

DRAFT SCOPING/ENVIRONMENTAL IMPACT ASSESSMENT REPORT

THE WATER SUPPLY IMPROVEMENT PROJECT TO THE LANGER HEINRICH URANIUM MINE

*DRAFT 03
23/11/2010
for comment by stakeholders*

Prepared by: Enviro Dynamics
Project proponent: Langer Heinrich Uranium (Pty) Ltd



EXECUTIVE SUMMARY

Introduction and project description

The Langer Heinrich Mine (LHM) is located approximately 90km east of Swakopmund in the Namib Naukluft National Park in the Erongo Region of Namibia. Langer Heinrich Uranium Mine (LHM) focuses on the mining and processing of uranium ore.

The Water Resource Improvement Project is required to secure a water resource for the future extensions of the mine. It is clear that the water demand of the mine is reaching the limits of its available resources. .

LHM appointed Enviro Dynamics to conduct an environmental impact assessment (EIA) of the proposed Water Resource Improvement Project in line with Namibia's Environmental Management Act (2007).

The Terms of Reference for the detailed environmental impact assessment are to:

- ✓ assess the impacts of the additional water abstraction of 250,000m³/annum from the Husab Berg (HBC) groundwater compartment to supply the LHM if the capacity of compartment allows for it;
- ✓ assess the alternative routes for electricity and water pipeline infrastructure from the mine to the Swakop River boreholes in terms of archaeology, vegetation and sense of place; and
- ✓ assess the impacts related to construction, operation and maintenance of the water and electricity lines and borehole infrastructure.

Originally additional abstraction from both the Langer Heinrich- and Husab Berg Compartments in the Swakop River were included as part of the study. The client however decided to only investigate the possibility of abstracting 250 000m³/annum from the Husab Berg Compartment as an option for additional water supply to the mine.

In order to implement this planned abstraction, additional infrastructure is required such as water line from the mine to the HBC as well as a power line that supplies both LHC and HBC. The entire project is situated in the Gawib valley and the Swakop River valley.

The Scope of the EIA is:

- ✓ Physically limited to the Gawib River valley and the Langer Heinrich and Husab Berg groundwater compartments in the Swakop River valley.

- ✓ Geographically placed in the wider socio-economic context of the Erongo Region. Although the project is relatively small and focused in size, there are elements to the project that will have to be guided by the wider context such as the Uranium Rush Strategic Environmental Assessment.

Public consultation process

Key stakeholders and the Public were invited to participate in the public consultation process via formal invitation adverts. The consultation process was guided through a public meeting in Swakopmund and an authorities meeting in Windhoek on the 4th and 20th of August 2010 respectively. Stakeholders were also invited to raise issues electronically.

The key issues raised by stakeholders were the potential impact on the regional groundwater source, and the water table and water quality. These are major concerns in the context of regional water resource equation in the Erongo Region. The effect of this on tourism and farming livelihoods as well as the potential impact on the well known heritage resources of the area were also raised.

Further steps in the public consultation plan included circulation of the Issues and Responses Trail (a record of all issues raised and the initial responses provided in the meeting). It is planned to present this Draft Report as part of an Open Day and it will be circulated for comment to all on the stakeholder database. Comments received will be incorporated into the Final Environmental Impact Report.

Legal review

A legal framework was compiled for this EIA. It includes the applicable environmental and water utilisation laws and policies and shows the implications of each for compliance and implementation. In addition it is emphasised that the draft Uranium Rush SEA should guide the decision-making process of the project.

Baseline description

The project is located in the Erongo Region, which is one of the more affluent regions in Namibia with a high average income of N\$16,819 per annum but still with a relatively high unemployment rate of 34%.

The uranium mining industry is one of the two major employers in the region. This industry is growing significantly and has contributed to the region's international status. Langer Heinrich has 269 employees, 300 long term and 490 short term subcontractors. Taking into account the *workers: dependents* ratio of 1: 4.3, the number of dependents benefiting from employment at this mine is 4,554.

However this also increases the demand for electricity and water, which is a very limited resource of the region. The region is fairly isolated from the national water resource base and depends mostly on groundwater from within the region.

Other main economic activities in the region are tourism and commercial fishing.

The project is located in the central Namib Desert which is characterised by rocky terrain and sensitive gypsum plains. The source of HBC investigated is located in the Swakop River, which classifies as a linear riparian oasis that has a history of degradation due to the impact of dams that were built in the 1960s and 1970s.

The groundwater capacity of the HBC is low and recharge is limited due to the reduction in catchment area by the dams. Therefore the sustainable yield is only 150,000 m³/annum.

The HBC vegetation may be degraded but the impact of water abstraction on vegetation over time is still uncertain; therefore a cautionary approach of assessment is required.

The archaeology study identified significant sites close to the infrastructure route alternatives. The only area that is not sensitive to development in terms of archaeology is the Gawib River bed.

Impact assessment

The sensitivities identified were screened to identify those that require further assessment and those that can be dealt with in an EMP without further assessment. Those that require further assessment were grouped into aspects and the potential impacts of each were described. This resulted in seven impacts that were assessed according to the methodology described in **Section 7** of the Impact Assessment. The Table below provides a summary of the Impact Assessment and key mitigation measures.

| Related Aspect | Related Impact | Rating before mitigation | Key Mitigation | Rating after mitigation |
|---|---|--------------------------|--|-------------------------|
| Continued/increased groundwater abstraction | The protection of the limited regional water resource is compromised (Combined impacts No 1, 8) | H | Do not abstract from HBC. | L |
| | The Husab Berg Compartment water levels will decline below the acceptable model limits. | H | Only abstract up to 150k m ³ /annum from HBC. | L |
| | Groundwater dependent | M | Apply groundwater | M |

| Related Aspect | Related Impact | Rating before mitigation | Key Mitigation | Rating after mitigation |
|----------------|--|--------------------------|--|-------------------------|
| | riparian vegetation distribution and density reduces resulting in reduced habitat that cannot recover due to the inferior ability of the Swakop River to sustain groundwater dependent biodiversity once groundwater levels are reduced. (Combined Impacts No 3, 4, 5, 14) | | model strictly to abstraction. Apply a scientific vegetation monitoring system. Do not lower groundwater level by more than 10cm month. | |

Three project alternatives were investigated namely

- ✓ Abstracting an additional 250m³/annum groundwater from the HBC.
- ✓ Finding an alternative source of water in desalination.
- ✓ No Project alternative.

Finding an alternative source in desalinated water is the most sustainable option.

Conclusions and recommendations

LHM must find improved water sources to be able to implement its future extension plans. The project investigated these sources which include the use of desalinated water and increased groundwater. The desalination option is not yet available and currently the use of groundwater is the short term solution.

The mine should implement the Uranium rush SEA recommendations related to water for its operations. This will only be possible if Namwater can come to an agreement with the sole desalinated water supplier, or an alternative desalination plant is developed. Both these options will take time to implement.

The specific source of groundwater investigated in the HBC is too limited in capacity to be used on a sustainable basis.

The conclusion of the EIA therefore is that :

The proposed abstraction of 250,000m³/annum from the Husab Berg compartment is not sustainable. The impact of this activity will be high since the sustainable abstraction rate is only 150,000m³/annum and the SEA gives a clear recommendation/guideline that future mining activities must source desalinated water only.

In the light of this conclusion the following recommendations are made for LHM:

- ✓ Align with the EQO water recommendation of the Uranium Rush SEA as a matter of priority.
- ✓ Make a public commitment not to abstract water from the HBC.

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LIST OF ACRONYMS

| | |
|----------------------------|---|
| BID | Background Information Document |
| BIWAC | Bittner Water Consult |
| °C | Degree Celsius |
| EA | Environmental Assessment |
| ED | Enviro Dynamics cc |
| EIA | Environmental Impact Assessment |
| EMP | Environmental Management Plan |
| GDP | Gross Domestic Product |
| GPS | Global Positioning System |
| HBC | Husab Berg Compartment |
| LHC | Langer Heinrich Compartment |
| LHM | Langer Heinrich Uranium Mine |
| m³/annum | Cubic meter per year |
| mm/annum | Millimetre per year |
| Nampost | Namibia Post Ltd |
| Namwater | Namibia Water Corporation |
| MET | Ministry of Environment and Tourism |
| MME | Ministry of Mines and Energy |
| NGO | Non Governmental Organisation |
| NNNP | Namib Naukluft National Park |
| NPC | National Planning Commission |
| RED | Regional Electricity Distributor |
| SEA | Strategic Environmental Assessment |
| SAEIA | South African Institute for Environmental Impact Assessment |
| SEMP | Strategic Environmental Management Plan |
| WSIP | Water Supply Improvement Project |

1. INTRODUCTION

1.1. Background

The Langer Heinrich Uranium Mine (LHM) is located approximately 90 km east of Swakopmund in the Erongo Region. The mine is situated close to the Swakop River on the northern boundary of the Namib Naukluft National Park.

The mine was established in 2006 and went into full operation by 2007. Stage 2 expansion of the mine was completed by 2009. Future planning of the mine includes two more expansions (Stage 3 which is being constructed and planned to be commissioned in 2011 and Stage 4).

1.2. Rationale of the project

The water resource improvement project is required for the following reasons:

- ✓ The mine is close to its limits in terms of water available from formal Namwater sources after the Stage 2 expansion and cannot continue with the Stage 3 and 4 expansions unless additional water resources are made available.
- ✓ The mine requires additional water for dust suppressing purposes and for certain construction activities for the Stage 3 expansion project.

The alternative water resources available to LHM are currently from groundwater compartments in the Swakop River, namely the Langer Heinrich and Husab Berg Compartments, as well as other supply options being investigated in collaboration with Namwater (i.e. desalinisation options).

1.3. Scope of the EIA

Langer Heinrich Uranium Mine, the project proponent, therefore embarked upon this project called:

The Water Supply Improvement Project to the Langer Heinrich Mine.

LHM has a permit to abstract 500,000m³/annum of water per annum from the Langer Heinrich Compartment from the Department of Water Affairs. Currently they use about 50% of this allotment which might increase to 100%.

The objective of the mine is to apply for a permit to abstract additional water from the Swakop River. Originally additional abstraction from both the Langer Heinrich and Husab Berg Compartments in the Swakop River were included as part of the study. The client however decided to only investigate the possibility of abstracting

250 000m³/annum from the Husab Berg Compartment as an option for additional water supply to the mine.

According to the Namibia Environmental Management Act (2007) the permit application for the proposed abstraction of water from the Husab Berg Compartment and construction of associated infrastructure requires an Environmental Impact Assessment (EIA).

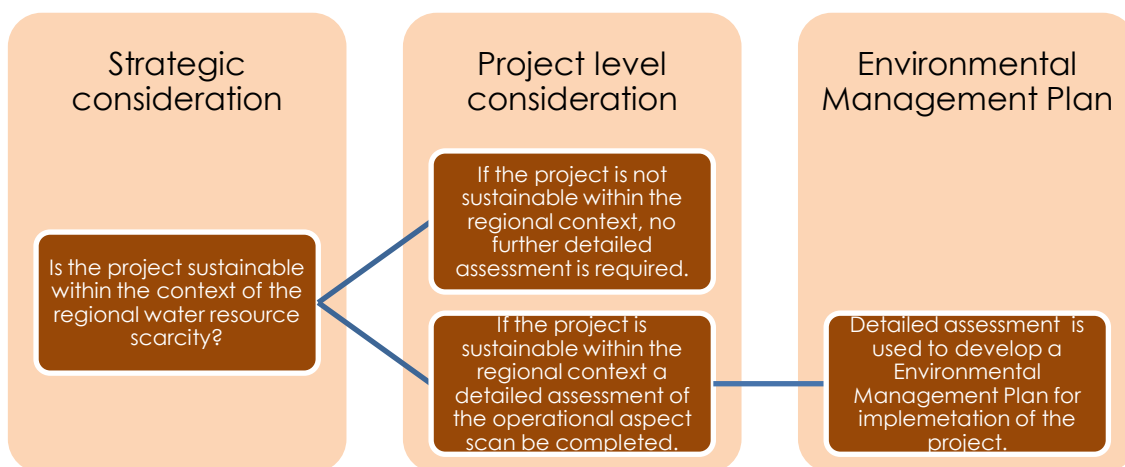
LHM therefore appointed Enviro Dynamics to conduct a full EIA on the project.

The initial objective of the EIA was to assess the viability of increasing the abstraction of the groundwater from the Husab Berg and Langer Heinrich Compartments in the Swakop River in the context of the importance of groundwater resources to the water resource security of the Erongo Region.

Due to the increasing demand pressure on groundwater in the Erongo Region and the limited capacity of this resource in the region the strategic significance of the project must be considered also.

Figure 1-1 provides a visual presentation of the nature of the project and how it is to be considered.

Figure 1-1: Process of confirming the project.



Although the project is relatively small and focused in size, there are elements to it that will have to be guided by the wider context such as the Uranium Rush Strategic Environmental Assessment.

Once this consideration is addressed by the EIA the particular objectives of the EIA in terms of the revised Terms of Reference are to:

- ✓ assess the impacts of the additional water abstraction of 250,000m³/annum from the Swakop River (Husab Berg (HBC) groundwater compartment) to supply the LHM;

- ✓ assess the alternative routes for electricity and water pipeline infrastructure from the mine to the Swakop River boreholes in terms of archaeology, vegetation and sense of place; and
- ✓ assess the impacts related to construction, operation and maintenance of the water and electricity lines and borehole infrastructure.

The project scope is:

- ✓ Physically limited to the Gawib River valley and the Husab Berg groundwater compartments in the Swakop River valley.
- ✓ Geographically placed in the wider socio-economic context of the Erongo Region. Although the project is relatively small and focused in size, there are elements to the project that will have to be guided by the wider context such as the Uranium Rush Strategic Environmental Assessment.

The following assumptions are made on the EIA:

- ✓ This EIA does not assess the existing permit conditions of LHM to abstract from LHC.

1.4. The EIA process followed

The usual procedure for conducting an EIA is described in **Figure 1-2** below. The procedure is based on the requirements of the Environmental Management Act of 2007.

The EIA team is responsible for coordinating the process as an independent entity from the project proponent.

In the case of this project the strategic importance of the possible impacts was clear from the start. The areas that will require specialist attention was also evident and are defined as follows:

- ✓ Specialist investigation of the groundwater conditions in the Husab Berg Compartment.
- ✓ Specialist investigation of the riparian linear oasis along the Swakop River in the project area and along the alternative infrastructure routes.
- ✓ Specialist investigation into the archaeology of the Gawib valley and Riet area in the project area.

Therefore three specialists were solicited to the project namely:

- ✓ Bittner Water Consult as geo-hydrologist specialist.
- ✓ Coleen Mannheimer as vegetation specialist.
- ✓ John Kinahan as archaeologist.

Each is a recognized leader in his or her field of specialization.

The decision to conduct a combined Scoping/EIA immediately and not to produce a Scoping Report first and thereafter conduct the assessment and prepare a separate EIA Report was communicated to the Directorate of Environmental Affairs (See Appendix A).

The EIA therefore followed the steps described in **Figure 1-2** except for the Report that is usually produced at the end of the Scoping Phase. The proceedings required in the Scoping Report have been fully incorporated in this Scoping/EIA Report.

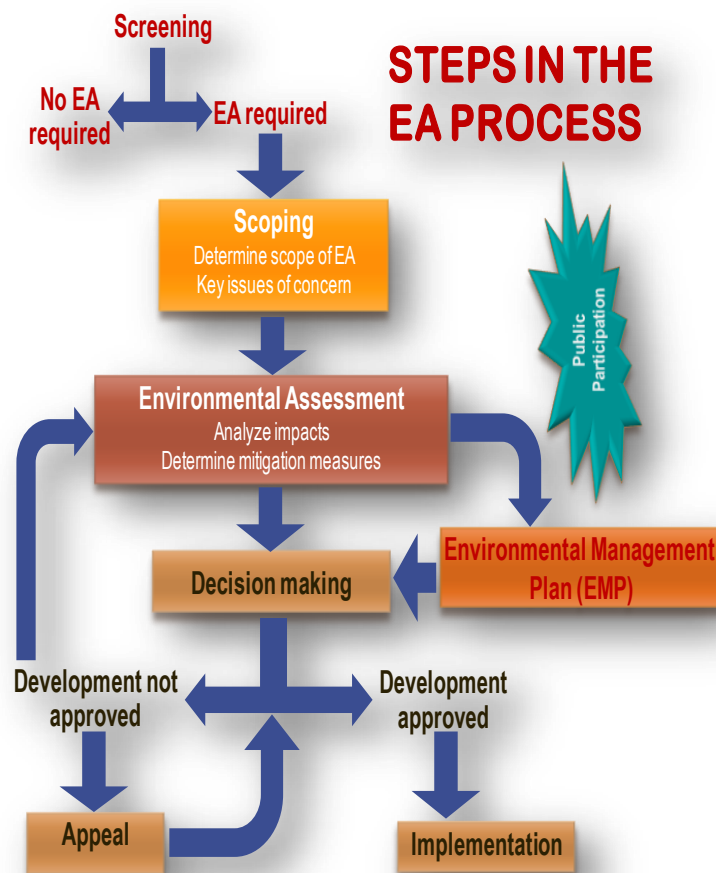


Figure 1-2: Steps in the EIA Process

2. PROJECT DESCRIPTION

2.1. Introduction

This Project Description Chapter

- ✓ defines the project and its role players;
- ✓ provides the rationale for the project; and
- ✓ includes a description of the project characteristics.

2.2. Project locality

The LHM is located on the northern edge of the Namib Naukluft National Park in the Southern Erongo Region of Namibia (see **Figure 2-1**). The proposed LHM Water Supply Improvement Project is located in the Gawib River and Swakop River valleys near the Mine.

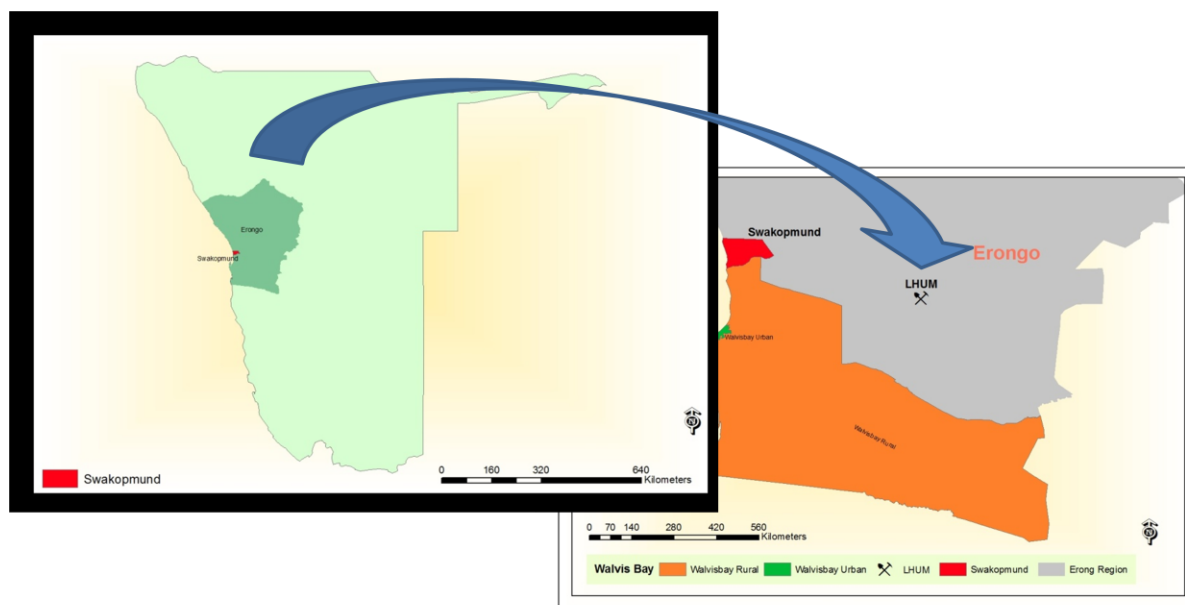


Figure 2-1: : Locality of the LHM in Namibia and the Erongo Region

The existing infrastructure, alternative routes for new infrastructure and the positions of existing and new boreholes is shown in **Figure 2-2**. Boreholes were drilled in the HBC as part of the study to conduct amongst others pump tests.

The BID in Appendix C also provides a A4 map of the project proposal.

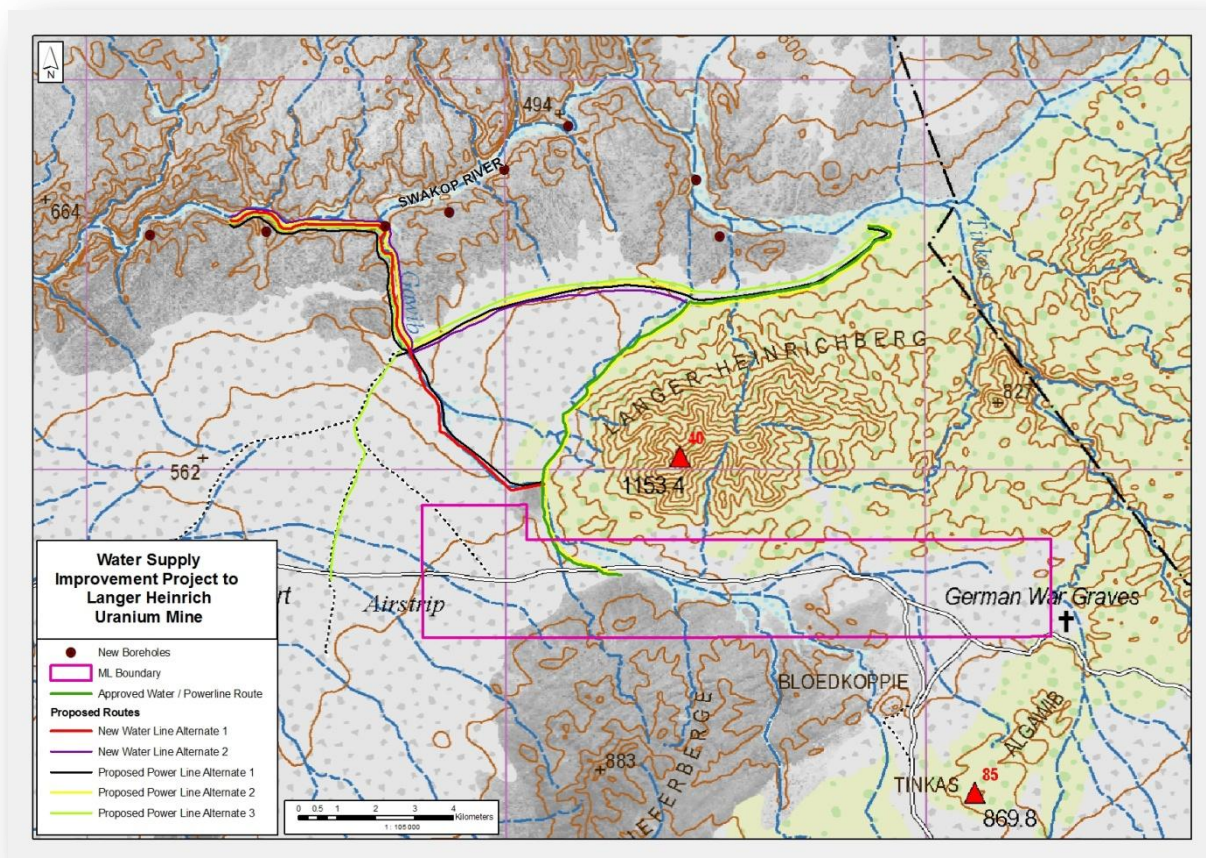


Figure 2-2: Locality of the existing infrastructure and proposed alternative routes for new infrastructure in the Swakop River and leading to the LHM

The Gawib valley is a historically sensitive area rich in heritage while the Swakop River valley is considered a sensitive line oasis as a natural resource.

2.3. The water resource requirements of LHM

The mine has been operational since 2007 and has since planned several expansions, namely:

- ✓ the Stage Two expansion was fully implemented by 2009;
- ✓ the Stage Three expansion which is under construction and to be commissioned by the first quarter of 2011; and
- ✓ the Stage Four expansion which is still in its preliminary planning stages and can only be implemented once a significant additional water source is secured.

For each of the stages which the mine implements it requires additional water resources. These requirements are explained in **Table 2-1**.

Table 2-1: Water requirements per stage expansions

| STAGE | Total water required | Requirement timeline |
|---------|--------------------------|----------------------|
| Stage 2 | 1.28M m ³ /pa | current |
| Stage 3 | 2.25M m ³ /pa | Q3 2011 |
| Stage 4 | >6.0M m ³ /pa | ±2014 |

It is clear from the table that the mine is at its limits in terms of the water resources required to implement any future expansions. The mine will require new water resources to operate in the future.

2.4. The alternative water resources that may be available to LHM

The current situation with available water resources in the Erongo Region is not ideal. Supply is mostly from groundwater schemes as Erongo does not have significant infrastructure connections to the national water resource base in Namibia.

The two main groundwater resources that are being used by the Region are the Omdel Aquifer at Henties Bay and the Kuiseb Aquifer at Walvis Bay. Both these aquifers are managed by Namwater. They are currently utilized to their permitted limits and the Ministry of Agriculture and Water indicated that they will likely reduce future volumes to Namwater to prevent over utilization (pers. comm. Koch, 2010). Namwater has allocated 1.5M m³/pa to LHM from the Omdel Aquifer and this volume will in all likelihood not be increased. Additional water is therefore not available to LHM from the Omdel Scheme.

In addition LHM has an existing permit for the use of groundwater from the Langer Heinrich Compartment (LHC) of the Swakop River valley. The permit, which allows for the abstraction of 0.5M m³/pa from the LUC must be renewed by the end of 2010.

As explained in SAIEA, 2010 there are three desalination water supply options which are currently in the pipeline for the Region, as follows.

- ✓ The AREVA Company mining uranium at Trekkopje developed a water desalination plant at Wlotzkasbaken. The plant will have a spare water capacity of 6M m³/pa after supplying the Trekkopje Mine.
- ✓ Namwater is considering a desalination plant to be commissioned by 2014 with which the aim is to supply 25M m³/pa.

There are however constraints to the access of these water supply options (SAIEA, 2010), namely:

- ✓ Namwater is the only authorized seller of bulk water in Namibia. All negotiations to access these sources must therefore go through Namwater; and
- ✓ the regional pipeline infrastructure is dated and will need replacement to assure access and uninterrupted supply.

The immediate water supply alternatives (for the stage 3 water requirements) available to LHM are very limited and therefore the mine decided to investigate the possible utilization of additional groundwater from the Husab Berg Compartment (HBC) of the Swakop River aquifer.

2.5. Infrastructure requirements to supply more water from the Swakop River

The existing and new infrastructure required to supply the mine with water from the Swakop River is shown in **Figure 2-2**. The new infrastructure will include:

- ✓ new pump(s) from the abstraction borehole(s) in the HBC;
- ✓ new electricity lines from the mine to the existing and new boreholes in the HBC and LHC;
- ✓ new water lines from the mine to the new boreholes in the HBC and LHC; and
- ✓ new narrow width tracks along the new electricity and water lines from the mine to the boreholes.

The new boreholes were drilled for testing purposes only in proximity to a number of existing holes in the LHC and HBC of the Swakop River. These two compartments stretch from the Namib Naukluft National Park border in the east to the Husab/Witpoort mountain range, which crosses the Swakop River some 16km downstream of the Swakop/Gawib River confluence.

From the existing and new boreholes the overhead electrical line and the surface water lines will follow the Gawib River valley to link with the mine. The alternative routes (see **Figure 2-2**) are:

- ✓ Route 1 from LHM along the Gawib River bed into the Swakop River bed (preferred route).
- ✓ Route 2 from the Gawib River / MET road intersection eastwards along the MET road to the intersection with the existing route to the Swakop River bed.
- ✓ Route 3 from the main road to LHM along the MET road to the intersection with the Gawib River for electrical line only.

- ✓ The existing approved route from LHM along the eastern Gawib Valley edge/ Langer Heinrich Mountain foothills to the Swakop River bed.

Currently there is one surface water pipeline on the existing approved route that supplies the mine with water from the existing Swakop River boreholes (in the LHC).

2.6. Technical features of the infrastructure

The infrastructure that is relevant to the project is:

- ✓ The borehole layout.
- ✓ The pipeline details.
- ✓ The power line features.

The following sections provide technical descriptions of these entities.

2.6.1. Pipeline specifications

- ✓ The line will be an HDPE, 200/150mm line pressure class 20.
- ✓ The joint method will be welded.
- ✓ The pumping capacity will be 75m³/hr.
- ✓ The spare pumping capacity on existing line is 25m³/hr.

2.6.2. Power line specifications

- ✓ The line will be a 11kV line with 3 cables.
- ✓ The frame will be made of timber poles with 3 aluminium conductors.
- ✓ Height of structure is 9m and will be a single pole structure with an average distance of 100m between structures.

2x 10 ton trucks will be used to erect the electricity lines. One with the drill and the other with the rest of the equipment (e.g. poles, electricity line, etc.)

The truck with the drill will reverse in the correct position where the pole needs to be planted. This is the only area where the truck will have to get off the existing track to drill the hole but it will be right next to the track and the disturbance will be limited.

- ✓ A 350mm diam hole (2m deep) will be drilled.
- ✓ After the hole is drilled the other truck will pull into the correct position to plant the pole and to erect the electricity lines.

The centre of river (washes) will be prevented as far a possible as the poles would need protection by means of rock and cement (1.5m high) around the base of the pole. This would also cause bigger disturbance.

2.7. Associated infrastructure

The following infrastructure is associated with the project. The project will make use of this existing infrastructure during construction or operations.

2.7.1. Power grid

The power line will connect to the existing power supply to LHM. This means the supply is in place and no additional supply or infrastructure is required.

2.7.2. Roads

The new routes will follow existing tracks in the project area. In the case of Route 1 only the route will be serviced by a new track down the Gawib River bed. No additional tracks except on Route 1 will be allowed.

The track, whether existing or new, must be properly marked and mapped by GPS. All construction and maintenance teams must be supplied with a GPS with the track active.

The track in Route 1 will comprise of following and possible widening of the existing track in the riverbed, to accommodate the power line and waterline.

2.7.3. Contractor's camp / laydown area

No contractor's camps will be allowed on site. The contractors may use the existing facilities of LHM for contractors in the mining license area. Management of the camp will fall under the LHM mining Environmental Management Plan.

2.8. Construction and maintenance process

2.8.1. Construction process

The construction of the infrastructure will follow the schedule below:

- ✓ Select route and clear track.
- ✓ Construct the overhead power line.
- ✓ Construct the surface waterline.
- ✓ Borehole site installation.

2.8.2. Maintenance process

Maintenance work is currently done by teams that is guided by the mine's Environmental Management Plan (EMP) and the Environmental Management System (EMS) and monitored by the environmental unit of the mine.

2.9. Economic contribution

2.9.1. Contracts

The project will be executed through up to four contracts:

- ✓ Route marking and clearing of the track.
- ✓ Constructing the overhead power line.
- ✓ Constructing the surface waterline.
- ✓ Borehole site installation.

The expected value of the project is not determined yet.

2.9.2. Employment and equipment required

The construction teams may be composed of:

- ✓ One survey team with a commercial pick-up vehicle to mark and clear the track/route. The team will mark the route with physical markers and also with a GPS.
- ✓ Two teams of 5 people each with two trucks to construct the overhead power line. The procedure is as follows:
 - Team 1 will excavate a series of holes per day.
 - Team 2 will follow immediately and plant the pole in all excavated holes.
 - Teams 1 and 2 will string and complete the lines jointly.
- ✓ One laying team of 5 people with a truck to lay the pipelines and one connecting team of 3 people with a commercial pick-up vehicle to join the pipe sections are required.

- ✓ Two teams of 7 people with a light commercial pick-up and a truck each are required for the installation work at the boreholes.

The overall workforce required will therefore consist of up to 5 senior personnel and 32 semi-skilled and unskilled personnel for a period of up to two months.

2.10. Conclusion

The implementation of the project is not complex and can be managed by means of an Environmental Management Plan.

The public consultation process of the EIA is explained in the next section.

3. PUBLIC CONSULTATION AND DISCLOSURE

3.1. Introduction

Public Participation forms an important component of this EIA. It has been defined by the Draft MET Environmental Assessment Regulations (2010) of the Environmental Management Act (2007), as a *'process in which potential interested and affected parties are given an opportunity to comment on, or raise issues relevant to, specific matters'*.

Besides these legal requirements, it was also endeavoured to follow best practice as far as stakeholder consultation and feedback is concerned, so that the voice of the Public may be heard and taken into account during the decision-making process.

Thus, Background Information Documents (BIDs) were distributed and meetings were held with the stakeholders, creating a platform whereby their concerns could be conveyed. This fed into the final scope for the EIA, to cover all issues and concerns raised by the project stakeholders.

The purpose of this section of the report is to 1) indicate the indentified stakeholders; 2) provide feedback of the meetings that have been conducted; and to 3) provide a summary of the common themes of concerns and comments raised at these meetings and via electronic communication. A summary of all issues and concerns that have been raised during public consultation is provided as Appendix B.

3.2. The stakeholders

An interested and affected party can be defined as *'(a) any person, group of persons or organization interested in or affected by an activity; and (b) any organ of state that may have jurisdiction over any aspect of the activity'* (MET, 2010).

The interested and affected parties for this project were identified using the existing LHM EIA stakeholders list. This was further augmented using the Enviro Dynamics stakeholder database.

In addition, advertisements were placed in various newspapers (refer to Table 3.2) inviting the Public to register as interested and affected parties. Background Information Documents (BIDs) (Appendix C), along with an invitation to a meeting was mailed to all registered stakeholders. Stakeholders were also afforded the opportunity to send questions/comments/issues to the Consultant.

For this project, key stakeholders have been identified at national, regional, and local level. A summary of these stakeholders are presented in the **Table 3-1**. The complete stakeholders list can be viewed in Appendix D. A Site Notice was also placed at the entrance gate to LHM.

Table 3-1: Summary of stakeholders

| Level | Description |
|-----------------|---|
| National | Ministry of Mines and Energy Ministry of Environment and Tourism Ministry of Agriculture and Water Ministry of Labour and Social Welfare Ministry of Health and Social Services Ministry of Works and Transport Ministry of Regional and Local Government Housing National Heritage Council of Namibia |
| | Mining Industry HERS Committee |
| | Namwater Media NGOs |
| Regional | Ministry of Mines and Energy Ministry of Environment and Tourism Ministry of Agriculture, Water and Forestry |
| | Erongo Regional Council |
| | Erongo RED Namwater Media |
| Local | Local Parks and Wildlife Management Staff (for Namib Naukluft Park) Arandis Town Council Walvis Bay Municipality Swakopmund Municipality Usakos Municipality Farm owners and tenants adjacent to the applicable groundwater compartments Plot owners downstream and adjacent to the Swakop River Tourism Operators Filming Industry |
| | NGOs Specialists Other Consultancies Media |

3.3. The meetings to date

3.3.1. National level

An authorities meeting was held in Windhoek with the national institutional and regulatory stakeholders on 20 August 2010. Representatives from the Ministry of Mines and Energy, Ministry of Agriculture and Water Affairs as well as the Directorate of Water Affairs, attended the meeting. Namwater and the Namibian Heritage Council were also represented at the meeting. Presentations were made by Enviro Dynamics, the consultant, as well as by LHM, the project proponent. The minutes of the meeting are attached as Appendix E.

3.3.2. Regional and local level

On 4 August 2010, a formal public meeting was conducted in Swakopmund for the regional and local stakeholders. These stakeholders were invited via e-mails, faxes and Nampost where necessary.

The meeting was also advertised in national and local newspapers as shown in **Table 3-2**. The records of these communiqué are attached as Appendix F.



Photo 3-1: Good attendance at the public meeting held in August 2010.

Table 3-2: Summary of newspaper advertisements

| Date | National Newspaper | Circulation |
|--------------|--------------------|-------------------------------|
| 22 July 2010 | Republikein | Afrikaans Newspaper, National |
| 29 July 2010 | The Namibian | English Newspaper, National |
| Date | Local Newspaper | Circulation |
| 20 July 2010 | Namib Times | English & German, Coastal |
| 27 July 2010 | Namib Times | English & German, Coastal |

This formal public meeting provided a platform for the broader community to raise their issues and concerns, and had 50 attendees. This included plot owners, farmers, MWAf, MME, MET and the Swakopmund Municipality. Representatives from the filming industry, tourism, CTAN, Scientific Society Swakopmund, the media and other uranium mines in the region also attended the meeting (See Appendix F for the minutes of this meeting.)

The key concerns raised by the attendees can be summarized as the impact on the groundwater, the water table and quality as well as the existing and future impacts on groundwater dependent vegetation such as the camel thorn and Anna trees. The historical and archaeological value of the area under study was also highlighted. In general, the meeting conveyed groundwater use discontent and the attendees of the meeting raised various issues.

3.4. Issues identified

The issues that were raised during the above consultation forums, as well as in writing, as well as responses to these issues have all been collated in the Issues and Responses Trail (see Appendix B).

Common themes are highlighted and ranked according to the number of times they were mentioned as an issue. This is presented in the table below.

Table 3-3: Summary of themes resulting from the Public Participation process

| No. | Theme | Number of Hits |
|-----|---|----------------|
| 1. | Impact on groundwater, water table and quality, surface flow along the river course and impact on regional water demand limitations | 32 |
| 2. | The need to use desalination water or alternatives to groundwater. | 12 |
| 3. | Impact on groundwater dependent vegetation and habitat. | 8 |
| 4. | Impact on agricultural / tourism livelihood of farms in area. | 7 |
| 5. | Impact on sensitive terrain. | 4 |
| 6. | Impact on neighbour relations and LHM credibility. | 4 |
| 7. | Impact on birds and wildlife. | 4 |
| 8. | Impact on undocumented archaeological and historical sites. | 3 |

From **Table 3-3** it is clear that the potential impact on groundwater, the water table and water quality is a major concern as well as the impact on the regional water resource security. This issue was raised at both the public and authorities' meeting, as well as in the written comments submitted to the Consultant. Consequently, the issue of using desalination water and investigating alternative water supply options also ranked high.

The potential impact of a lower water table, die-back of vegetation and the degradation of a sensitive terrain and its impact on the farmers and tourism industry were also stressed.

The abstraction of water from the Swakop River along with past promises not kept by LHM was raised as an issue by the stakeholders. The potential impact on birds and wildlife by both water abstraction and the construction of a power line was identified as a common theme. Although it has the lowest number of hits, the potential impact on the archaeological and historical sites were also flagged as a concern, therefore an archaeological specialist study was included in the EIA.

3.5. Key sensitivities

The themes identified act as guidelines for potential impacts that will be assessed.

The **Table 3-4** below summarizes key sensitivities regarding the public perception environment with regards to the proposed LHM project.

Table 3-4: Public Consultation Sensitivities

| Feature | Sensitivity |
|-------------------------------------|---|
| Water resource quality and capacity | Impact on groundwater, water table and quality, surface flow along the river course and impact on regional water demand limitations |
| Alternative water sources | The need to use desalination water or alternatives to groundwater. |
| Biodiversity | Impact on groundwater dependent vegetation and habitat. |
| Socio-economic status | Impact on agricultural / tourism livelihood of farms in area. |

3.6. Public feedback

Due to the arrangement with DEA that the EIA process will immediately follow the first set of public consultation meetings, without the need to produce a scoping report, there needs to be a process to inform all registered interested and affected parties of the issues documented during the initial consultation phase (Scoping Process). Therefore the issues solicited through the Scoping Process have been circulated to the interested and affected parties via a draft Issues and Responses Trail on the 9th of September 2010, before the EIA Report was compiled. There were no comments made in response to this circulation and the Issues and Responses Trail was therefore accepted as complete. More detailed responses were however provided to the issues raised, as an outcome of the assessment. These responses are presented in the final Issues & Responses Report appended to this Report.

This Draft Environmental Impact Assessment will be circulated to all registered interested and affected parties for comment from 19 November 2010 until 3 December 2010. In addition, a public open day will be held on 1 December 2010 where the main findings of this report will be presented, along with other important environmental activities of LHM. The feedback from these processes will be summarized in a comments and responses trail, which will include statements of how the comments were considered and incorporated into the Report.

Chapter 4 which follows summarizes the applicable legal framework which influences the environmental decision-making process of the Project.

4. LEGAL FRAMEWORK

4.1. Introduction

The legal framework in this chapter includes a review of the relevant policies, Namibian Acts and guiding frameworks that will have an influence on the project and its implementation. The chapter concludes with a summary of the potential influences and conflicts of the Project with the legal framework.

4.2. Relevant national and regional Government acts and policies

Environmental Assessment Policy (1995)

Namibia's Environmental Assessment Policy was the first formal effort in the country to regulate the application of environmental impact assessment that was endorsed by Cabinet and published in 1995 (MET, 1995). The Policy provides a procedure for environmental assessments as indicated, which sets out to:

- ✓ better inform decision makers and promote accountability of decisions taken;
- ✓ strive for a high degree of public participation and involvement by all sectors of the Namibian community in the environmental assessment process;
- ✓ take into account the environmental costs and benefits of proposed policies, programmes and projects;
- ✓ take into account the secondary and cumulative environmental impacts of policies, programmes and projects; and
- ✓ promote sustainable development in Namibia, and especially ensure that a reasonable attempt is made to minimize anticipated negative impacts and maximize the benefits of all development.

Environmental Management Act (2007)

Namibia's Environmental Management Act was passed in Parliament in October 2007, and gives effect to Namibia's Environmental Assessment Policy (Government of Namibia, 2007). Essentially this Act specifies the environmental assessment procedures to be followed and the activities requiring EIA (provided in listed activities). Of relevance to this Project are the following listed activities, provided in Section 27 of this Act, which include:

- water use and disposal;
- transportation;

- energy generation and distribution;

The Regulations of this Act are not in force yet which will set the provisions of the Act in motion. However, the Regulations are in the final stages of development and the latest version (May 2010) has been used to guide the process of this EIA.

4.2.1. Other applicable Namibian Legislations

Other Namibian legal instruments which have a bearing on the environmental decision-making process of LHM are summarised in **Table 4-1** below. Also given in this table are the project specific implications of each relevant piece of legislation.

Table 4-1: Cross-sectoral legislations which influence the environmental decision-making process for LHM.

| Statute | 4.3. Provisions | 4.4. Project Implications |
|--|---|--|
| Forest Act 12 of 2001 | Provision for the protection of various plant species. No regulations promulgated yet. Section 22(1): It is unlawful for any person to "cut, destroy or remove": <ul style="list-style-type: none"> • any living tree, bush or shrub growing within 100 metres from a river, stream or watercourse on land that is not part of a surveyed erf or a local authority area without a licence. | <ul style="list-style-type: none"> • Vegetation in water courses to be protected from damage. Intended removal of such vegetation would require a permit. Because no township establishment will take place on the project, this will mean that any development within 100m of any watercourse will be subject to the application of a permit to remove any vegetation. |
| National Heritage Act 27 of 2004 | Heritage resources to be conserved in development. | All archaeological sites to be identified and protected. |
| Nature Conservation Ordinance 4 of 1975 | Protects inter alia nature reserves, conservancies, the hunting and protection of wild animals, and the protection of indigenous plants. Prohibits disturbance or destruction of the eggs of huntable game birds or protected birds without a permit. Requires a permit for picking (the definition of "picking" includes damage or destroy) protected plants without a permit. | Protected plants will have to be identified during the planning phase of the project. In case there is an intention to remove protected species, then permits will be required. The Park rules and Ordinance of the Namib Naukluft National Park will have to be applied and monitored during the development phase as well as the operation phase of the Project. |
| Preservation of Trees and Forests Ordinance | Protection to tree species. | The Contractor will require a permit to remove any protected trees. |
| Convention on Biological Diversity, 1992 | Protection of biodiversity of Namibia. | Conservation worthy species not to be removed if not absolutely necessary. |

| Statute | 4.3. Provisions | 4.4. Project Implications |
|---|--|--|
| | | Since biodiversity may also be influenced by the additional abstraction of groundwater, this aspect needs to be included in the assessment. |
| United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, 1994 | Protection of vegetation cover. | No vegetation to be removed if not absolutely necessary. |
| Soil Conservation Act 76 of 1969 | Prevention and combating of soil erosion; conservation, improvement and manner of use of soil and vegetation, and protection of water sources. The Minister may direct owners or land occupiers in respect of inter alia water courses. No Regulations exist to this effect. | Removal of vegetation cover especially in the river courses must be avoided and minimized at all costs. |
| Water Act 54 of 1956 Water Resources Management Act 24 of 2004 | The Water Resources Management Act 24 is presently without regulations; therefore the Water Act 54 is still in force. The Act provides for the management and protection of surface and groundwater resources in terms of utilisation and pollution. | Obligation not to pollute surface water bodies. <ul style="list-style-type: none"> • A water abstraction permit is required for this Project. |
| Public Health Act 36 of 1919 | Provides for the prevention of pollution of public water supplies. | A general obligation not to pollute the water bodies in the area. |

4.5. Relevant guiding documents

4.5.1. Strategic Environmental Assessment of the Central Namib Uranium Rush

The SEA of the Central Namib Uranium Rush (SAIEA, 2010) has been authorized by the Namibian Government in 2009 to provide strategic direction to the regional and individual development of the uranium mining industry in Namibia.

The objective of the SEA is to:

- ✓ “Provide **recommendations** on accepted overall strategic approaches for sustainable mining development in the Erongo Region.

- ✓ Develop and assess **viable scenarios** of mining and associated developments as a basis for subsequent decision-making and formal planning.
- ✓ Provide **guidance for overall solutions** on crucial (cumulative) impacts and challenges stemming from the mining operations.
- ✓ Outline a Strategic Environmental Management Plan (SEMP)" (SAIEA, 2010).

The SEA is now approved and it is in the interest of the Proponent to consider its findings and recommendations.

The SEA (SAIEA, 2010) identifies "Water availability, quality and hydrological function" as Environmental Quality Objective 7 which states:

To ensure that the public have:

- ✓ the same or better access to water in future as they have currently,
- ✓ that the integrity of all aquifers remains consistent with the existing natural and operational conditions (baseline).
- ✓ that both the quantity and quality of groundwater are not adversely affected by prospecting and mining activities.

The targets that relates to the project are:

- ✓ Uranium Rush does not compromise community access to appropriate quality water
- ✓ Uranium Rush does not compromise surface and groundwater movement and availability

The following recommendations apply to the project:

- ✓ The mines must use only desalinated water for operations.
- ✓ The mines may use groundwater temporarily for exploration and construction.
- ✓ Only groundwater from the mine pit may be used for dust suppression.

4.6. Conclusion

The relevant legal framework along with relevant guidelines and policies oblige the Proponent and the Competent Authority, namely the Ministry of Environment and Tourism, to take certain environmental sustainability principles into account when considering this project. In addition, there are a number of permit requirements which need to be adhered to should the Project be implemented.

The following chapters include a summary of the socio-economic and biophysical baseline of the Project area, from which the future implications of this proposed project will be assessed.

5. SOCIO- ECONOMIC BASELINE

5.1. Introduction

This section of the report provides an overview of the receiving socio-economic environment in which the proposed development will take place. It will form the baseline against which potential issues and impacts will be identified and assessed. Consequently, only information relevant to this study will be highlighted.

Since the proposed project is located within the Erongo region, an overview of the social and economic environments of this region will be provided. In addition, key land use activities will be emphasised.

5.2. Overview of the Erongo Region

5.2.1. Social environment

5.2.1.1. Population and growth

In 1991 the Erongo Region had a population of 55,470. A decade later, this number had increased to an estimated 107,663, resulting in an increase of almost 94% during the period 1991 to 2001 (NPC, 2001). This can partly be attributed to the inclusion of Walvis Bay into Namibia in 1994, as well as migration to the urban coastal towns.

When comparing the regional annual growth rate of some 3.7%, excluding figures for Walvis Bay, to the national growth rate of 2.6% and a fertility rate that is lower than the national average, the high rate of population growth in the region further reflects immigration to these areas (NPC, 2001; Enviro Dynamics, 2009). In addition, only 35% of the regional population was born in the Erongo Region while 30% of the same was born in the north-central regions of Namibia (NPC, 2001).

Table 5-1 indicates the population figures for the main urban centers within the Erongo Region as obtained from the 2001 Population and Housing Census (published in 2003) as well as figures enumerated for Swakopmund during the 2006 polio vaccination campaign. These figures for the main urban centers amounts to 108,200 people (SAEIA, 2010). Using this figure and assuming that the urban population forms 80% of the total regional population, the Uranium Rush SEA estimates the regional population at, 135,250 people. This is higher than the 2001 regional population of 107,663 as well as the estimated figure of 120,460 for the current regional population using the regional growth rate of 1.3% (SAEIA, 2010).

Table 5-1: Population Figures for the main towns in the Erongo Region (SAIEA, 2010)

| Town | Townland area (km ²) | Population | Source for Population data |
|---|----------------------------------|----------------|--|
| Arandis | 29 | 7,600 | NPC, 2007 |
| Henties Bay | 121 | 3,300 | NPC, 2003 |
| Karibib | 97 | 3,800 | NPC, 2003 |
| Omururu | 352 | 4,800 | NPC, 2003 |
| Swakopmund | 193 | 42,000 | 2006 polio vaccination campaign, quoted in UraMin 2007 |
| Usakos | 58 | 3,000 | NPC, 2003 |
| Uis | 10 | ? | |
| Walvis Bay | 29 | 43,700 | NPC, 2003 |
| Total urban population | | 108,200 | |
| Total estimated Erongo Region Population | | 135,250 | |

5.2.1.2. Poverty and unemployment

The Erongo Region is one of the most affluent regions in Namibia, with the second highest per capita income in Namibia at N\$16,819 per annum. This income is mainly obtained from the tourism, fishing, and mining industries (Enviro Dynamics, 2009). Compared to other regions in Namibia, Erongo has the second highest level of development and the second lowest rate of human poverty, yet it still has a high unemployment rate (Hoadly, 2009).

The Erongo Region has an unemployment rate of 34%. Gender inequality is reflected in that 72% of males are employed compared to 58% of women being employed (Erongo Regional Council, 2007).

The private sector employs approximately 68% of the employed population, while 16% are employed by the government and the remaining 16% is unaccounted for (Erongo Regional Council, 2007). Unfortunately, the employment figures are not segregated to indicate the number of people employed by the commercial farming sector. The fishing and mining industries are the main employers, while the main economic drivers are the mineral sector, fishing, tourism, the Walvis Bay Corridor Group and Namport (SAIEA, 2010).

5.2.1.3. Livelihood strategies

A number of strategies are followed within this region in order to sustain livelihoods. Wages and Salaries constitute the main source of income for the region as well as the Swakopmund and Walvis Bay Urban Constituencies at 67%, 73% and 78% respectively. This is also higher than the national average of 41.4% (NPC, 2001). Table 5-2 below summarizes main sources of income in the Erongo Region.

Table 5-2: Main Sources of Income in the Erongo Region (NPC, 2001)

| Source of Income | Erongo Region (%) | Swakopmund Constituency (%) | Walvis Bay Urban Constituency (%) |
|------------------------|-------------------|-----------------------------|-----------------------------------|
| Farming | 4 | 1 | 1 |
| Wages & Salaries | 67 | 73 | 78 |
| Cash Remittances | 8 | 7 | 4 |
| Business (Non-farming) | 8 | 9 | 7 |
| Pension | 10 | 8 | 6 |

5.2.2. Economic environment

The economic activities of the Erongo Region revolve around its natural resources both renewable such as fish and water, as well as non-renewable resources which include minerals.

The reporter, Des Erasmus, from Die Republikein noted '*Erongo Region in the grip of Uranium Fever*' (Erasmus, 2006). This is due to the renewed interest in nuclear energy. Consequently, with the region now marked as globally important, a number of uranium mines have been established in this region over the last few years. Rössing and Langer Heinrich are some of the uranium mining companies currently operational. Furthermore, a number of companies are exploring their EPL areas to indentify new prospective sites for uranium mining (Enviro Dynamics cc, 2009).

Uranium exploration and mining activities are expected to have a significant impact on the Namibian economy during the next few years as increased production contributes to the growth in GDP. According to the Uranium Rush SEA, the mining industry throughout Namibia accounts for approximately 20% of the GDP. In 2009, 4% of the GDP was accounted for by the uranium industry (SAIEA, 2010).

Yet, the operations of the uranium mining industry depend on the sustainable supply of resources such as electricity and water, especially in a water scarce area, and the creation of sustainable habitats and livelihoods (Enviro Dynamics cc, 2009). Currently, all the mines except Trekkopje are dependent on Namwater for their water supply. In the face of the lack of freshwater resources, the future Namwater desalination plant as a source of water supply is key in the mines optimizing their operations (SAIEA, 2010).

Industrial infrastructure is provided by a railway connection that is also used by the mines to transport final product (uranium oxide) to Walvis Bay from where it is shipped for export. Consequently, an increase in mining activities has also contributed to the increase in container shipments through the Port of Walvis Bay. The Erongo Region is also connected by the national road network to the rest of the country via Okahandja, Windhoek, and Otjiwarongo and forms part of the Trans Kalahari Highway. Thus, the transport networks within the Erongo Region play a key role in the facilitation of trade via Walvis Bay, supporting it as a hub for commercial trade.

The fishing industry is another key economic activity and forms the base of the industrial activity in the region (SAIEA, 2010). The commercial fishing industry is the cornerstone of Walvis Bay's economy and is the biggest employer as it employs approximately 10,000 people throughout its value chain (Enviro Dynamics, 2009).

Agricultural activity in this region is very limited due to the lack of water and aridity of the soil (Hoadley, 2009). Nonetheless, both communal and commercial farmers can be found in this region, which mostly keep livestock (Enviro Dynamics, 2009).

These economic activities are also reflected in the various land uses within the region.

5.2.3. Land-use activities

5.2.3.1. Mining

A number of mines are operational within the Erongo Region. This includes Navachab near Karibib where gold is mined, a number of marble and granite mines, and also salt mining near Swakopmund, Cape Cross and Walvis Bay. Other mining activities include sand mining and gemstones mined by the small miners (SAIEA, 2010).

As for uranium mining, Rössing and Langer Heinrich are the operational mines. Their combined productivity has earned Namibia a spot as the fourth largest uranium producing country in the world (Chamber of Mines of Namibia, 2009). Two new mines are currently under construction, namely Valencia and Trekkopje.

Langer Heinrich has 269 employees, 300 long term, and 490 short term subcontractors. Taking into account the *workers: dependents* ratio of 1: 4.3, the number of dependents benefiting from employment at this mine is 4,554. The Langer Heinrich, Rössing and Navachab mines combined accounts for almost 3.5% of employment in the Erongo region.

5.2.3.2. Agriculture

As previously mentioned, the arid landscape limits agricultural activity in the Erongo Region. Nonetheless, both commercial and communal farming, such as that of the Topnaars, are accounted for in this region.

As for commercial farming, a number of farms are situated near the Langer Heinrich mine. Commercial farming in the region consists of livestock, wildlife, lodges and game farms as well as irrigation and crop cultivation (Hoadley, 2009). In 2000, only 10km² of land have been cleared for crops which includes the small holdings in the Swakop River bed (SAIEA, 2010).

5.2.3.3. Conservation and tourism

Almost one third of the Erongo Region is marked as state protected areas (See **Figure 5-1**). This can be attributed to the uniqueness and ecological sensitivity of the Namib Desert. This conservation area in the Erongo Region consists of four national parks, namely, the National West Coast Tourist Recreational Area, the Cape Cross Seal Reserve, the Walvis Bay Nature Reserve and Dunes, and the Namib Naukluft Park (Mendelsohn & al, 2009).

Currently, only LHM is operational in the Namib Naukluft Park. This sets precedence in operating a mine in a park, thus similar trends might follow from this example.

Apart from conservation, the parks also play an important role in tourism. A number of tourism companies are operational within this area. Unspoiled landscapes, vast and quiet spaces along with wildlife and biodiversity play an important role in the marketing strategies of these companies. Consequently, damage caused to the landscape by mining activities can adversely impact on the tourism sector. Approximately 80% of the tourism operators use the Goanikontes-Moon Landscape and Welwitchia flats in their tours (SAIEA, 2010).

Tourism, over the years, has become a catalyst for the economic activity of Swakopmund, Walvis Bay and the Erongo Region (NCCI, 2009). This is reflected in that the Coast and it accommodates 54% of all visitors to Namibia (Leippert, 2009). Also, the coastal tourism accommodation sector had an output of some N\$833.2 million in 2007 (SAIEA, 2010).

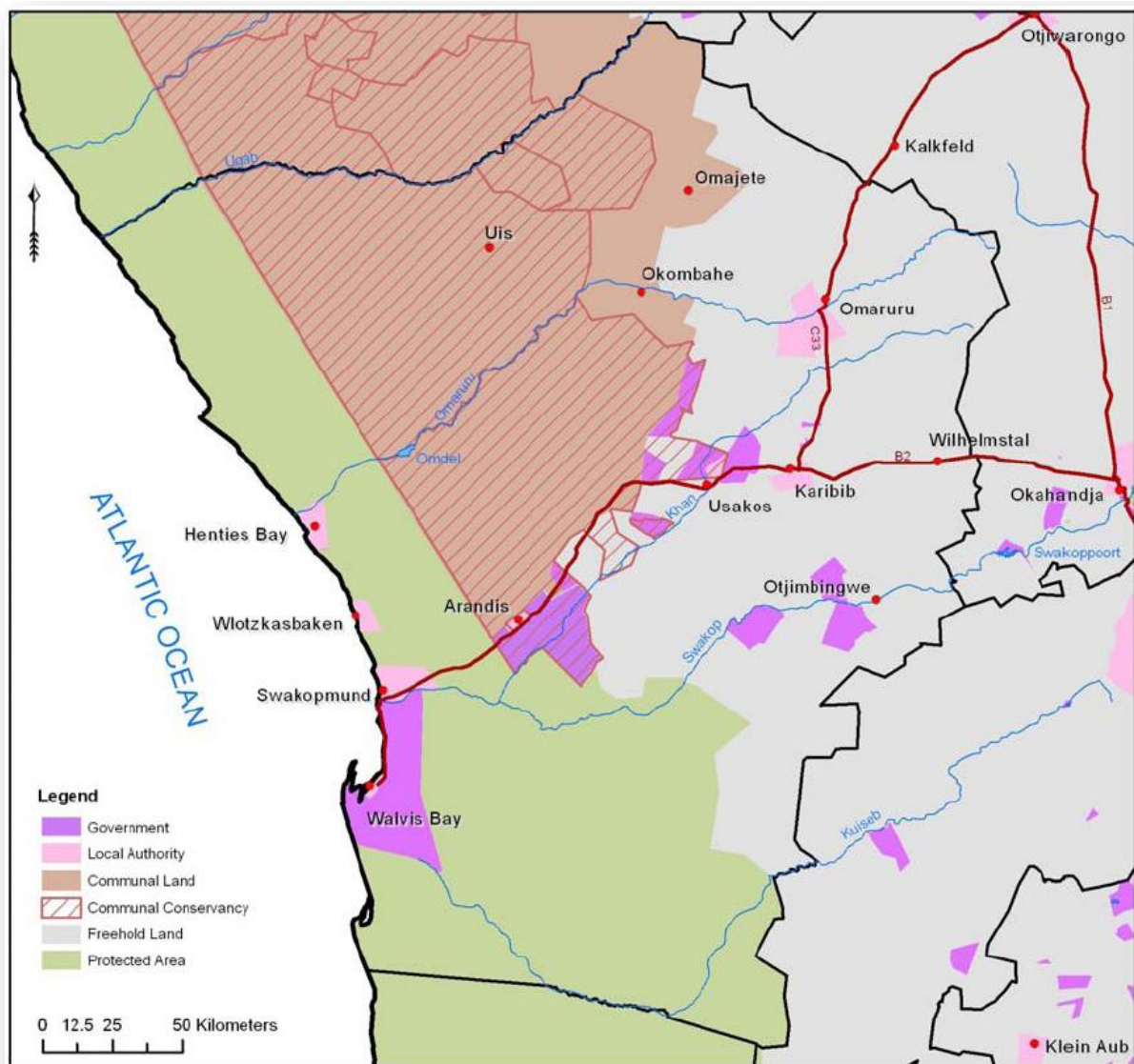
The tourism industry in Namibia was expected to contribute 3% to the national GDP in 2007 (NEPRU, 2007). Furthermore, it is estimated that this industry has created 18,800 jobs in 2006 and has generated N\$1,600 million per annum in revenue (SAIEA, 2010).

5.2.4. Water supply

Water is a scarce and valuable commodity in the desert and thus requires proper management. As mentioned in the Uranium Rush SEA, groundwater from the coastal aquifers is heavily relied on to meet the water needs of the region (2010). Yet, the growing water demand, especially by the mining developments, calls for an additional water source, the most viable being desalinated water as the availability of freshwater resources are limited.

After Namwater pulled out of a contract with AREVA in 2008, the latter party continued constructing its own desalination plant near Wlotzkasbaken and inaugurated it in April 2010 (Sherbourne, 2010); (AREVA, 2010). Namwater, on the other hand, has undertaken to construct its own plant in the near future.

Figure 5-1: Various land uses in the erongo region (SAEIA, 2010)



The Omdel Scheme is the main supplier of drinking water to Swakopmund, but is currently also utilized to its maximum allowed capacity (Hoadley, 2009). Immigration to this town may increasingly pressurize this source. This water scheme also supplies water to the LHM for its operations. Currently, the total water demand by the coastal users is 14.4 Mm³ per annum, of which the mining sector demands 4.6 Mm³ per annum (SAIEA, 2010).

As for water supply to Walvis Bay, the current facilities at the aquifers at Rooibank and the Kuiseb River are struggling to meet the water demand (Hartmann, 2009.). Also, should there be another water supply crisis as in March 2009, Walvis Bay will only be able to supply water for about two to three days (Walvis Bay Municipality, 2008). Apart from the inconvenience for residents, water crises are costly and hamper various economic activities. During March 2009 an estimated N\$20 million was lost in production (Hartmann, 2009.).

One can conclude that the existing water sources and infrastructure are already under pressure and the sustainable water supply both locally and on a regional level is important in sustaining livelihoods as well as economic activities.

5.3. Key sensitivities

The table below summarizes key sensitivities regarding the socio-economic environment with regards to the proposed LHM project.

Table 5-3: Key socio-economic sensitivities

| Feature | Sensitivity |
|--------------------------|---|
| Employment | The mines are one of two main employers in the Erongo Region. |
| Economic contribution | Growth in the Uranium industry improves the national and regional GDP and therefore employment capability. |
| Water demand pressure | The increase in water demand puts pressure on the limited regional water resource. |
| Conservation and tourism | Mine and related infrastructure development in the visually/tourism/conservation sensitive areas lowers the value of access corridors and prime areas affected. |

The next chapter includes details of the physical and biological environments of the Project area.

6. BIO-PHYSICAL BASELINE

6.1. Introduction

The biophysical baseline reflected in this Chapter includes both information on the immediate Project area and regional influences that have a bearing on the Project environment. Those features of the environment which are likely to be affected by the various project aspects receive stronger emphasis. The chapter concludes with a summary of the sensitivities in the environment which are likely to be affected by the project.

6.2. Meteorological environment

6.2.1. Climate

In Africa, Namibia's climate is second in aridity only to the Sahara Desert with 92 percent of the land area defined as hyper-arid, arid, or semi-arid (FAO, 2005).

The climate of the Namib Desert is strongly influenced by four features which enhance its aridity, namely:

- ✓ the South Atlantic Anticyclonic Cell;
- ✓ the Benguela Upwelling System;
- ✓ the Great Escarpment; and
- ✓ the absence of major topographical features on the 150-km wide plains.

(Ward, 1983) explain that these features are responsible for the stable climate experienced in the Namib Desert. The Namib Desert is believed to be 25-80 million years old with the present hyper-arid phase having persisted for 5 million years.

The cold Benguela current influences the Central Namib coastal zone. It is positioned in the latitudinal zone of stable descending air, limiting convectional rainfall throughout much of the interior (Midgley G, 2005). LHM is located at the edge of this zone.

A high-pressure cell overlying the South Atlantic Ocean frequently forces westerly winds up to the escarpment, preventing movement of moist air masses from the east into the Namib (CSIR, 2009). In the winter months, the influence of the Atlantic high-pressure cell weakens and dry east winds and associated seasonal dust storms (also called berg winds) cross the Namib to reach the coast (Enviro Dynamics, 2008).

6.2.2. Temperature

The average annual temperature is 24°C at the mine. Due to the typical desert climatology, the temperature variation can exceed 30°C on any given day.

Maximum temperature can reach 45°C. Minimum temperatures of 6°C during the winter months are common (Enviro Dynamics, 2009); (Metago Environmental Engineers, 2009).

6.2.3. Rainfall and evaporation

Rainfall at LHM and the Namib in general is erratic and low. On average the annual rainfall is less than 100mm. In contrast evaporation exceeds 2,000mm per annum (Mendelsohn & al, 2009)

Weather stations at Ganas and Gobabeb show that March (average 28mm), April (average 9mm), and September (average 22mm) are the peak rainfall months in this west-central part of the Namib Desert (Enviro Dynamics cc, 2009).

Flash flooding has also been known to occur due to significant rainfall events. The maximum single recorded rainfall event in the region is 45mm (recorded at Rössing in 1995) (Metago Environmental Engineers, 2009).

Fog is the predominant moisture supply at the coast resulting from the stable high pressure Atlantic Ocean cell in combination with the cold upwell from the Benguela current. The fog precipitation may reach up to 34mm/year and is a stable source of moisture over long periods (CSIR, 2009).

Most plants and animals in the Central Namib rely on fog for water.

6.2.4. Wind

The wind direction is mainly from the north-west, west and south-west. These winds are moderate with a speed of between 3m/sec. to 6m/sec. (Metago Environmental Engineers, 2009).

Strong winds do occur during berg wind conditions in the winter months with wind speeds of 8m/sec. from an east to north-east direction. These winds are dry and are capable of raising sandstorms (Seely, M & Pallet, J, 2008).

6.3. Physical environment

6.3.1. Geology

According to the groundwater specialist report (Appendix H, (Bittner, 2010), the Project area forms part of the Swakop River alluvial aquifer system. The surrounding rocks consist mainly of Damara sequence rock units such as quartzite, schist and

marble, granite and gneiss as well as the alluvial deposits of the Swakop River aquifer and weathered debris deposits.

6.3.2. Geohydrology

The groundwater baseline is described in detail in the groundwater specialist report (see Appendix H) which focuses on the baseline information required to determine the sustainable yield of the Husab Berg Compartment (See **Figure 6-1**: Swakop River catchment area with compartments).

According to the report the Husab Berg Compartment forms part of the Swakop River alluvial aquifer system and has limited hydraulic connection to the upstream Langer Heinrich and the downstream Ida Dome Compartments.

The most important contributing catchment to the Husab Berg Compartment (HBC) is the Gawib River tributary, which is relatively small.

According to the SEA findings (SAIEA, 2010) there was a pre-dam recharge volume of 6.3 Mm³/annum in the HBC, which decreased to 4.8 Mm³ after the Von Bach and Swakoppoort dams were built. The quality of the groundwater is also low.

The average annual recharge to the river alluvium of the HBC was calculated as approximately 150,000 m³. This volume is considered to be the maximum sustainable abstraction rate of the HBC as more abstraction might lead to dropping water levels and pumping from aquifer storage.

6.3.3. Soils

The surface soils of most of the western and central parts of the project area can be classified as coastal gravel plains. Coastal gravel plains consist of thin soil crusts approximately 4mm thick. These plains are widely spread in the Namib and they reach up to the project area and beyond to the east. They are generally either gypsum crusts (gypcrete) or calcium carbonate crusts (calcrete) that develop from deposits due to fog precipitation (CSIR, 2009).

The coastal gravel plains of the Central Namib are very fragile systems and are extremely sensitive to destruction by development activities (NACOMA, 2009). Gravel plains are usually difficult to restore (Burke, 2005).

The central project area is divided by the Gawib River that mostly contains washed sandy soils. The soft structure and moisture content of the sand allow for plants to usually grow larger than in the immediate surroundings.

To the eastern border of the project area the terrain changes to broken mountain foothills with numerous small riverbeds which contain loose sand to washed pebbles of various sizes. The terrain between the riverbeds is usually very shallow weathered material that is loose with bed rock protruding close to the surface.

6.3.4. Surface hydrology

There are two larger rivers in the project area, namely the Swakop River and the Gawib River.

The Gawib River is a local tributary to the Swakop River and only flows during rare thundershowers in the Langer Heinrich Mountain area. Most of the small streams on the foothills of the Langer Heinrich Mountain contribute to the Gawib River and since the terrain falls sharply from the mountain to the Swakop River, as well as the type of rocky soils in the upper catchment, flashfloods would be the norm when the river does flow.

The Gawib River divides the project area in approximate equal eastern/western parts and flows from the south-east in a northern direction where it flows into the Swakop River.

The Swakop River is a regional river with its catchment mainly in the central plateau of Namibia. The river depends on the upper 39% of the catchment for most of its flow, where annual rainfall exceeds 300mm/annum. This section of the river catchment is dammed by the Swakoppoort and Von Bach dams that form the main source of surface water for the central parts of Namibia (Jacobsen, PJ et al, 1995).

Figure 6-1: Swakop River catchment area with compartments

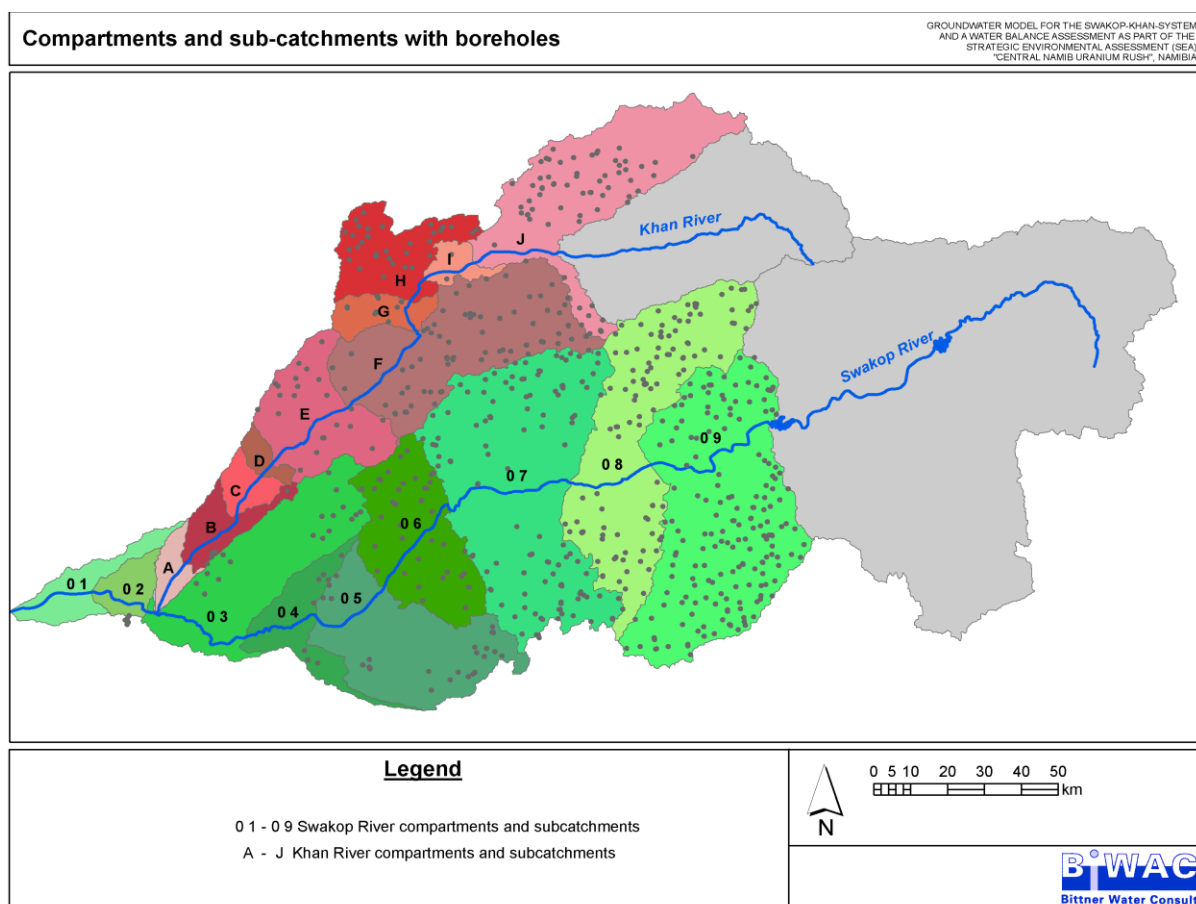


Figure 6-1 shows the catchment area of the Swakop River. Compartment 04 is the Husab Berg Compartment and compartment 05 is the Langer Heinrich Compartment. It is clear from **Figure 6-1** that only compartments 01 to 09 can contribute to the Lower Swakop River since the building of the dams.

Since the building of the two dams the lower section of the river depends mainly on 41% of the catchment area to provide flow that is significant where the rainfall varies between 300mm/annum to 100mm/annum (Jacobsen, PJ et al, 1995)).

The Kahn River has since become the main contributor to the lower Swakop River (Seely, M & Pallet, J, 2008). The confluence of this tributary is below the project area.

The Swakop River is considered a linear oasis and approximately 8% of the length falls in a protected park of which the project area is a part (Jacobsen, PJ et al, 1995). The groundwater compartments are limited to the direct vicinity of the river bed and dependent on the longitudinal surface flow of the river for recharge (see discussion of the groundwater specialist in Appendix H. This flow has become more sporadic since the building of the dams.

The historical limitations set on the flow capacity of the lower Swakop River have therefore changed the characteristics of the river in terms of its ability to recharge its groundwater aquifers as well as to maintain its robustness as a linear oasis.

6.3.5. Existing surface impacts

The existing impacts in the project area are as follows:

- ✓ The MET road in the western and northern part of the project area.
- ✓ The surface pipeline and its service road on the eastern side of the project area.
- ✓ Vehicle tracks in the Gawib River bed.
- ✓ Vehicle Tracks in the Swakop River bed.
- ✓ Boreholes and associated infrastructure in the Swakop River.

The existing impacts bear testimony that it is difficult to control the proliferation of tracks. **Photo 6-1** shows the proliferation of tracks along the existing pipeline. Therefore the movement of mine personnel and vehicles must be restricted to an absolute minimum and vehicle routes must be planned and monitored.

The breaching of the water line causes



Photo 6-1: Proliferation of tracks along the existing pipeline.

severe trampling by game in very short periods of time. **Photo 6-2** shows a leak on the line and evidence of trampling.



Photo 6-2: A leak in the existing water line.

This can be limited to the minimum by using an electronic leak detection system on the line.

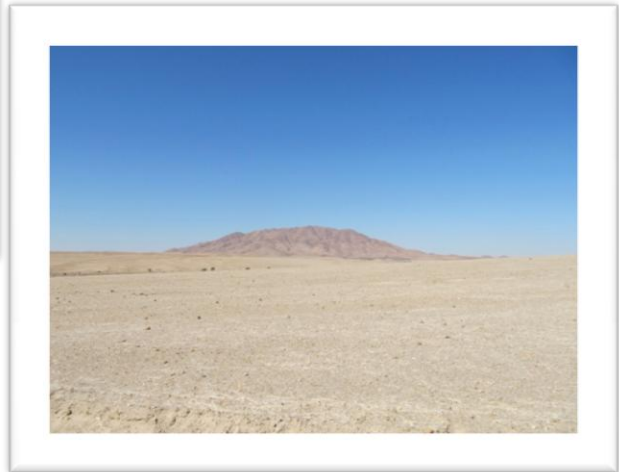


Photo 6-3: Visual resources along the proposed power line route

6.3.6. Visual effects

The visual effect in the project area will be limited to the power line from the mine to the boreholes in the Swakop River. **Photo 6-3** shows the terrain where the line will be visual. The scale of the terrain is vast. In contrast the power line will be small and the MET road is closed for tourism activities. The landscape is therefore not visually sensitive.

The mine closure plan requires that the terrain be restored to its original state.

6.4. Biological environment

6.4.1. Biodiversity

The entire project area is included in the Eastern Namib Plains and defined as a yellow flag area with medium significant biodiversity value. The Swakop River valley is defined as a red flag area that is of high significant biodiversity value (SAIEA, 2010) due to its value as a linear oasis.

Therefore any activity in the project area must be evaluated from a conservation point of view. The preservation of ecological integrity is fundamental to the project environment and the project activities must not interfere with the functioning of the ecosystem services in the area.

The fragmentation of especially the linear oasis habitat may lead to significant changes on a very small scale over long periods of time. These are difficult to observe and usually go unnoticed until it culminates in a major impact.

6.4.2. Flora

The flora of the Swakop and Gawib River beds as well as the new alternative route along the MET road is discussed in detail by the vegetation specialist (See Appendix G, (Mannheimer, 2010).

Vegetation was assessed for sensitivity regarding the impacts of proposed new infrastructure in the form of a power line and a pipeline. Various route options were considered. Riparian vegetation in the HBC was assessed for sensitivity to increased water abstraction.

Riparian vegetation in the Husab Berg Compartment was found to be degraded, with few *Faidherbia albida* (juveniles mostly) and small sized *Acacia erioloba*. The compartment is heavily infested with *Prosopis* and *Tamarix usneoides*. The reason for this condition of the riparian vegetation is likely to be low water quality than external factors.

No baseline information is however available to predict how sensitive the vegetation is to groundwater fluctuations and monitoring over time is required to improve the predictability of the ecosystem.

6.4.3. Fauna

Compared to reptiles and arthropods, mammals are generally not well represented in true deserts for a number of reasons, but mainly as a result of a lack of water. Humans tend to associate significant life with mammals. However, a paucity of mammal species in the study area does not mean that diversity is low, but rather that it is unique.

Special attention must be given to possible reptile habitation of the site especially in the exposed rock on river banks and the Langer Heinrich foothills due to large areas of exposed rock and broken terrain (Seely, M et al, 2004).

The Swakop and Gawib Rivers are defined in the Uranium Rush SEA as areas with a relative high density of wildlife occurrence (SAIEA, 2010).

Mammals that typically occur nomadically in the area are Oryx (*Oryx gazella*) and Springbok (*Antidorcas marsupialis*). Mountain Zebra may traverse the project area in search of water (SAIEA, 2010).

Small mammals such as ground squirrel, meerkat, mongoose, jackal, bat-eared fox and aardwolf could visit or be resident in the project area (Seely, M et al, 2004).

Birds form a major component of the ecology in the project area. Possible species include (Seely, M et al, 2004):

- ✓ Ostrich.
- ✓ Lappetfaced Vulture.
- ✓ Ludwig's Bustard.
- ✓ Ruppel's Korhaan.
- ✓ Ruppel's Parrot
- ✓ Namaqua Sandgrouse.
- ✓ Black Crow.

The Ludwig's Bustard is endemic to the central Namib Gravel Plains. This bird is a low flyer and the population is estimated at approximately 70,000 to 100,000. The species typically has a low distribution per km² (Hockey PAR et al, 2005).

Both the Ludwig's Bustard and the Lappetfaced Vulture are susceptible to power line collisions.

6.4.4. Arthropoda

Although very little insect activity has been observed on site, the following common beetle species could be present (Seely, M et al, 2004):

- ✓ Zophis Amabilis.
- ✓ Metriopus depressus.
- ✓ Carchares Macer.
- ✓ Physosterna cribripes.
- ✓ Physadesmia globosa

These species are common and widely distributed through the Namib Desert.

The scorpion diversity of the area is above average and the endemism is very high. This makes the area sensitive for the impact on endemic scorpion species (Mendelsohn & al, 2009).

6.4.5. Archaeology

The project area has been identified as a yellow flag area of medium significance due to its well preserved terrain and the high research value of especially of World War 1 history (SAIEA, 2010). Of particular value is the overall landscape preservation that is characteristic to the Gawib valley and surrounds.

Therefore a specialist study has been conducted (see Appendix I, (Kinahan, 2010)) to provide an in-depth assessment of the alternative routes proposed.

An archaeological field survey was conducted to investigate various routes and localities associated with proposed improvements to water supplies for the LHM.

The survey documented a total of twelve sites, including two pre-colonial graves and a number of features associated with the conflict at Riet in 1915.

Although the local density of archaeological sites is low, a number of the sites are of high significance.

On archaeological grounds, the Gawib drainage is therefore considered to be the least sensitive area investigated and can accommodate infrastructure away from the sensitive archaeological sites.

6.5. Biophysical baseline sensitivities

The following sensitivities can be derived from the baseline on the biophysical environment.

| Feature | Sensitivity |
|--------------------------|--|
| Climate | The hyper arid conditions make the restoration of ecosystems and physical surface damage difficult. The low precipitation in the desert leads to a very scarce water resource. |
| Gravel plains | The gravel plains are very sensitive to surface disturbance and are difficult to restore. |
| Geo-hydrology | The Husab Berg Compartment is sensitive to over abstraction, additional water abstraction should be very carefully considered. |
| Surface Hydrology | Flashfloods are likely to occur if significant rainfall takes place in the Gawib River catchment. The Swakop River's ability to recharge groundwater aquifers at pre-1970 levels has deteriorated significantly due to the building of the Swakoppoort and Von Bach dams. |
| Existing surface impacts | Control over the movement of vehicles and people in the project |

| Feature | Sensitivity |
|--------------------------|--|
| | <p>area are difficult.</p> <p>Leaks in the water line causes severe trampling by game in very short periods of time.</p> |
| Biodiversity | <p>The Swakop River's ability to maintain the linear oasis biodiversity at pre-1970 levels has deteriorated significantly due to the building of the Swakoppoort and Von Bach dams.</p> <p>The already destabilized linear oasis biodiversity is sensitive to further change, even though small and difficult to define.</p> |
| Flora | <p>The vegetation along the proposed routes will be marginally vulnerable to additional infrastructure and additional activities.</p> <p>"Lowering of the water table in the HBC by unsustainable extraction may be expected to reduce the already low numbers of Acacia erioloba and Faidherbia along the compartment. These are both protected, and are regarded as keystone species in riparian ecosystems along the western-flowing ephemeral rivers Namibia. The lack of data make it difficult to predict outcomes with any level of certainty, but the available evidence suggests that loss of these species will result in a knock-on loss of biodiversity at all levels and in many groups of organisms.</p> <p>According to the best available model at present (BIWAC 2010), extraction of 250 000 m³ pa would be unsustainable. It is therefore recommended that pumping at these levels should not be undertaken, and that a highly conservative approach to water extraction be followed" (Mannheimer, 2010)</p> |
| Fauna | <p>The pipeline will fragment ecosystems, especially by being a barrier to small fauna and arthropoda.</p> <p>Additional noise and movement of equipment and people will disturb the normal movement patterns of wildlife.</p> <p>Reduced groundwater water levels may increase the vulnerability of the fauna populations of this habitat</p> |
| Conservation and Tourism | <p>The Park and its visually/tourism/conservation sensitive areas are sensitive to the proliferation of infrastructure development. However, the MET Road is closed for tourist activities which mean the landscape is not visually sensitive. The mine closure plan requires that the terrain be restored as close as possible to its original state.</p> |
| Archaeology | <p>The route alternatives outside the Gawib River are sensitive to disturbance of scientifically important archaeological sites.</p> |

7. IMPACT ASSESSMENT

7.1. Introduction

The Impact Assessment focuses on evaluating the impacts that may affect the environment of the project area.

The chapter includes:

- ✓ A screening process to filter the sensitivities and issues in need of further consideration from the ones for which further investigation and impact assessment is not required (i.e. which can be managed in an EMP and for which adequate information is available to make a decision).
- ✓ Selection of key sensitivities and issues for an Impact Assessment.
- ✓ Describe the aspects and impacts derived from the sensitivities.
- ✓ The methodology of the Impact Assessment.
- ✓ The Impact Assessment, with mitigation proposals.
- ✓ Project alternatives.

7.2. Methodology to screen issues and sensitivities

To assist in the identification of key issues, a decision-making process is applied to the sensitivities (in Chapters 5 and 6) and issues raised (Chapter 3), based on the following criteria (**Figure 7-1**).

- ✓ Whether or not the issue falls within the scope of the EA process and the responsibility of LHM; and
- ✓ Whether or not sufficient information is available to respond to the issue/sensitivity.

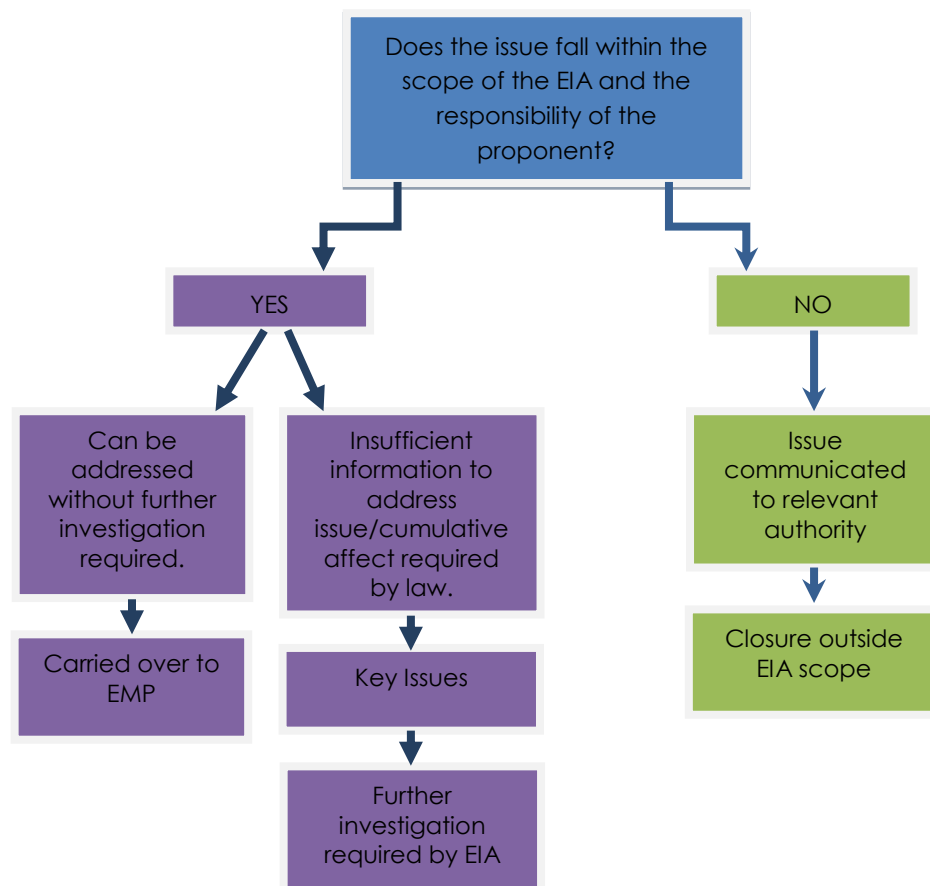


Figure 7-1: Flow chart for the screening of issues and sensitivities.

7.3. Screening of sensitivities

This section provides a summary of the issues identified by all stakeholders and sensitivities identified from the socio-economic and bio-physical baseline studies. The result of the selection process is shown in column 3.

Table 7-1: Result of screening process for issues and sensitivities.

| Feature | No | Sensitivity | Fall in EIA scope | Require impact assessment |
|-------------------------------------|----|---|----------------------|---------------------------|
| Water resource quality and capacity | 1 | Impact on groundwater, water table and quality, surface flow along the river course . | Yes | Yes |
| Alternative water sources | 2 | The need to use desalination water or alternatives to groundwater. | On alternatives only | On alternatives only |
| Biodiversity | 3 | Impact on groundwater dependent | Yes | Yes |

| Feature | No | Sensitivity | Fall in EIA scope | Require impact assessment |
|--------------------------|----|--|-------------------|---|
| | | riparian vegetation and habitat. | | |
| | 4 | The Swakop River ability to maintain the linear oasis biodiversity at pre-1970 levels has deteriorated significantly due to the building of the Swakoppoort and Von Bach dams. | Yes | Yes |
| | 5 | Additional water abstraction will increase the pressure on the destabilized linear oasis biodiversity. | Yes | Yes |
| Employment | 6 | The mines are one of two main employers in the Erongo Region. | Yes | Yes |
| Economic contribution | 7 | Growth in the Uranium industry improves the national and regional GDP and therefore employment capability. | Yes | Yes |
| Water demand pressure | 8 | The increase in water demand puts pressure on the limited regional water resource. | Yes | Yes |
| Conservation and tourism | 9 | Mine and related infrastructure development in the visually/tourism/conservation sensitive areas lowers the value of access corridors and prime areas affected. | Yes | Future use of the area via mining closure |
| | 10 | Impact on future agricultural / tourism livelihood of farms in area. | Yes | Yes |
| Climate | 11 | The hyper arid conditions make the restoration of ecosystems and physical surface damage difficult. | Yes | Yes |
| Physical environment | 12 | The gravel plains are very sensitive to surface disturbance and difficult to restore. | Yes | Yes |
| Geo-hydrology | 13 | The Husab Berg Compartment has a limited water resources and additional abstraction from it stretches the sustainability of the source. | Yes | Yes |
| Surface hydrology | 14 | Flashfloods are likely to occur if significant rainfall takes place in the Gawib River catchment. | Yes | No |
| | 15 | The Swakop River's ability to recharge | Yes | Yes |

| Feature | No | Sensitivity | Fall in EIA scope | Require impact assessment |
|--------------------------|----|--|-------------------|---------------------------|
| | | groundwater aquifers at pre-1970 levels has deteriorated significantly due to the building of the Swakoppoort and Von Bach dams. | | |
| Existing surface impacts | 16 | Control over the movement of vehicles and people in the project area are difficult. | Yes | No |
| | 17 | Leaks in the water line causes severe trampling by game in very short periods of time. | Yes | No |
| Flora | 18 | The route alternatives will lead to the proliferation of tracks. | Yes | No |
| Fauna | 19 | The pipeline will fragment ecosystems, especially by being a barrier to small fauna and arthropoda. | Yes | No |
| | 20 | Additional noise and movement of equipment and people will disturb the normal movement patterns of wildlife. | Yes | No |
| | 21 | Reduced groundwater water levels may increase the vulnerability of the fauna populations of this habitat | Yes | No |
| Archaeology | 22 | The route alternatives are sensitive to disturbing scientifically important archaeological sites. | Yes | Yes |

A list of aspects and related impacts are derived from Table 7-1: Result of screening process for issues **and sensitivities**. by selecting the sensitivities which require an Impact Assessment. The definitions of "Aspect" and "Impact" are as follows:

- ✓ An activity/facility/product/service is an Aspect when it interacts with the project environment.
- ✓ The interaction of an Aspect with the project environment that brings change to the environment is an Impact.

Each sensitivity is allocated to a typical aspect and then the related impacts for that sensitivity are described. **Table 7-2** provides the results.

7.4. Selection of aspects and impacts from key sensitivities

Table 7-2: Aspects and impacts table (tracked from table 7-1 above).

| No | Issue/Sensitivity | Related Aspect | Related Impact |
|----|--|-----------------------------------|---|
| 1 | Impact on groundwater, water table and quality, surface flow along the river course. | Increased groundwater abstraction | Lowering of groundwater table and quality that reduces regional water resource base. |
| 3 | Impact on groundwater dependent riparian vegetation and habitat. | Increased groundwater abstraction | Groundwater dependent riparian vegetation distribution and density reduces resulting in reduced habitat. |
| 4 | The Swakop River ability to maintain the linear oasis biodiversity at pre-1970 levels has deteriorated significantly due to the building of the Swakoppoort and Von Bach dams. | Increased groundwater abstraction | Lower ability of the Swakop River to sustain groundwater dependent biodiversity once groundwater levels are reduced. |
| 5 | Additional groundwater abstraction will increase the pressure on the destabilized linear oasis biodiversity. | Increased groundwater abstraction | Lower ability of the Swakop River to sustain groundwater dependent biodiversity once groundwater levels are reduced. |
| 6 | The mines are one of two main employers in the Erongo Region. | Regional economic contribution | Economic stability and employment opportunity in the Erongo Region reduces if the mining operations are curtailed by a lack of water. |
| 7 | Growth in the Uranium industry improves the national and regional GDP and therefore employment capability. | Regional economic contribution | |
| 8 | The increase in water demand puts pressure on the limited regional water resource. | Increased groundwater abstraction | The protection of the limited regional water resource is compromised. |
| 10 | Impact on future agricultural / tourism livelihood of farms in area. | Increased groundwater abstraction | Water resources on farms to the north of the HBC become more scarce and difficult to access. |
| 11 | The hyper arid conditions make the restoration of ecosystems and physical | Construction and | Destruction of gravel plains, surface, and vegetation. |

| No | Issue/Sensitivity | Related Aspect | Related Impact |
|----|---|--|---|
| | surface damage difficult. | maintenance of the infrastructure | |
| 12 | The gravel plains are very sensitive to surface disturbance and difficult to restore. | | Destruction of gravel plains, surface and vegetation |
| 13 | The Husab Berg Compartment has a limited water resources and additional abstraction from it stretches the sustainability of the source. | Increased groundwater abstraction | The Husab Berg Compartment water levels will decline below the acceptable model limits. |
| 15 | The Swakop River ability to recharge groundwater aquifers at pre-1970 levels has deteriorated significantly due to the building of the Swakoppoort and Von Bach dams. | Increased groundwater abstraction | Lowered ability to recharge groundwater levels once used. |
| 21 | The route alternatives are sensitive to disturbing scientifically important archaeological sites. | Construction and maintenance of the infrastructure | Destruction of archaeological sites. |

From **Table 7-2** we can identify three related aspects that will interact with the project environment namely:

- ✓ The abstraction of groundwater from the Husab Berg Compartment.
- ✓ The contribution of the mine to the regional economy.
- ✓ Construction and maintenance of the infrastructure

The expected impacts may also be grouped according to their related aspect as summarised in **Table 7-3** below.

7.5. Summary of aspects and impacts

Table 7-3: Summary of aspects and impacts.

| No | Related Aspect | Related Impact |
|--|--|--|
| 1, 3, 4, 5, 8, 10, 13, 14 | Increased groundwater abstraction | <p>The protection of the limited regional water resource is compromised (Combined Impacts no 1, 8).</p> <p>Groundwater dependent riparian vegetation distribution and density reduces resulting in reduced habitat that cannot recover due to the inferior ability of the Swakop River to sustain groundwater dependent biodiversity once groundwater levels are reduced. (Combined Impacts No 3, 4, 5, 14)</p> <p>The Husab Berg Compartment water levels will decline below the acceptable model limits.</p> <p>Water resources on farms to the north of the HBC become more scarce and difficult to access.</p> |
| 6, 7 | Regional economic contribution | Economic stability and employment opportunity in the Erongo Region reduces if the mining operations are curtailed by a lack of water. |
| 11, 12, 20 | Construction and maintenance of the infrastructure | <p>Destruction of gravel plains surface and vegetation.</p> <p>Destruction of archaeological sites.</p> |

7.6. Methodology

The impact assessment of each aspect has been conducted by:

- ✓ naming the impact with a short description;
- ✓ assessing the impact as per agreed standard criteria used by LHM in terms of pre- and post mitigation; and
- ✓ describing mitigation measures.

The assessment is structured as follows:

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

| | | | | | |
|---|--|----------|--|--|--|
| | Medium term | M | Medium | Medium | High |
| | Short term | L | Medium | Medium | High |
| | | | L | M | H |
| | | | Localised Within site boundary Site | Fairly widespread Beyond site boundary Local | Widespread Far beyond site boundary Regional/ national |
| SPATIAL SCALE | | | | | |
| PART C: DETERMINING SIGNIFICANCE | | | | | |
| PROBABILITY (of exposure to impacts) | Definite/ Continuous | H | Medium | Medium | High |
| | Possible/ frequent | M | Medium | Medium | High |
| | Unlikely/ seldom | L | Low | Low | Medium |
| | | | L | M | H |
| CONSEQUENCE | | | | | |
| PART D: INTERPRETATION OF SIGNIFICANCE | | | | | |
| Significance | Decision guideline | | | | |
| High | It would influence the decision regardless of any possible mitigation. | | | | |
| Medium | It should have an influence on the decision unless it is mitigated. | | | | |
| Low | It will not have an influence on the decision. | | | | |

7.7. Impact assessment

7.7.1. The protection of the limited regional water resource is compromised.

The regional water resource base is limited by nature and currently under threat due to the drastic regional water demand increase.

The Uranium Rush SEA (SAIEA, 2010) identifies four aquifers being used commercially to supply the central Erongo Region water demand. These are:

- ✓ The Omaruru and Kuiseb River aquifers which supply the formal water demand of the towns, industries and mines in the central Namib.
- ✓ The Kahn and Swakop River aquifers which supply limited volumes of water to some prospecting and mining activities.

The cumulative effect of the proliferation of mines using the river aquifers as a source for their operations will lead to the over abstraction of these primary aquifers (SAIEA, 2010). The Swakop River aquifer mine users may increase from one user to seven users in the future if this trend is continuing.

If the objective of this project to make more use of groundwater from the Swakop River aquifer is allowed to proceed, it will set a precedent for future users despite the recommendations of the SEA.

It is the recommendation of the Uranium Rush SEA (2010) that:

- ✓ The mines must use only desalinated water for operations.
- ✓ The mines may use groundwater temporarily for exploration and construction.
- ✓ Only groundwater from the mine pit may be used for dust suppression.

The rationale for the assessment is based on regional data, the Uranium Rush SEA guidelines/recommendations, and professional opinion.

| Impact | Aspect | Criteria | Rating without mitigation/enhancement | Rating with mitigation/enhancement |
|---|-----------------------------------|---------------------------|---------------------------------------|------------------------------------|
| The protection of the limited regional water resource is compromised. | Increased groundwater abstraction | Severity | H | L |
| | | Duration | M | M |
| | | Spatial Scale | H | L |
| | | Consequence | H | L |
| | | Probability of occurrence | M | L |
| | | Significance | H | L |

The following mitigation measures are proposed:

- ✓ LHM should not abstract water from the HBC.

7.7.2. The Husab Berg Compartment water levels will decline below the acceptable model limits.

Bittner (Appendix H) in his groundwater study has recommended annual abstraction rate from the Husab Berg Compartment be set at 150,000m³/annum. If the abstraction rate exceeds this amount, the groundwater model predict a deficit in annual average recharge and the mine will use the aquifer storage and groundwater levels will drop below normal reduction levels.

If LHM abstracts the proposed 250,000 m³/annum from the HBC, it will reduce the aquifer storage annually and the recharge deficit will increase annually.

The rationale for the assessment is based on the Groundwater Specialist Report.

| Impact | Aspect | Criteria | Rating without mitigation/enhancement | Rating with mitigation/enhancement |
|---|-----------------------------------|---------------------------|---------------------------------------|------------------------------------|
| The Husab Berg Compartment water levels will decline below the acceptable model limits. | Increased groundwater abstraction | Severity | H | L |
| | | Duration | H | M |
| | | Spatial scale | L | L |
| | | Consequence | H | L |
| | | Probability of occurrence | H | L |
| | | Significance | H | L |

Should the project proceed the following mitigation measures are proposed:

- ✓ Abstraction from the Husab Berg Compartment must not exceed 150,000m³/annum.

7.7.3. Groundwater dependent riparian vegetation distribution and density reduces resulting in reduced habitat that cannot recover due to the inferior ability of the Swakop River to sustain groundwater dependent biodiversity once groundwater levels are reduced.

The reduction of groundwater levels in the Husab Berg Compartment of the Swakop River may affect the distribution, occurrence and reseedling of riparian vegetation of value. This relates in particular to large tree species such as *Faidherbia albida* and *Acacia erioloba* (Appendix G).

Vegetation in the Husab Berg Compartment was found to be degraded, with very few *Faidherbia albida* and *Acacia erioloba*, and heavily infested with *Prosopis*. With no data available it is difficult to make recommendations. The precautionary principle is to be followed in absence of data.

The ability of the Swakop River to maintain the linear oasis biodiversity at pre-1970 levels has deteriorated significantly due to the building of the Swakoppoort and Von Bach dams. The increased sensitivity of the Swakop River baseline environment therefore requires that this be taken into account when conducting the assessment.

Too little information is available to scientifically determine the impacts on already low numbers of *Acacia erioloba* and *Faidherbia* along the compartment if groundwater abstraction from the Swakop River is unsustainably increased. These are both protected, and are regarded as keystone species in riparian ecosystems along the western-flowing ephemeral rivers. If groundwater abstraction from the Swakop River is unsustainably

increased. Evidence suggests that loss of these species will result in a knock-on loss of biodiversity at all levels, which justify a conservative approach.

The impact on groundwater dependent biodiversity is therefore of even higher concern because of increased vulnerability of the ecosystem, compared to its pre-1970 condition. The increased vulnerability of the river system means that the ability of river is reduced and that activities therefore need to be considered more stringently.

The rationale of the assessment is based on the specialist vegetation study (Mannheimer, 2010), keeping the regional baseline conditions in mind.

| Impact | Aspect | Criteria | Rating without mitigation/enhancement | Rating with mitigation/enhancement |
|--|-----------------------------------|---------------------------|---------------------------------------|------------------------------------|
| Groundwater dependent riparian vegetation distribution and density reduces resulting in reduced habitat. | Increased groundwater abstraction | Severity | H | M |
| | | Duration | M | L |
| | | Spatial Scale | L | L |
| | | Consequence | M | M |
| | | Probability of occurrence | H | M |
| | | Significance | M | M |

Should LHM abstract additional groundwater from the HBC the following mitigation measures are proposed (see p11 of Appendix G for detail):

- ✓ The modelled threshold water levels proposed by BIWAC (2010) should be used and should not be breached. In the event of a year, or years, with below average runoff this model should also be used to reassess pumping levels.
- ✓ A rigorous scientific vegetation monitoring system must be put in place. At the first sign of deterioration in groundwater levels the groundwater model should be reassessed.
- ✓ Groundwater levels should not be allowed to drop at a rate higher than 10cm per month, and should preferably be held below that.
- ✓ Clearing of *Prosopis* should be given serious consideration.

7.7.4. Water resources on farms to the north of the HBC become more scarce and difficult to access.

Impact on future agricultural and tourism based livelihood of farms in the area may reduce because groundwater resources adjacent to the HBC may become scarcer if the groundwater of the HBC is over-utilised.

According to the groundwater specialist report (Appendix H) the compartment is approximately 25km long with an average compartment width of 212m. The compartment is therefore very narrow and does not affect the groundwater on adjacent farms significantly.

The water in the HBC is also high in salinity and therefore not fit for farming or human consumption in its untreated state.

The rationale for the assessment is based on regional perceptions and the Groundwater Specialist Report.

| Impact | Aspect | Criteria | Rating without mitigation/enhancement | Rating with mitigation/enhancement |
|--|-----------------------------------|---------------------------|---------------------------------------|------------------------------------|
| Water resources on farms to the north of the HBC become more scarce and difficult to access. | Increased groundwater abstraction | Severity | L | L |
| | | Duration | M | L |
| | | Spatial Scale | M | L |
| | | Consequence | M | L |
| | | Probability of occurrence | L | L |
| | | Significance | L | L |

If LHM proceed with the project the following mitigation measures are proposed:

- ✓ Abstraction from the Husab Berg Compartment must not exceed 150,000m³/annum.
- ✓ Monitor the groundwater levels in the Husab Berg Compartment to regulate abstraction up to equal of the recharge.
- ✓ Spot monitor upstream and downstream groundwater compartments for changes in water levels and quality and review the groundwater model if required.
- ✓ Spot monitor adjacent farm boreholes for a reduction in water levels and recovery rates and review the groundwater model if required.

7.7.5. Economic stability and employment opportunity in the Erongo Region reduces if the mining operations are curtailed by a lack of water.

The mines are one of two main employers in the Erongo Region. Growth in the Uranium industry improves the national and regional GDP and therefore employment capability.

Therefore if the LHM mining is curtailed due to a lack of water supply the economic contribution and employment capacity of the mine will be reduced. This will have a significant influence in the regional economic stability and on the lower income employment rate of the region.

The rationale for the assessment is based on desktop review and professional opinion.

| Impact | Aspect | Criteria | Rating without mitigation/enhancement | Rating with mitigation/enhancement |
|---|--------------------------------|---------------------------|---------------------------------------|------------------------------------|
| Economic stability and employment opportunity in the Erongo Region reduces if the mining operations are curtailed by a lack of water. | Regional economic contribution | Severity | M | L |
| | | Duration | L | L |
| | | Spatial Scale | H | H |
| | | Consequence | M | M |
| | | Probability of occurrence | M | L |
| | | Significance | M | L |

The following mitigation measures are proposed:

- ✓ Diversify the water supply resources available to the LHM to include desalinated water.
- ✓ Improve the pipeline capacity and reliability of supply from the sources available to the LHM. This will have to be done in conjunction with Namwater.

7.7.6. Destruction of gravel plains surface and vegetation

The hyper arid conditions make the restoration of ecosystems and physical surface damage difficult.

It is especially the surface of the Namib gravel plains that are at risk. Various plant species on these gravel plains are small and difficult to observe from vehicles. These are located to the western part of the project area.

The rationale for the assessment is based on desktop review and professional opinion.

| Impact | Aspect | Criteria | Rating without mitigation/enhancement | Rating with mitigation/enhancement |
|--|--|---------------------------|---------------------------------------|------------------------------------|
| Destruction of gravel plains surface and vegetation. | Construction and maintenance of the infrastructure | Severity | M | L |
| | | Duration | H | H |
| | | Spatial Scale | L | L |
| | | Consequence | M | M |
| | | Probability of occurrence | M | L |
| | | Significance | M | L |

If LHM proceed with the project the following mitigation measures are proposed:

- ✓ The movement of mine personnel and vehicles must be restricted to an absolute minimum and vehicle routes must be planned and monitored for track proliferation as per the mine EMP and EMS.
- ✓ The occurrence of leaks on the water line must also be limited to the minimum by using an electronic leak detection system on the line.

7.7.7. Destruction of archaeological sites

The route alternatives are sensitive to disturbing scientifically important archaeological sites.

The archaeological study (Appendix I) confirms the recognized archaeological value of the project area careful consideration of activities is necessary. The only route that will not impact on the archaeology of the project area is the Gawib River course.

The rationale for the assessment is based on the Archaeological Specialist Study (See Appendix I)

| Impact | Aspect | Criteria | Rating without mitigation/enhancement | Rating with mitigation/enhancement |
|--------------------------------------|--|---------------------------|---------------------------------------|------------------------------------|
| Destruction of archaeological sites. | Construction and maintenance of the infrastructure | Severity | M | L |
| | | Duration | H | H |
| | | Spatial Scale | L | L |
| | | Consequence | M | M |
| | | Probability of occurrence | M | L |
| | | Significance | M | L |

Should the project proceed, the following mitigation measures are being proposed:

- ✓ Use the existing route and the Gawib River course as the only power line and waterline routes.
- ✓ The movement of mine personnel and vehicles must be restricted to an absolute minimum and vehicle routes must be planned and monitored for track proliferation as per the mine EMP and EMS.
- ✓ Demarcate identified archaeological sites with physical barriers.
- ✓ Only existing tracks may be used by contractors and maintenance teams. The existing tracks must be marked by GPS

7.8. Project Alternatives

Three project alternatives were investigated namely

- ✓ Abstracting an additional 250000m³/annum groundwater from the HBC.
- ✓ Finding an alternative source of water in desalination.
- ✓ No Project alternative.

Each will be described in terms of content, advantages/disadvantages and expected impacts.

From the evaluation it can be commented that the only viable long term alternative for LHM to secure a water resource that is sustainable and not in conflict with

regional forces is to find a desalination water source. This is the only option that will provide a beneficial outcome in that it achieves the project objectives and improves the environmental footprint of the mine.

The project alternative of this EIA does not compare favourably to the desalination alternative. The possible benefits for LHM do not justify the risks and impacts involved in the alternative.

The no project alternative will only continue to contribute to the deterioration of the regional water situation and increase the risks that the mine is exposed to. Therefore it is not advised to merely uphold the status quo on securing a sustainable water source for the mine at both project and regional levels.

7.8.1. Abstracting an additional 250,000m³/annum groundwater from the HBC**Description**

LHM continues with the project to abstract an additional 250m³/annum from the HBC for the purpose of mine construction and dust suppression purposes.

| Advantages | Disadvantages | Expected impact areas |
|---|---|--|
| <ul style="list-style-type: none"> ✓ Cost of water resource is low. ✓ The contribution of the mine to employment and economic growth continues in the short term. ✓ LHM improves its control of a minor component of its water supply resource. ✓ Water with a high salinity (not fit for human consumption) will be used at LHM. | <ul style="list-style-type: none"> ✓ The volume of water that the alternative can secure does not allow for future extensions of the mine. ✓ The development of the desalination alternative by LHM and Namwater is time consuming. ✓ The negative perception that LHM is threatening the regional water resource security is increased. ✓ The linear oasis of the lower Swakop River is exposed to the risk of permanent deterioration. ✓ The risk of damage to archaeological sites and sensitive gravel plains increase | <ul style="list-style-type: none"> ✓ Unsustainable use of the HBC groundwater destroy riparian linear oasis. ✓ Construction related impacts along the route alternatives in the Namib Naukluft National Park. ✓ LHM contributes to the perception of water security threats in the Erongo Region. |

Comment

This alternative is not sustainable in the long term at project level and will only provide short term relief to LHM. The alternative does not align LHM with the recommendations of the Uranium Rush SEA.

7.8.2. Finding an alternative source of water in desalination.**Description**

LHM finds an alternative source of water by either developing an appropriate capacity desalination plant, or by sourcing desalinated water via Namwater.

Advantages

- ✓ Reduction or elimination of groundwater use.
- ✓ Elimination of the negative perception that LHM is threatening the regional water resource security.
- ✓ Secure an adequate and reliable water supply for all future extensions of the mine operations.
- ✓ Alignment with the Uranium Rush SEA recommendations.
- ✓ Eliminated risk of environmental degradation of the Swakop River riparian oasis.
- ✓ Reduced risk of disturbing archaeological sites as well as gravel plains and vegetation in the Gawib valley.
- ✓ Reduced risk of unintentional impacts on the groundwater resource of the farms north of the Swakop River.

Disadvantages

- ✓ The cost of the alternative is high.
- ✓ The timeline to implement the alternative is long and various factors beyond the control of LHM may delay implementation.
- ✓ The existing regional and mine specific water infrastructure will require major upgrading.

Expected impact areas

- ✓ Significant increase in the cost contribution of water to the mining operations.
- ✓ Construction related impacts along the existing services corridor in the Namib Naukluft National Park.
- ✓ Site specific impacts related to a desalination plant.

Comment

This alternative may be complex in implementation but will provide a sustainable water solution that is aligned with the regional and national vision for uranium mining in the central Namib by the SEA

7.8.3. No Project alternative.**Description**

LHM decides to cancel the project to increase abstraction from the Swakop River by an additional 250,000m³/annum. The mine continues to utilise the current water supply by NamWater as well as the groundwater from the Langer Heinrich Compartment under the current groundwater abstraction permit conditions .

Advantages

- ✓ Maintain the status quo
- ✓ Reduce the risk of disturbing archaeological sites as well as gravel plains and vegetation in the Gawib valley.
- ✓ The cost contribution of the water to the mining operations is relatively low.
- ✓ The mine can use up to 500, 000m³/annum water from its existing groundwater abstraction permit and 1.5Mm³/annum from NamWater (Omdel Scheme) without additional capital cost

Disadvantages

- ✓ The volume of water that the alternative can secure for the mine is the existing 500,000m³/annum + 1.5 Mm³/annum, which does not allow for future extensions in full.
- ✓ The development of the desalination alternative by LHM and Namwater is delayed due to reduced demand.
- ✓ LHM does not yet align with the Uranium Rush SEA recommendations.

Expected impact areas

- ✓ Reduction in economic and employment contribution to the region due to slowed expansion.

Comment

This alternative may provide a status quo on the water requirements of LHM. It does not however solve the future water demand of the mine or align LHM with the recommendations of the Uranium Rush SEA.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1. The Context of the EIA

8.1.1. *The future planning of the mine*

The LHM development is still in its early stages. At least one more stage of development is envisioned and Stage 3 is being constructed. These two stages will double the water requirements of the mining operations from its current demand.

This strategy necessitated the development of secure adequate water resources for LHM. The EIA focuses on assessing the viability of using the Husab Berg groundwater compartment in achieving this objective while other sources are being investigated.

The EIA must be seen in the wider context of the recent Uranium Rush SEA which gives a clear recommendation that uranium mines must in future use desalinated water for their operations and that the operational use of groundwater from the riparian linear oasis along the ephemeral rivers must be phased out.

There are however complex limitations in the implementation of securing this resource for the mine.

The existing desalination plant can provide excess water that is sufficient for the future needs of LHM but the responsibility and negotiations for the purchasing of the water rests with Namwater. Currently there is little guarantee in place that this source will become available soon.

Namwater also plans to build its own desalination plant. The timeline for this operation to start with output is still uncertain.

The existing infrastructure will also need to be upgraded through the central Erongo Region to assure a reliable source at the mine. This is also the responsibility of Namwater.

LHM faces a complex and uncertain situation in terms of its future water requirements.

Therefore LHM must investigate the viability of using additional groundwater resources from the Husab Berg Compartment in the interim.

8.2. Key Conclusions of the EIA

The key conclusion of the EIA is that:

The proposed abstraction of 250,000m³/annum from the Husab Berg compartment is not sustainable. The impact of this activity will be high since the sustainable abstraction rate is only 150,000m³/annum and the SEA gives a clear recommendation/guideline that future mining activities must source desalinated water only.

The following key impacts have been identified during the EIA if the project is implemented:

- ✓ The protection of the limited regional water resource is compromised.
- ✓ The Husab Berg Compartment water levels will decline below the acceptable model limits should the 250,000m³/annum be abstracted.

On the other hand the following key impact may realize if LHM does not have access to a sustainable water source:

- ✓ Economic stability and employment opportunity in the Erongo Region reduces if the mining operations are curtailed by a lack of water.

The following key concerns have been raised by the various specialist studies during the EIA:

- ✓ According to the best available model at present (BIWAC 2010), extraction of 250 000 m³ pa would be unsustainable. It is therefore recommended that pumping at these levels should not be undertaken, and that a highly conservative approach to water extraction be followed.
- ✓ Lowering of the water table in the HBC by unsustainable extraction may be expected to reduce the already low numbers of *Acacia erioloba* and *Faidherbia* along the compartment. These are both protected, and are regarded as keystone species in riparian ecosystems along the western-flowing ephemeral rivers Namibia. The lack of data make it difficult to predict outcomes with any level of certainty, but the available evidence suggests that loss of these species will result in a knock-on loss of biodiversity at all levels and in many groups of organisms (Mannheimer, 2010).
- ✓ Although the density of archaeological sites found during the investigation is relatively low, these sites include two pre-colonial graves. Due to the high to medium significance of impact and the high level of consequence, any possible or definite exposure should be considered highly negative.

These concerns justify a conservative approach to the assessment of the viable use of the Husab Berg Compartment.

LHM should align with the desalination recommendation of the Uranium Rush SEA. It is also clear that the regional implementation of this recommendation is complex and subject to a long implementation timeline that is still very uncertain.

8.3. Recommendations of the EIA

The conclusion of the EIA, that the proposed abstraction of 250,000m³/annum from the Husab Berg compartment is not sustainable and the SEA gives a clear recommendation/guideline that future mining activities must source desalinated water only, therefore negates the need for an Environmental Management Plan and a Record of Decision by MET.

In the light of this conclusion the following recommendations if made for LHM:

- ✓ Align with the EQO water recommendation of the Uranium Rush SEA as a matter of priority.
- ✓ Make a public commitment not to abstract water from the HBC.

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