.

In the Erongo Region 67.5% of all households depend on salaries and wages as the main income. Exact figures do not exist, but this high percentage can be ascribed to the dominance of the mining, fishing and manufacturing and processing sectors together with the prominence of state departments and the administrative sectors in the Erongo Region. A total of 12.6% of households receive their income from business activities.

Average annual household consumption in urban households in Namibia was nearly double that of rural households: N$150,692 and N$81,742 respectively in 2017. In 2017 the Erongo Region ranked third highest in household consumption – urban and rural combined – at N$128,617 per annum, behind Khomas and Hardap Regions. Household income is predominantly spent on housing (38.6%), followed by food at (23.1%), which is the lowest proportion nationally. While unemployment remains a significant challenge in the region, with 30% of the labour force estimated to be jobless, this figure is the second lowest in the country. Poverty levels are on the lower side of the scale as well, with only 4.4% of all households in the region being considered poor, the lowest in the country (Namisun, 2022).

6.6.4 DEVELOPMENT CONTEXT

In 2017, Namibia was classified as a high middle-income country with a per capita GDP of N$74,489, yet this status is somewhat deceptive owing primarily to Namibia's level of income inequality, which is the third highest in the world (with South Africa) with a Gini coefficient of 76, according to the World Bank. The top 10% of the population hold 65.6% of financial assets. Socio-economic inequalities inherited from pre-independence 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 (Namisun, 2022).

The economy grew between 2010 and 2015 by an average of 5.3% per annum, but since 2016, it has not come out of recession. The 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 (Namisun, 2022).

As of the beginning of 2020 COVID-19 caused illness in humans at a pandemic scale. The viral outbreak adversely affected various socio-economic activities globally, and with reports of the increasing number of people testing positive, it has significant impacts on the operations of various economic sectors in Namibia too. The disease caused many countries to enter a state of emergency and lockdown mode, with dire economic consequences. COVID-19 negatively impacted commodity export markets, tourism and local consumption patterns and service industries and these resulted in a further 8.5% contraction of the economy in 2020. The World Bank predicts that the rebound will be slower than initially expected, with growth projected at 2.4% in 2022 (Namisun, 2022).

Before the COVID-19 pandemic, tourist arrivals to Namibia reached 1,681,000 people in 2019. Swakopmund estimated 300,000 foreign tourists and 100,000 Namibian tourists annually, in 2016. There is much relief that tourism is recovering from the catastrophic blow of Covid-19 which affected 96% of businesses due to border closure, quarantine restrictions and fears surrounding virus contraction during travel. In March 2022, hospitality establishments at the coast recorded an occupancy rate of 45% (Namisun, 2022).

As tourism involves so many different activities from handicraft manufacturing to a wide variety of retail, travel, hospitality and leisure activities, it was estimated that tourism's direct and indirect contribution to the economy amounted to N$15.1 billion in 2015 or 10.2% of GDP. The sector recorded a significant contribution to employment, recording direct employment of 44,700 which directly and indirectly generated employment for over 100,000 people in 2015. By 2018, over 80,000 Namibians, 11.4% of all those employed, worked in the accommodation and food service activities and more than three quarters of them were women. The mean monthly wage for employees in this sector was N$2,819 per month. This hides a huge gender disparity as the average male monthly wage was N$4,810 compared to N$2,143 for females (Namisun, 2022).

Tertiary industries have always been the most significant contributor to Namibia's GDP in recent years, contributing 58%, in 2019. These industries include the public sector, retail and wholesale, transport and services sectors. Secondary industries contributed 18% to GDP and include manufacturing such as meat and other food processing, beverages, mineral processing, electricity generation and construction. The primary industries, such as mining and agriculture, contributed 16% to GDP (Namisun, 2022).

In 2018, the construction industry in Namibia employed over 45,000 people, which was 6.2% of all those employed nationally. Of those construction workers, 65% (29,400) were informally employed and less than 6% were unionised. It is a very male dominated sector with average monthly wages in 2018 of N$5,441. Over 50% of those employed were under 34 years of age, so it is a valuable contributor to youth employment. The 2014 Labour Force Survey details that the Erongo Region had the second highest number of people employed in the construction sector after the Khomas Region, 7,400 and 15,500 respectively (Namisun, 2022).

The fisheries sector plays a significant role in terms of production, employment, foreign exchange earnings and government revenue. The marine fishery sector consists of a primary sub-sector that harvests fish which is landed at the Port of Walvis Bay and the Port of Lüderitz. The manufacturing sub-sector processes fish for both the local and export markets and is exclusively industrial, dominated by private enterprises with no direct government financial support and is internationally competitive. The sector employed about 15,600 people in 2019, and is a significant employer in Walvis Bay (Namisun, 2022).

The value of fish exports increased by more than 500% in 20 years, from N$1.6 billion in 1998 and provided on average about N$10 billion annually in forex earnings during the 2012- 2016 period, which makes the sector the second most important forex earner for Namibia after mining.

The contribution to GDP has increased from 2.1% at independence to 3.4% of GDP by 2018 or an average of 4.3% between 1991 and 2018 (Namisun, 2022).

The mining sector has contributed significantly to the national economy over the years with an average of >10% to GDP since 1990. In 2021, the sector contributed 9%, compared to the highest recording in 2008 of 17%. In March 2020, Namibia had 38 mines in production. The main commodities mined in the Erongo Region are uranium, gold, salt and dimension stones. (Namisun, 2022).

Mining provides upstream, downstream, and side stream linkages for the Namibian economy. Upstream linkages are the supply chains of mining inputs and services required to build and run a mine and processing plant. Examples of side stream linkages include transport services, power, water, skills, research and development, logistics, communications, and financial services. Downstream linkages are the value additions to the raw ore, which in this case will be processing the magnetite. These linkages contributed to an estimated 106,000 indirect jobs in 2021 (based on the Chamber of Mines conservative mining multiplier of 7 times the direct jobs in mining) (Namisun, 2022).

The country has good mineral resources, some remaining fish stocks, widespread livestock production, an increasingly urban population and high school attendance of both girls and boys up to Grade 11. However, the governing political party, Southwest Africa People's Organisation (SWAPO), is under more pressure than ever before to improve the lives of Namibians. There is widespread rural and urban poverty, low educational attainment, few technical skills, a major housing back-log and deepening unemployment (Namisun, 2022).

The Fifth National Development Plan 2017/18 – 2021/22 (NDP5) aims to achieve rapid industrialisation while adhering to the four integrated pillars of sustainable development: Economic Progression, Social Transformation, Environmental Sustainability and Good Governance. NDP5 recognises that mining can contribute to Namibia's transformation into an industrialized economy. It supports value added industrialisation, creating value-chains of production, and to accelerate Small and Medium Enterprise (SME) development (Namisun, 2022).

7 IDENTIFICATION AND DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACTS THAT ARE LIKELY TO CHANGE AS A RESULT OF THE PROPOSED RETURN TO PRODUCTION OF LHU

This chapter outlines the environmental aspects and potential impacts that could change because of the proposed changes as a result of the Return to Production of LHU and related activities, including the upgrades to the existing LHU Water Supply Scheme. It reasons potential cumulative impacts, and which environmental aspects and potential impacts need further assessment (Chapter 8).

7.1 ASPECT AND IMPACT IDENTIFICATION

Table 12 provides a summary of the activities associated with the 'Return to Production project' and the associated key 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 12 to determine which aspects / potential impacts need to be assessed in further detail (Chapter 8 of this report).

TABLE 12: KEY ENVIRONMENTAL IMPACTS AND ASPECTS ASSOCIATED WITH THE RETURN TO PRODUCTION PROJECT

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
Construction: • Refurbishments of the process plant. • Dismantling of FPR building. • Clearing of vegetation, site preparation, use of earthmoving equipment and machinery. • Establishing of working areas and laydown areas, waste handling facilities and construction staff amenities. • Materials delivery and laydown / storage. • Trenching, excavation. *Operations phase*: • Use of vehicles and equipment to do maintenance.	Construction activities can be disturbing / destroying **fauna (including avifauna) and flora** and habitats.	***General to all:*** In the broadest sense, biodiversity provides value for ecosystem functionality, aesthetic, spiritual, cultural, and recreational reasons. LHU and associated infrastructure fall within the NNNP. Construction activities related to the new powerline (i.e. sleeved powerline when placed underground or on ground surface) between the LHU site and the pump station at the Swakop River, the new booster pump station for the Swakop River Pipeline, the third bladder reservoir and the upgrade of the pump stations on the NamWater pipeline could cumulatively cause a loss of natural vegetation and could lead to habitat fragmentation and degradation. All of the expected construction work is not large-scale and is confined to small work areas though. The potential impacts on biodiversity (physical impacts and general disturbance), therefore include: • Loss of vegetation and associated fauna due to construction activities. • Impact on fauna movement. • Disturbance to habitats. ***Refurbishments of the LHU process plant and related activities and infrastructure, including the third water storage bladder:*** Most of the activities will be undertaken within the disturbed areas associated with the process plant, no additional impacts to biodiversity are expected. The proposed third bladder will be adjacent to the existing two bladders in an area with some level of disturbance. Taking the (relatively) small additional areas of disturbance into account, limited additional disturbance to biodiversity is expected. Also taking the commitments in the amended LHU EMP into account (relating to the above mentioned biodiversity impacts), no further assessment is required. ***Swakop River pipeline – new booster pump station and 11 kV powerline:*** With reference to Section 6.2, the booster pump station will be located on a small hill near the pipeline, previously disturbed. The limited disturbance of the proposed powerline infrastructure, (i.e. using the existing service track next to the pipeline during installation) will also cause limited additional disturbance to biodiversity. However, the assessment findings from the Stage 3 EIA (Metago, 2009) need to be taken into account during the implementation of the powerline, with the commitments in the EMP remaining relevant. In this regard "proposed power line that will follow the route of the existing pipeline and associated gravel track between the ML and the Swakop River. Parts of this pipeline route are situated in irreplaceable habitats (see section 6.2). Despite this, the amount of disturbance

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
• Operations of refurbished FPR area *Decommissioning and closure*		that can be caused by the placement of a low voltage power line along the existing gravel track is limited, particularly in the managed scenario" (Metago, 2009). Taking the above into account and the commitments in the amended LHU EMP (relating to the above mentioned biodiversity impacts), no further assessment is required.
		Amendment to NamWater's Swakopmund - LHU Water Supply Scheme - increased height of the pump stations: With reference to Section 4.6.2.1, the footprint of the pump stations will stay unchanged. Access to the pump stations will be from the C28 road and it is expected that the construction activities will be confined to the already disturbed reserve between the C28 road and the pipeline. Therefore, limited additional disturbance to biodiversity is expected. Taking the commitments in the amended NamWater EMP into account, no further assessment is required.
	Activities and infrastructure disturbing / killing **avifauna** (specifically)	***Swakop River pipeline – new booster pump station and 11 kV powerline:*** Potential impacts on avifauna related to the aboveground section of the powerline (i.e. between the mine site and the booster pump station) include the following: • Bird collisions with infrastructure. • Bird electrocutions on power line infrastructure. With reference to Section 6.2, twelve priority species are at risk mainly due to collision impacts, and electrocutions in some cases, in the event of the powerline being aboveground. Refer to Section 8 for the assessment of the potential impacts on avifauna.
	Air quality can worsen	***Refurbishments of the LHU process plant and related activities and infrastructure*** Emissions from the stacks of the refurbished FPR can result in air pollution and lead to an increased risk of health impacts to third parties. Also, the six (6) diesel generators with a total generation capacity of 10MW, will be used as back-up power generation for approximately 18 hours per year. Refer to Section 8 for the assessment of the potential impacts on air quality.

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
	New structures and infrastructure can contribute to overall **visual** impacts	***General to all:*** Visual impacts on this receiving environment may be caused by activities and infrastructure in all mine phases. Potential visual impacts therefore include: • General visual impacts and sense of place.
		Refurbishments of the LHU process plant and related activities and infrastructure, including the third water storage bladder: The activities (and infrastructure) are all being conducted within the footprint of the current operations at LHU and will not add cumulatively to the visual impacts to third parties (i.e. from Bloedkoppie). No further assessment is required.
		Swakop River pipeline – new booster pump station and 11 KV Powerline: The existing pipeline follows a route (north of the Langer Heinrich Mountain) where no tourism activities are allowed / undertaken. The only visual receptor is Farm Riet, located near the Swakop River abstraction boreholes. The powerline will be at ground level, next to the existing pipeline and would cause very limited additional (cumulative) visual disturbance near the Swakop River. No further assessment is required.
		Amendment to NamWater's Swakopmund - LHU Water Supply Scheme - increased height of the pump stations: Due to the increased height of the pump station buildings along the NamWater pipeline the potential cumulative visual impacts can increase during operations, along the C28 road. Refer to Section 8 for the assessment of the potential visual impacts.
	Archaeological / heritage sites can be damaged during construction, operational and decommissioning activities.	***General to all:*** The construction, operational (maintenance) and decommissioning activities have the potential to encroach upon, disturb, damage or destroy archaeological remains protected under the National Heritage Act (27 of 2004). This risk remains, even though all known archaeological are outside of the expected work areas.
		Refurbishments of the LHU process plant and related activities and infrastructure, including the third water storage bladder:

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
		Most of the activities will be undertaken within the disturbed areas associated with the process plant, no additional impacts to archaeology are expected. The proposed third bladder will be adjacent to the existing two bladders in an area with some level of disturbance with no previously identified archaeological / heritage sites. Taking the (relatively) small additional areas of disturbance into account, no disturbance to archaeological / heritage sites is expected. Taking the commitments in the amended LHU EMP into account (including a standard Chance Find Procedure for the managing of discoveries made), no further assessment is required.
		Swakop River pipeline – new booster pump station and 11 kV powerline: With reference to Section 6.4, various archaeological sites are situated near the existing pipeline. Further construction activities associated with the booster pump station and the new powerline have the potential to encroach upon, disturb, damage or destroy these sites. The Stage 3 EIA (Metago, 2009 with Kinahan 2009) already assessed the overall Archaeological impacts at LHU, including a proposed powerline along the Swakop River. However, due to the sensitivities and LHU's proposal to possibly install the powerline underground in certain sections, this issue was re-assessed, Refer to Section 8 for the assessment of the potential archaeological / heritage impacts.
		Amendment to NamWater's Swakopmund - LHU Water Supply Scheme - increased height of the pump stations: With reference to Section 4.6.2.1, the footprint of the pump stations will stay unchanged. Access to the pump stations will be from the C28 road and it is expected that the construction activities will be confined to the already disturbed reserve between the C28 road and the pipeline. Therefore, no disturbance to archaeological / heritage sites is expected. Taking the commitments in the amended NamWater EMP into account (including a standard Chance Find Procedure for the managing of discoveries made), no further assessment is required.
	Waste management	With reference to Section 4, the following relating to waste management: • Various 'construction related' waste of a diverse nature (i.e. general waste, hazardous (non-radioactive) and radioactive waste is generated – as part of the refurbishment activities. • The FPR is being dismantled and replaced with an upgraded facility. The waste being generated from these activities are largely radio-active contaminated and disposed / 'stored' in dedicated areas on TSF 2. Waste management commitments at LHU are included in the approved EMP. No further assessment is required, however, additional management and mitigation measure are included in the amended LHU EMP, specifically

ACTIVITY / FACILITY	ASPECT	POTENTIAL IMPACT AND RELEVANCE (SCREENING) OF POTENTIAL IMPACT
		related to the future radio-active contaminated waste storage / disposal on site. LHU have already engaged with a Radiological Specialist to provide specialist input.
	Employment of people and **socio-economic** aspects.	The proposed Return to Production of LHU brings economic benefits, jobs and new skills to Erongo Region and Namibia. To the contrary, it is likely to induce negative social impacts such as in-migration and significant additional pressures on state services such as education and health. The potential impacts that were previously identified and assessment (as part of the original EIAs) include the following: • Economic impacts during construction, operations, decommissioning and closure. • Job creation and skills development during construction and operations. • Loss of jobs and livelihoods on decommissioning and closure. The return to production of the LHU, will ensure new employment opportunities and the above mentioned impacts (both positive and negative) remain relevant. However, the changes proposed will not cumulatively add to the previously assessed impacts and therefore no further assessment is required. The commitments in the LHU EMP remain valid.

7.2 Summary of Environmental Aspects and Potential Impacts that Require Assessment

Based on the discussions in Table 12, the aspects / potential impacts that require further assessment (see Chapter 8) are summarised below.

Refurbishments of the LHU process plant and related activities and infrastructure:

- Air quality:
    - Air pollution and increased risk of health impact to third parties relating to the stacks of the refurbished FPR.

Swakop River pipeline – new booster pump station and 11 kV powerline:

- Avifauna:
    - Bird collisions with powerline infrastructure.
    - Bird electrocutions on power line infrastructure.
- Archaeology:
    - Damage or destruction of archaeological sites.

Amendment to NamWater's Swakopmund - LHU Water Supply Scheme - increased height of the pump stations:

- Visual and sense of place :
    - Potential cumulative visual impacts as a result of the increased height of the pump station buildings.

8 ENVIRONMENTAL IMPACT ASSESSMENT

This chapter assesses the key potential impacts (as identified in Chapter 7, relating to the proposed Return to Production of LHU and related activities.

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

- Air quality: Impacts relating to the stacks of the refurbished FPR.
- Avifauna: Bird collisions and electrocutions with the proposed new 11 kV powerline infrastructure for the Swakop River pipeline.
- Archaeology: Damage or destruction of archaeological sites during the construction activities of the above mentioned powerline and booster pumpstation (i.e. Swakop River pipeline).
- Visual Potential cumulative visual impacts as a result of the increased height of the pump station buildings NamWater's Swakopmund - LHU Water supply scheme.

The activities that are summarised in this chapter are linked to the descriptions provided in Chapters 4 and 7 (Table 12). 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 summarised in this chapter and presented in the Amended LHU EMP (see Appendix F) and Amendment NamWater EMP (see Appendix G).

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 13 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 14 and Table 15 respectively.

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

TABLE 13: 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 14: 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 15: 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 REFURBISHMENTS OF THE LHU PROCESS PLANT AND RELATED ACTIVITIES AND INFRASTRUCTURE

8.1.1 AIR QUALITY: AIR POLLUTION AND INCREASED RISK OF HEALTH IMPACT TO THIRD PARTIES RELATING TO THE STACKS OF THE REFURBISHED FPR.

The information in this section was sourced from the Air Quality Report (Airshed, 2023) included in Appendix D.

With reference to Table 12, Emissions from the stacks of the refurbished FPR can result in air pollution and lead to an increased risk of health impacts to third parties. Due the proposed project amendments, Airshed re-assessed the potential cumulative air quality impacts.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

The main findings from Airshed's Level 1 screening of potential impacts from the two FRP stacks are (refer to section 3.3.2 for the AQOs):

- Simulated highest hourly ground level SO_2 concentrations from the FPR Stack 1 are well below the SO_2 hourly AQO at the Closets Receptors, provided the design ensures an emission limit of 400 mg/Nm³.
- Simulated highest hourly ground level PM concentrations from the FPR Stack 2 are well below the PM_{10} and $PM_{2.5}$ daily AQOs at the Closets Receptors. No hourly limits exist but should these highest hourly concentrations be extrapolated to daily averages; it will be even lower.
- It is highly unlikely that emissions from the two FPR stacks would result in unacceptable impacts at the Closets Receptors, even if considering cumulatively.

The potential for unacceptable ground level concentrations from gaseous emissions are therefore low, provided only three HFO boilers are in operation, the FPR Stack 1 is designed to meet a SO_2 emission limit of 400 mg/Nm³ and the back-up diesel generators do not operate for more than 1.5 hours per month.

Taking all of the above into consideration, the impact intensity for the operations phase is rated as low. The duration of the impact (unmitigated) will be moderate. The extent is rated as low.

Consequence

The determining consequence of the impact is therefore low.

Probability

The probability of increased $PM_{2.5}$ and PM_{10} and SO_2 concentrations at the Closets Receptors is unlikely.

Significance

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

Tabulated summary of the assessed impact – Air pollution

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

The new FPR stacks, based on the design specification provided, are therefor likely to have an insignificant contribution to the cumulative air quality impacts and the original (cumulative air quality impact assessment (i.e. relating to the approved Stage 4 operations remain unchanged). The main source of concern at LHU remain unpaved roads, followed by windblown dust from the TSFs and WRDs.

Management and mitigation measures

The management measures and monitoring requirements as provided in the original (approved) EMP Commitments should remain, with no changes required to these commitments but the additional recommendations provided by Airshed (2023) should be included. Refer to Amended LHU EMP (Appendix F).

Cognisance needs to be given to the requirements of the Best Practice Guide for the Mining Sector in Namibia with regards to air quality management. Requirements applicable to LHU are:

- Dust and gaseous emissions require immediate monitoring, as well as the establishment of a network of meteorological measuring points. Dust requires the monitoring of particulate matter (PM), in PM_{10}–format, but the monitoring program may require simultaneous measurement of TSP or $PM_{2.5}$ as well.

- Dust Management Plans for all operational sites (mines, exploration sites and quarries); annual reporting of dustfall levels and PM_{10} concentrations to the authorities; dust suppression at construction sites (as well as annual reporting on dust mitigation measures); update and improvement of the current emissions inventory; establishing a monitoring regime to enhance source apportionment of PM concentrations and sodium content; and continuation with PM_{10} and meteorological monitoring.
- All mines must, as a minimum requirement of an air quality management plan, manage dust.

Requirements as set out in the Metals & Mining standard (SABS, 2021) applicable to LHU are:

- Quantify and report on Scope 1 GHG emissions annually as carbon dioxide equivalents (CO_2-e) and calculated in accordance with published 100-year time horizon global warming potential (GWP) values according to the methodology contained in The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (GHG Protocol) (EM-MM-110a.1).
- Compile a short-term and long-term GHG strategy or plan to manage its Scope 1 GHG emissions, including emission reduction target(s) (EM-MM-110a.2.)
- Quantify and report on non-GHG emissions (CO, NOx, SOx, PM_{10}, mercury (Hg), lead (Pb), and volatile organic compounds (VOCs)) as metric tons per pollutant, associated with the entity's direct air emissions resulting from all mining and processing activities (including, but not limited to, stationary and mobile sources, production facilities, office buildings, and transportation fleets) (EM-MM-120a.1).

8.2 SWAKOP RIVER PIPELINE – NEW BOOSTER PUMP STATION AND 11 KV POWERLINE

8.2.1 AVIFAUNA AVIFAUNA: BIRD COLLISIONS AND ELECTROCUTIONS WITH THE PROPOSED NEW 11 KV POWERLINE INFRASTRUCTURE FOR THE SWAKOP RIVER PIPELINE.

The following sections are extracts from the Avifauna Specialist Report (ACS, 2023) (see Appendix E).

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

Birds may be injured or killed by colliding with power line infrastructure. This impact is well documented in Namibia and elsewhere in the world. It is a likely impact, in the event of the above-ground power line option being followed.

An electrocution occurs when a bird is perched or attempts to perch on an electrical structure and is large enough to cause an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components. An electrocution could also be caused should a large bird perch on top of a pole and send down a "streamer" of excrement that could hit a conductor, thereby bridging the gap between an earthed and a live component.

A collision / electrocution is a direct impact that could potentially result in:

- Bird injuries and/or mortalities
- Indirectly, mortalities of breeding birds would result in reduced breeding success; and mortalities of juveniles, in reduced recruitment to the population.

Most of the identified high priority bird species in the study area (Table 1) are prone to power line collisions. These include the following:

- Ludwig's Bustard.
- Lappet-faced Vulture.
- White-backed Vulture.
- Martial Eagle.
- Rüppell's Korhaan.
- Raptors: Black-chested Snake Eagle.
- Barn Owl.

Priority bird species in the study area that may potentially be impacted by electrocution in the above way (i.e. by direct contact, or by streamers) include Lappet-faced Vulture, White-backed Vulture and Martial Eagle and other raptors. The impact is likely to be moderate, but depending on the presence of the nomadic bustards which are not resident in the area. Although there will be an impact, based on evidence, mortalities are likely to be moderate, and these mortalities will probably not contribute significantly to the health of the priority species' population.

The extent of the impact would be confined to the project area and its nearby surroundings (i.e. local). The duration of impacts is rated as high in the event of death or injury to individual birds.

Consequence

The determining consequence of the impact is moderate.

Probability

The probability of impacts on birds are moderate (i.e. electrocutions) to high (i.e. collisions) for the unmitigated scenario and low with mitigation.

Significance

The significance of the impact in the unmitigated scenario is rated Moderate and low with mitigation.

Tabulated summary of the assessed impact – Bird collisions and electrocution with 11 kV power;ine infrastructure

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

Management and mitigation measures

Refer to Amended LHU EMP (Appendix F). Key measures include the following:

- Monitoring is essential to identify (potential) problem areas; any movement of hitherto unrecorded species into the area should be monitored; and any resulting negative impacts result should be addressed (see Amended EMP for further details).
- The need for reporting power line incidents should be stressed, and reporting procedures clarified.

- Any sections that subsequently still prove to be problematic in terms of electrocutions should be retro-fitted with mitigation, by way of adaptive management.
- Bird nesting activities should be discouraged early in the cycle, before any eggs are laid; the MEFT should be contacted for specific guidelines to discourage and manage such activities, e.g. by removing nests at a stage when this is acceptable.

8.2.2 ARCHAEOLOGY: DAMAGE OR DESTRUCTION OF ARCHAEOLOGICAL SITES DURING THE CONSTRUCTION (AND MAINTENANCE / DECOMMISSION) ACTIVITIES OF THE 11 KV POWERLINE AND BOOSTER PUMPSTATION.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

With reference to Table 12, the construction (and decommissioning) activities and movement of vehicles associated with proposed new 11 kV powerline and the booster pump station have the potential to encroach upon, disturb, damage or destroy archaeological remains protected under the National Heritage Act (27 of 2004). With reference to section 6.4 a number of specific sites (some having high archaeological sensitivity) are considered to be potentially vulnerable to disturbance from Project activities and in close proximity to the existing pipeline and associated service road.

According to Metago / Kinahan (2009), "parts of the proposed power line route to the Swakop River are situated near to sites associated with the historical battlefield which is considered relatively more sensitive".

Taking the above into consideration, the impact intensity is rated as high in the unmitigated scenario. The duration of the impacts is considered to be long term (high). The extent is local, mostly within the project area and is rated as low.

Consequence

The determining consequence of the impact is therefore high in the unmitigated scenario.

Probability

With reference to the above, the probability of significant historical remains being disturbed or destructed, is most likely in the unmitigated scenario. With mitigations (i.e. avoidance of activities on these sites, the probability reduces to low.

Significance

The significance of the impact is rated as moderate to high in the unmitigated scenario and low with mitigation.

Tabulated summary of the assessed impact – Damage or destruction of archaeological sites

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

Management and mitigation measures

Refer to the updated LHU EMP (Appendix F). Key measures include the following:

- Refer to the Archaeology assessment reports conducted during the Stage 3 and stage 4 Expansion EIAs to confirm the location of all the archaeological sites as well as commitments by the Archaeologist.

- Avoid damage / disturbance to all these sites by carefully planning and constructing the final routing / placement of the powerline, booster pumpstation and associated infrastructure.

- Avoid excavations / trenches for the powerline and associated infrastructure in the vicinity of the archaeological sites. In these locations, the (sleeved) powerline must by laid (immediately or as near as possible) next to the pipeline or service road, to avoid any further disturbance. Also, all vehicles must stay on the existing service track in these areas.

- The following commitments from Kinhan, 2009, refers: “The German infantry trenches at QRS 58/074 should be condoned off during construction. This should take the form of a line of steel posts with highly visible danger tape. Contractors should also be shown the site and instructed to avoid encroaching on them. If possible, work on this section should be served by a track on the eastern side of the pipeline. All soil disturbance except the minimum service track should be rehabilitated by hand after construction.

8.3 AMENDMENT TO NAMWATER'S SWAKOPMUND - LHU WATER SUPPLY SCHEME - INCREASED HEIGHT OF THE PUMP STATIONS:

8.3.1 VISUAL AND SENSE OF PLACE: POTENTIAL CUMULATIVE VISUAL IMPACTS AS A RESULTS OF THE HIGHER PUMP STATION BUILDINGS.

Assessment of impact

Nature and intensity, duration of impact and geographical extent

With reference to section 6.5, the NNNP (and DNP) offers a natural landscape and scenic beauty, and sense of place primarily for tourists visiting the area. This is due to the lack of human activity and the presence of natural features (i.e. wilderness), that provides a nature related 'feel' in the park.

With reference to section 4.1.2, the current water pipeline along the C28 Road will remain as is. However, the height of the pump stations will be increased with ~2.1 m. These modifications will be done within an existing service corridor along the C28 with infrastructure. The cumulative impact with the infrastructure is considered in the assessment below.

The severity of visual impacts is determined by assessing the change to the visual landscape as a result of the proposed change to the booster pumps stations. The visual receptors are the immediate travellers on the C28 road.

The visual landscape is determined by considering: landscape character, sense of place, aesthetic value, sensitivity of the visual resource and sensitive views. In this regard, the area in which the section of the pipeline route will follow the C28 has already been compromised by the existing infrastructure along the service corridor, including the pipelines for the Husab Mine and Langer Heinrich Mine pipelines and booster pump stations, powerlines, and a data line. A service road (i.e. track) is adjacent (north) to the Husab pipeline and the Walmund substation, with various overhead powerlines connected to the substation. However, the proposed changes to booster pump stations will add to the cumulative negative visual impact of the existing development along the C28. Taking the relatively small changes (i.e. "addition to infrastructure") along this existing service corridor into account, the contribution to the cumulative negative visual impact would be small. However, this would add to the cumulative impacts.

When considering the potential change to the visual landscape the key issues are: visual exposure, visual intrusion, and sensitivity of receptors (Metago, 2012).

Considering the above mentioned, the intensity relating to the visual impacts associated with the increase in height of the pump stations is low, however due to it contributing cumulatively, it is rated as moderate. The existing pipeline infrastructure and associated pump stations are visible beyond the boundary of the 'project'. This is rated as a low to moderate extent.

The duration of the visual impact is for the life of the project, therefore moderate.

Consequence

The consequence of this (cumulative) impact is moderate in the unmitigated scenario and will not change in the mitigated scenario.

Probability

The probability of the (cumulative) visual impact occurring is high in both the unmitigated and mitigated scenarios.

Significance

The significance (cumulative) is moderate in both the unmitigated and mitigated scenarios.

Tabulated summary of the assessed impact – Visual impact and sense of place

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

Management and mitigation measures

Conceptual discussion of the management and mitigation measures is provided below and detailed in the Amended NamWater EMP (see Appendix G):

- The infrastructure should be the same colour as the existing pipeline(s) or a natural colour that will blend in with the surrounding environment.
- Rehabilitate areas after the construction phase of the booster pump stations changes.

9 WAY FORWARD

The way forward is as follows:

- Distribute the EIA Amendment Report and a summary thereof for review by the IAPs and authorities.
- Receive comments from IAPs and authorities by (latest) 25 July 2023.
- Consider all comments received, update reports (where relevant) and submit the final report to the MEFT.
- 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 'Return to Production project' and associated activities, including the increased water requirements to the mine have been successfully identified. The following environmental aspects and their overall cumulative impacts associated with the proposed activates had to be assessed / re-assessed, taking the assessment findings of the original / approved EIAs (where relevant); the baseline environmental conditions; and the proposed project changes into consideration:

Refurbishments of the LHU process plant and related activities and infrastructure:

- Air quality:
    - Air pollution and increased risk of health impact to third parties relating to the stacks of the refurbished FPR.

Swakop River pipeline – new booster pump station and 11 kV powerline:

- Avifauna:
    - Bird collisions with powerline infrastructure.
    - Bird electrocutions on power line infrastructure.
- Archaeology:
    - Damage or destruction of archaeological sites.

Amendment to NamWater's Swakopmund - LHU Water Supply Scheme - increased height of the pump stations:

- Visual and sense of place :
    - Potential cumulative visual impacts as a result of the increased height of the pump station buildings.

The results of this impact assessment present the potential for additional negative environmental impacts. The return to production of the LHU, will however ensure new employment opportunities and the potential socio-economic impacts (both positive and negative) previous assessed for the LHU operations remain relevant.

The commitments in the LHU EMP and the NamWater EMP were both review and updated, where relevant.

Namisun therefore believes that all environmental aspects and potential impacts associated with the proposed 'Return to Production project' for LHU were identified, described and appropriately assessed. However, any future changes proposed by LHU relating to mining, processing (including handling and disposal of tailings and associated tailings storage facilities (TSFs), etc.) will be subject to further assessments and an amendment application of the LHU ECC. The associated activities / facilities and potential impacts associated with such changes were therefore not considered in this report.

It is recommended that, if MEFT provides a positive decision on the two applications for the proposed project changes, they should include a condition to the clearances that both LHU and NamWater must implement all commitments in the two amended EMPs.

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APPENDIX A – CURRICULUM VITAE

APPENDIX B – INFORMATION SHARING RECORD

APPENDIX C – STAKEHOLDER DATABASE

APPENDIX D – AIR QUALITY SPECIALIST REPORT

APPENDIX E – AVIFAUNA SPECIALIST REPORT

APPENDIX F – LHU AMENDED EMP

APPENDIX G – NAMWATER AMENDED EMP

APPENDIX H – SWAKOP RIVER PIPELINE BOOSTER PUMP STATION DESIGN

APPENDIX I - COMMENTS RECEIVED FROM I&APS