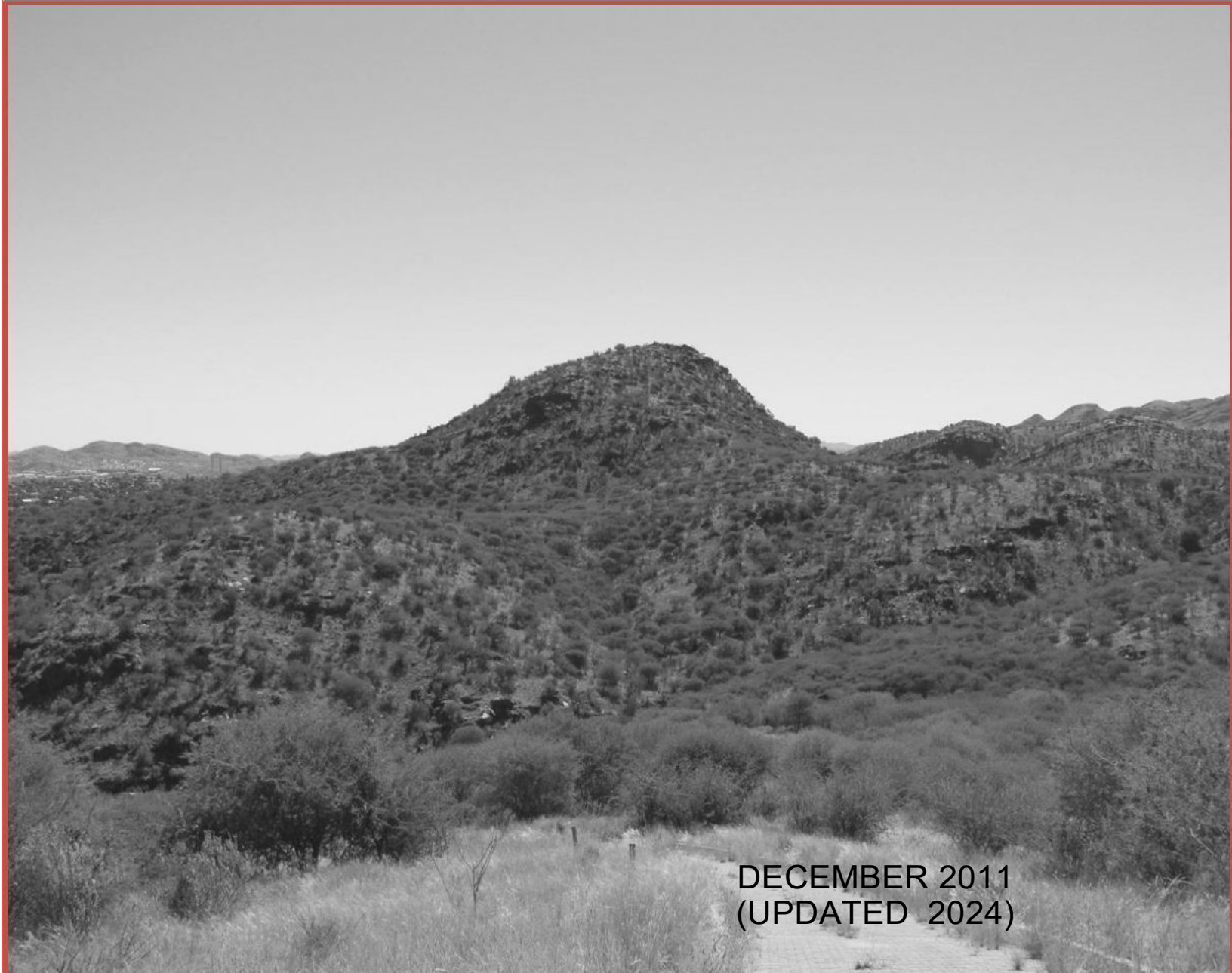




## APPENDIX A:

# ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) FOR THE PROPOSED KLEIN WINDHOEK EXTENSION 4 DEVELOPMENT



DECEMBER 2011  
(UPDATED 2024)

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## ABBREVIATIONS

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CoW	City of Windhoek
ECO	Environmental Control Officer
ER	Employers' Representative
ESMP	Environmental and Social Management Plan
MAWF	Ministry of Agriculture, Water and Forestry
NAMPAB	Namibia Planning Advisory Board

## APPENDICES

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# 1 PROJECT OUTLINE

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## 1.1 INTRODUCTION

Enviro Dynamics cc. was appointed by City of Windhoek to conduct an environmental assessment for the proposed development of Klein Windhoek Extension 4.

*What is an Environmental and Social Management Plan (ESMP)?*

An ESMP is simply a list of management actions needed to ensure that undue or reasonably avoidable adverse impacts of the planning, construction, operation, and decommissioning of a project are prevented; and that the positive benefits of the project are enhanced. It assigns responsibilities and will be used as a checklist to monitor compliance at the site.

This Environmental and Social Management Plan (ESMP) follows on the Environmental Assessment Process and addresses the Planning, Construction, and Operational Phases of the development.

*What are the legal implications and my obligations under this Plan?*

This ESMP with all its contents will be submitted to the Directorate of Environmental Affairs in the Ministry of Environment and Tourism. The implementation of the ESMP is required in terms of the Environmental Management Act of 2007. The MET will issue an environmental clearance certificate to the Developer which places the Developer under a legal obligation to adhere to the recommendations in the Environmental and Social Management Plan.

The implementation of the ESMP and the recommendations for development and design guidelines will be added as a specific condition to a) the purchase agreement and b) contractors agreement of all properties to be sold.

The ESMP, once approved, therefore becomes a legally binding document and each role-player identified in the ESMP is required to abide to the conditions stipulated in it.

## 1.2 PROJECT DESCRIPTION

Based on the Windhoek Structure Plan (1996) the proposed Klein Windhoek Extension 4 area is earmarked as:

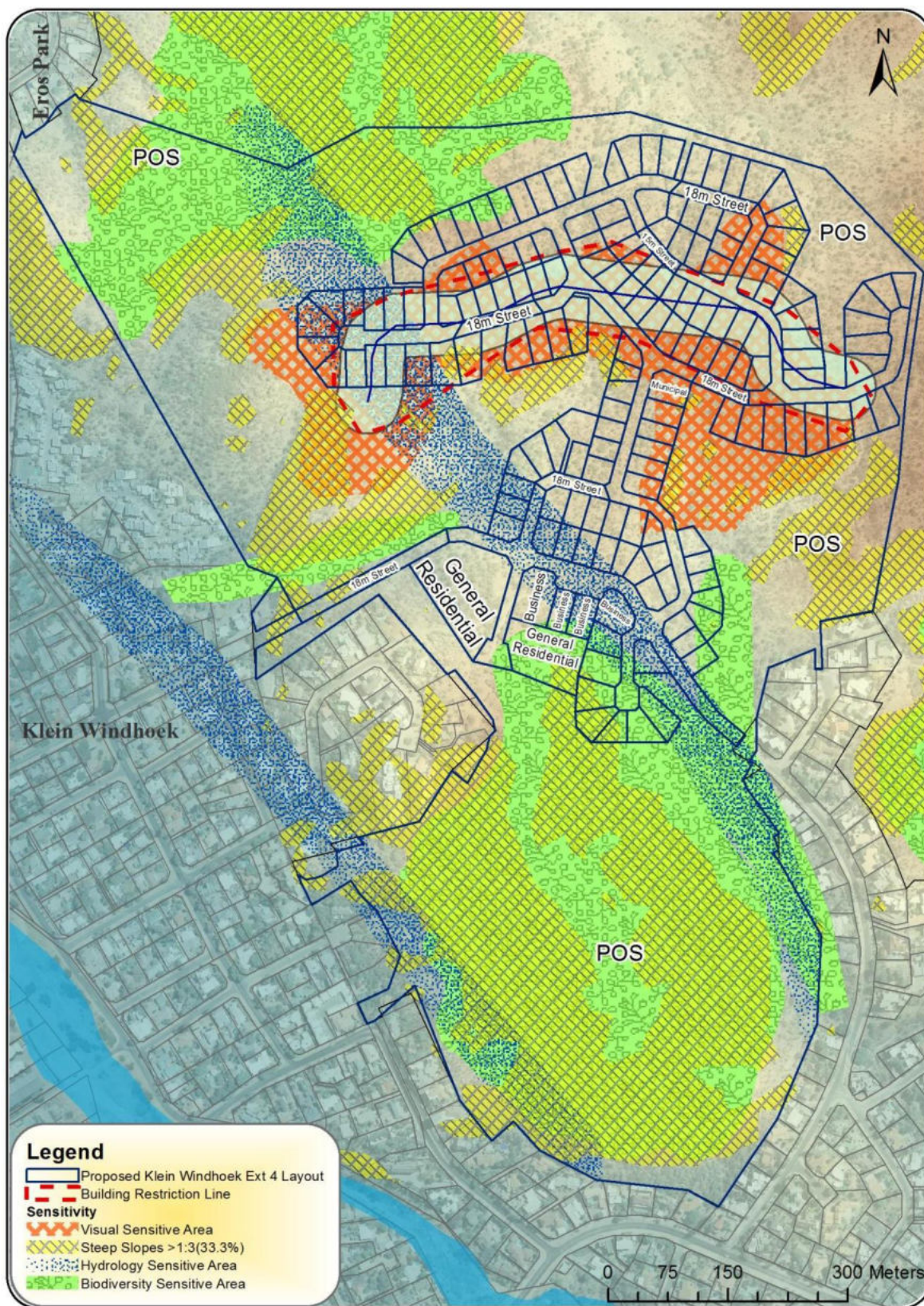
- *“Open space predominantly for recreational purposes, sports clubs, game farms, lodges and tourist centres;*
- *Residential area typified by a mixture of detached housing on erven greater than 700m<sup>2</sup>, with pockets of townhouses, semi-detached housing and flats; predominant entities will be lower than 1 dwelling/ 350m<sup>2</sup>.”*

The City of Windhoek has now entered into a Public Private Partnership with Twine Investments to do the development. The developer intends on applying for the rezoning of Portion 119 of Klein Windhoek Town and Townlands No. 70 from “*undetermined*” to “*residential*” while maintaining sensitive landscape, vegetation and geohydrological areas. In order to enhance the overall feasibility of the project, Twine Investments are recommending the following:

- Individual erven
- Low density erven (i.e. larger and less erven).
- Overall about 180 Single Residential erven will be created with a density of approximately 1:1000.
- Four General Residential erven will be created with a density of 1:300 (i.e. approximately 66 units).
- 2 Business erven.
- 1 Special erf for an electrician substation.
- 7 Public Open Spaces on areas not suitable for development or where small rivers pass through to create open viewing vistas.

## 1.3 ENVIRONMENTAL SENSITIVE AREAS

During the Environmental Assessment, environmental sensitive areas were identified including the prominent ridges and steep slopes as well as the main drainage lines with associated riparian vegetation. Disturbance to these areas should be avoided as far as possible. **Figure 1** gives an indication of the environmental sensitive areas as well as those areas that are visually sensitive in terms of the development.



**Figure 1: Sensitive areas identified for Klein Windhoek Extension 4**

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## **2 PLANNING REQUIREMENTS AND ACTIONS**

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### **2.1 PLANNING REQUIREMENTS**

In order to develop a unique cohesive character for the Klein Windhoek Extension 4 Residential development and to respond in an appropriate way to the sensitive environment, it is important that specific planning requirements are adhered to.

Because of the sensitive nature of the terrain of this development, coupled with the significant impacts associated with this project, it is necessary to identify alternative designs and development trends that could avoid these impacts, enhance the quality of the area and provide positive economic benefits to the City.

The Klein Windhoek Extension 4 development should therefore be treated as a Township development with special conditions contained in the conditions of establishment and registered in the title deeds of each property.

## 2.2 PLANNING ACTIONS

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
<b>Scenic quality</b>	Conservation of natural quality of site	<ul style="list-style-type: none"> <li>Project should be treated as a Township development with special conditions contained in the conditions of establishment and registered in the title deeds of each property.</li> <li>The implementation of the ESMP and the recommendations for development and design guidelines need to be added as a specific condition to a) the purchase agreement and b) contractors agreement</li> </ul>	<ul style="list-style-type: none"> <li>Application to NAMPAB for Township development.</li> <li>Application for environmental clearance.</li> </ul>	Twine Investments, CoW Planning, Urbanisation & Environment division NAMPAB MET	Application to NAMPAB Clearance certificate from MET

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COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
		<p>of all properties to be sold.</p> <ul style="list-style-type: none"> <li>The open space areas as indicated in the layout plan must be established and zoned as Public Open Spaces.</li> </ul>			
<b>Management and monitoring</b>	Ensure that the provisions of the ESMP are implemented during construction (of both the bulk services and the individual houses).	Implementation of the ESMP is a requirement during the construction of all services.	To be evaluated by the developer.	Twine Investments CoW Planning, Urbanisation & Environment division ER	ESMP a) purchase agreement and b) contractors agreement of all properties
		The implementation of the ESMP and the recommendations for development and design guidelines need to be added as a specific condition to a) the purchase agreement and	To be evaluated by the Home Owners Association or similar body during every purchase.	Managing body (e.g. home owners association)	

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COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
		<p>b) contractors agreement of all properties to be sold.</p> <p>A Home Owner's Association or similar body needs to be established that oversees the implementation of the building and ESMP requirements.</p> <p>Legal advice should be sought upon the establishment of the Home Owners Association to ensure that the body has legal standing to enforce the requirements of the ESMP.</p>			
<b>Sensitive zones</b>	Minimize the impact of development on the sensitive	<ul style="list-style-type: none"> <li>Areas indicated as open space should be established and zoned as Public Open Space.</li> </ul>	Monitored by the CoW and the developer	Urbanisation & Environment division of the CoW	Layout plans

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COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
	zones (as indicated in Figure 1).	<ul style="list-style-type: none"> <li>• Development should not infringe onto these Public Open Space areas.</li> <li>• Buildings and roads should be orientated so that they follow the contours as far possible. This will limit cut and fill and erosion along the slopes.</li> <li>• Storm water should be accommodated along the road.</li> </ul>		ER	
	To prevent the fragmentation of habitats	A 10 m green corridor to both side of the two major drainage lines and the gorge (Figure 1) should be established and maintained.	Incorporate into layout and design as Public Open Space	Twine Investments CoW Planning, Urbanisation & Environment division	Layout and Design

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COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
<b>NATURAL ENVIRONMENT</b>	Ensure minimum disturbance to natural environment.	<ul style="list-style-type: none"> <li>Large indigenous trees (i.e. with a trunk diameter of more than 150 mm) should be surveyed and marked with red Paint</li> <li>The layout and building design should incorporate large indigenous trees as far as possible. If not possible permits would be required to remove these trees. Each tree that is removed need to be replaced after construction (see list of recommended trees, <b>Appendix B</b>).</li> <li>The Planner also needs to consider the width of the access streets since</li> </ul>	<p>Ensure that layout and design complies with mitigation proposed.</p> <p>Apply for permits.</p> <p>Keep record of the following:</p> <ul style="list-style-type: none"> <li>the number of trees that are removed</li> <li>the specific tree species that is removed.</li> </ul>	<p>Architect</p> <p>Developer</p> <p>CoW Planning, Urbanisation &amp; Environment division</p> <p>ER</p> <p>Home Owners Association</p>	<p>List of trees</p> <p>Permits</p>

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COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/PARTNERSHIP	RESOURCES REQUIRED
		<p>a number of trees would be influenced. Consider to accommodate the trees in order to retain most of these trees and the natural "sense of place".</p> <ul style="list-style-type: none"> <li>Only a limited width +/- 5 m on the side of the road can be partially cleared of vegetation.</li> </ul>			
	Minimise run-off and erosion.	<ul style="list-style-type: none"> <li>No development allowed in drainage lines. Drainage lines incorporated as green corridors in Public Open Space system.</li> <li>Development on Erven sited on ridgelines and steep slopes need to adhere to architectural</li> </ul>	<p>Layout and Landscape design need to comply with mitigation measures proposed.</p> <p>Architect need to indicate innovative ways in which to deal with steep slopes.</p>	<p>CoW Planning, Urbanisation &amp; Environment division</p> <p>ER</p> <p>Architect</p>	Sensitivity map (Figure 1)

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COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
		and development guidelines (Appendix A) in order to minimise large impermeable areas as well as cut and fill.			
	Protection of drainage lines against contamination.	Sewerage lines to be placed on the banks of drainage lines outside of the green corridor and flood line area.	Establish protection zones before any construction starts.	Engineers ER	
	Conserve biodiversity	No development should be allowed within the areas marked as sensitive ( <b>Figure 1</b> ) in terms of biodiversity, e.g. major drainage lines. Architectural and development guidelines (Appendix A) need to be adhered to on steep slopes and ridgelines.	Discussions with architect and engineers. Layout and Landscape design need to comply with areas marked as sensitive.	Architect Engineers	

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COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
	Minimize clearance and disturbance of habitats	<ul style="list-style-type: none"> <li>• Make use of existing access roads and plan new roads or streets to follow contour lines in order to minimise erosion.</li> <li>• Run off from roads need to be accommodated within the Storm water Plan.</li> <li>• Plan road network to accommodate envisaged increased traffic.</li> <li>• Only a limited width +/- 5 m on the side of the road can be partially cleared of vegetation.</li> </ul>	Layout Plan to incorporate mitigation measures	Planners and Engineers CoW Planning, Urbanisation & Environment division ER	
	Minimize clearance and disturbance of	<ul style="list-style-type: none"> <li>• Place infrastructure lines along contour lines.</li> </ul>	Layout Plan to incorporate mitigation measures	Planners and Engineers	

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COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
	habitats	<ul style="list-style-type: none"> <li>Developers to follow guidelines in Drainage regulations of the CoW for internal reticulation.</li> </ul>		CoW Planning, Urbanisation & Environment division ER	
<b>VISUAL IMPACT</b>	To minimise a decrease in scenic quality or "sense of place".	<ul style="list-style-type: none"> <li>Lay out design and building structures should follow contour lines and building structures.</li> <li>Development above the building restriction line (Figure 1) should be limited and should adhere to the recommendations in the architectural and development guidelines (Appendix A).</li> <li>Avoid high bulk developments as such</li> </ul>	<ul style="list-style-type: none"> <li>Discussions and cooperation between architect, developer, engineers and Planning, Urbanisation and Environment Department of CoW</li> <li>Architectural guidelines should address the policy regarding building and additions to houses.</li> </ul>	Architect Developers ER ECO	Lay out design

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COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
		<p>developments are more visually intrusive.</p> <ul style="list-style-type: none"> <li>Architectural design should be environmental friendly and visually integrated with natural environment.</li> <li>Colours, textures, and materials used should blend in with the natural environment.</li> <li>No additions or alterations allowed to houses that are not on original architect plans without consultation with Home owners association.</li> </ul>			
	Prevention of pollution	<ul style="list-style-type: none"> <li>A complete water and sewer reticulation for</li> </ul>	Layout and design.	Architect / engineer	

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COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
		the site needs to be done and submitted to the Strategic Executive: Infrastructure at the CoW for approval as well as CoW Planning, Urbanisation & Environment division.		ER ECO CoW Planning, Urbanisation & Environment division	
<b>RENEWABLE RESOURCES</b>	To minimise or prevent impacts on resources	<ul style="list-style-type: none"> <li>Apply principles of sustainable architecture (see <b>Appendix A</b> for recommendations)</li> <li>Use renewable energy sources as far as possible</li> </ul>	Development should make use of renewable resources as far as possible.	Architect ER ECO Engineers	
<b>RUN-OFF</b>	Prevention of run-off and erosion.	<ul style="list-style-type: none"> <li>Channelling of run-off water in channels using natural rocks.</li> <li>Storm water channels accommodated next to</li> </ul>	Planning and design.	Architect Developers Engineers ER ECO	

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COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
		<p>roads.</p> <ul style="list-style-type: none"> <li>Minimise paved or impermeable areas.</li> <li>Storm water Management Plan to be developed by CoW for Extension 4 development.</li> </ul>		CoW Planning, Urbanisation & Environment division	
	Protection of drainage lines against contamination.	Sewerage lines to be placed on the banks of drainage lines outside of flood line areas.	Establish protection zones before any construction starts.	CoW Planning, Urbanisation & Environment division ER Contractor Developer	
<b>TRAFFIC AND ACCESS</b>	Management measures to cope with increased	<ul style="list-style-type: none"> <li>Risk assessment of increased traffic on Metje, Anna and Gever streets.</li> </ul>	Compare with similar circumstances in other areas in Windhoek.	CoW Planning, Urbanisation & Environment division	Risk assessment

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COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
	volume of traffic	<ul style="list-style-type: none"> <li>Planning and design of internal road network and accesses to the site to improve the smooth flow of traffic especially during peak hours.</li> </ul>		Engineer	
<b>AWARENESS RAISING</b>	Raising awareness amongst workforce	<p>Home Owners Association should organize an induction with contractors on the core issues listed in the ESMP.</p> <p>Each contractor will be responsible for the training of his workers and subcontractors.</p> <p>Contractors should sign agreement.</p>	Awareness of different actions on environment.	Contractor ER ECO	ESMP

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## 3 MANAGEMENT REQUIREMENTS AND ACTIONS FOR CONSTRUCTION AND OPERATION

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### 3.1 ESMP OBJECTIVES & STRATEGIES

This ESMP is intended to minimise the impact of the construction and operation of the Klein Windhoek Extension 4 as identified in the *Environmental Impact Assessment Report* on the immediate and surrounding areas. It is to be implemented in conjunction with the Building and Design Guidelines.

The objectives of this plan are to:

- ensure the implementation of sustainability principles through sound urban design and sustainable development;
- ensure all environmental safeguards are carried out correctly;
- minimise adverse impacts on the environment;
- conserve the biodiversity of the site;
- minimise disruption to existing adjacent neighbourhoods and residents;
- ensure the wellbeing and upliftment of the workforce and local community;
- meet the requirements of all relevant legislation; and
- monitor the project for environmental impact.

The strategies to achieve the objectives are:

- Control soil and sediment runoff on the site.
- Control waste generated by the construction team and during the operation of the development.
- Minimise disturbance to surrounding trees, vegetation, fauna, and environmental sensitive areas.
- Control and monitor water usage and monitor water quality.
- Monitor and review environmental procedures and audit compliance to ensure standards are being maintained whilst highlighting potential areas for improvement.
- Encourage sub-contractors, designers, and suppliers to adopt environmental policies and management systems that are satisfactory to the project manager.
- Reduce the environmental impacts and their effects by adopting reasonable controls for preventing air, ground, water, or noise pollution and keeping sites clean and tidy.
- Make use of opportunities to minimise waste and to reuse or recycle materials.

- Train employees and promoting environmental awareness and commitment.
- Keep abreast of and comply with legislation, regulations, and codes of practice on environmental matters relevant to the operational activities of the proposed development.
- Advise the developer on a wellness policy with focus on components such as training, awareness raising and skills development.

### 3.2 RISK STATEMENT

- It is important to avoid or if unavoidable, minimise impacts on the environment. Environmental and social risks exist in terms of:
  - Rapid soil loss in exposed areas by erosion during rain;
  - Different forms of pollution by a number of construction and operational activities;
  - Loss and disturbance to biodiversity and habitats;
  - Planting species that will become invasive or spread as weeds;
  - Use of herbicides and pesticides;
  - Increased water demand;
  - Pollution of groundwater and surface water;
  - Sustainability of groundwater;
  - Nuisances in the form of dust, noise to neighbouring residents;
  - High visibility and
  - Minimal benefits to local communities.

The primary control measures for these risks include:

- Minimise vegetation removal;
- Building and architectural guidelines regarding building on steep slopes
- Construct erosion and sedimentation barriers;
- Cover all bare soil as soon as possible with mulch or organic matting;
- Use environmentally friendly methods for stabilising bare slope areas;
- Monitor and minimise all possible pollution;
- Minimise roads and access as far as possible;
- Restrict topsoil stripping and reuse topsoil;
- Environmental sensitive planning of different types of land use;
- Design should incorporate large indigenous trees;
- Collection of wood on site should be forbidden;
- No fires will be allowed within construction area;



- Remove all alien vegetation that have established in disturbed areas;
- Bio control and organic treatment of pests will be recommended;
- Maximise the use of site soil;
- Maximise the use of locally indigenous vegetation;
- Water usages should be minimised and waste water recycled;
- Treat entire area as groundwater sensitive;
- Protection measures in place to avoid any surface contaminant reaching the drainage lines;
- Control dust and noise;
- Implement proposed layout, building and design guidelines;
- On site accommodation of labourers should be prohibited; and
- Introduce the „Locals First“ policy.

### **3.3 GENERAL REQUIREMENTS FOR THE ESMP**

#### 3.3.1 ESMP Administration

- Copies of this ESMP shall be kept at the site and will be distributed to all contract personnel. All personnel shall be required to familiarize themselves with the contents of this document.

#### 3.3.2 Roles and Responsibilities

- The implementation of this ESMP requires the involvement of several stakeholders, each fulfilling a different but vital role to ensure sound environmental management during each phase.

##### a) Contractor

- The Contractor shall appoint a person from the construction team to take responsibility for the implementation for all provisions of this ESMP.
- The Contractor shall report on the status of the implementation of the provisions of the ESMP.
- The contractor should implement the environmental awareness training as stipulated in this report.
- The contractor must list the stakeholders of the project and their contact details with whom communication would be required throughout the contract. This list, together with an indication of how stakeholder communication will be done

throughout construction must be agreed upon and given to the ER before construction commences.

- The contractor is also responsible for compliance to this ESMP by all sub-contractors. Make sure that all sub-contractors have a copy of this ESMP and that they understand its contents. Include the ESMP in the sub-contracts/agreements with sub-contractors.
- The Contractor must adhere to the regulations pertaining to Health and Safety, including the provision of protective clothing and shoes, failing which the contract may be ended immediately.

#### b) Employer's Representative (ER)

- The Developer needs to appoint an Employer's Representative (ER) that could act as the Employer's on-site implementing agent and will be responsible to ensure that the Employer's responsibilities are executed in compliance with relevant legislation and the ESMP. In addition to general project management, the ER in collaboration with the developer has the responsibility to appoint the Environmental Control Officer (ECO) (see below).
- Any on-site decisions regarding environmental management are ultimately the responsibility of the ER. The on-site ER shall assist the ECO where necessary and will have the following responsibilities in terms of the implementation of this ESMP:
- Ensuring that the necessary environmental authorizations and permits have been obtained.
- Assisting the Contractor in finding environmentally responsible solutions to problems with input from the ECO where necessary.
- Ordering the removal of person(s) and/or equipment not complying with the ESMP specifications.
- Providing input into the ECO's ongoing internal review of the ESMP, this review report is submitted to the Employer.

#### c) Environmental Control Officer (ECO)

- The Environmental Control Officer (ECO) will be a competent person appointed by the ER to act as the Employer's representative to monitor and review the on-site environmental management and implementation of this ESMP by the Contractor.
- During the construction of:
  - Service infrastructure this will be the responsibility of the Resident Engineer;
  - Buildings/houses this will be the responsibility of the Home Owners Association.
- The ECO shall be on site daily during the construction contract. The ECO's duties will include the following:

- Assisting the ER in ensuring that the necessary environmental authorizations and permits have been obtained.
- Maintaining open and direct lines of communication between the ER, Employer, Contractor and I&APs with regard to environmental matters.
- Regular site inspections of all construction areas with regard to compliance with the ESMP.
- Monitoring and verifying adherence to the ESMP, monitoring and verifying that environmental impacts are kept to a minimum.
- Taking appropriate action if the specifications are not followed.
- Assisting the Contractor in finding environmentally responsible solutions to problems.
- Monitoring the undertaking by the Contractor of environmental awareness training for all new personnel coming onto site.
- Advising on the removal of person(s) and/or equipment not complying with the specifications (via the ER).
- Recommending the issuing of fines for transgressions of site rules and penalties for contraventions of the ESMP (via the ER).
- Auditing the implementation of the ESMP and compliance with authorization on a monthly basis.
- Undertaking a continual review of the ESMP and recommending additions and/or changes to the document.

### **3.4 ENVIRONMENTAL AWARENESS TRAINING**

The Contractor shall ensure that adequate environmental awareness training of site personnel takes place and that all construction workers receive an induction presentation on the importance and implications of the ESMP. The presentation shall be conducted, as far as is possible, in the employee's language of choice.

As a minimum, training should include:

- Explanation of the importance of complying with the ESMP.
- Discussion of the potential environmental impacts of construction activities.
- The benefits of improved personal performance.
- Employees' roles and responsibilities, including emergency preparedness.
- Explanation of the mitigation measures that must be implemented when carrying out their activities.
- Explanation of the specifics of this ESMP and its specification (no-go areas, etc.).
- Explanation of the management structure of individuals responsible for matters pertaining to the ESMP.

- The contractor shall keep records of all environmental training sessions, including names, dates and the information presented.

## 4 MANAGEMENT ACTIONS

### 4.1 CONSTRUCTION PHASE

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
<b>COMMUNICATION AND STAKEHOLDER COMMUNICATION</b>	Continued involvement of stakeholders	<p>The Contractor shall report on the status of the implementation of all provisions of the ESMP.</p> <p>The contractor should implement the environmental awareness training as stipulated in this report.</p> <p>The contractor must list the stakeholders of the project and their contact details with whom communication would be required throughout the contract.</p>	<p>Ensure that all stakeholders are adequately informed throughout construction and that there is effective communication with and feedback to the consultant and client.</p> <p>During the construction of Infrastructure services the responsibility of stakeholder communication shall fall on the Municipality, contractors and engineer.</p> <p>During the construction of individual properties, the responsibility of stakeholder</p>	ER ECO Contractor	Minutes of meetings

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COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
		<p>This list, together with an indication of how stakeholder communication will be done throughout construction must be agreed upon and given to the ER before construction commences.</p> <p>All communication with the stakeholders must take place through the ECO.</p> <p>A copy of the ESMP must be available at the site for perusal to all stakeholders, who must be invited to raise any concerns and issues on the project progress.</p> <p>A register will be kept where all complaints received from the public should be recorded.</p>	<p>communication shall fall on the Home Owners association.</p>		

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COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
		<p>The register should be under the authority of the ER.</p> <p>A sign off procedure will be in place to address any concerns raised.</p> <p>Management measures to address the complaint should be indicated in the register.</p> <p>All people on the stakeholders list should be informed about the availability of the complaints register in writing by the ER prior to the commencement of construction activities.</p>			
<b>TRAINING OF THE WORKFORCE.</b>	Information dissemination to workforce	<ul style="list-style-type: none"> <li>• Training session with regards to code of conduct, general</li> </ul>	Attendance list to be signed by all participants.	Contractor and Management Team	Attendance list Housekeeping

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		housekeeping requirements, etc.		ER	requirements
<b>POLLUTION</b>	Prevention of soil pollution	<ul style="list-style-type: none"> <li>Spillages of any potentially toxic materials, must be scooped up immediately into waste bags and disposed of at a site designated for such purpose.</li> </ul>	<p>Inspection and regular clean up.</p> <p>Formal agreement signed with contractors.</p>	<p>Contractors</p> <p>ER</p> <p>ECO</p>	
<b>WASTE MANAGEMENT</b>	Reduce amount of waste generated.	<ul style="list-style-type: none"> <li>Have drums readily available on site.</li> <li>Cement bags must be gathered and disposed of in drums.</li> <li>Waste must be removed on a daily basis.</li> </ul>	<p>Regular inspection.</p> <p>Reducing waste generated.</p> <p>Formal agreement signed with contractor.</p>	<p>Contractor</p> <p>ER</p> <p>ECO</p>	
	Prevent pollution due to	<ul style="list-style-type: none"> <li>All cement need to be mixed on appropriate</li> </ul>	Inspection and regular clean up.	Contractor	

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	hazardous waste	<p>containers provided.</p> <ul style="list-style-type: none"> <li>No paints and solvents to be disposed of on the open ground.</li> <li>In the event of cement, paint and oil spillages must be scooped up immediately into waste bags and disposed of at a site designated for such purpose.</li> </ul>	Formal agreement signed with contractor.	ER ECO	
	Prevent pollution due to hazardous waste	<ul style="list-style-type: none"> <li>Any materials left after construction should be removed from the site</li> <li>Redundant construction materials to be removed once a week</li> </ul>	<p>Inspection.</p> <p>Formal agreement signed with contractor.</p>	Contractor ER ECO	
	Prevent pollution due to	<ul style="list-style-type: none"> <li>Chemical toilets should be provided during</li> </ul>	<p>Inspection daily.</p> <p>Formal agreement signed with</p>	Contractors ER	

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	affluent.	<p>construction.</p> <ul style="list-style-type: none"> <li>• These toilets should be within walking distance (&lt;50m) for construction workers.</li> <li>• Spillage or leakage to be cleaned-up.</li> <li>• No toilets allowed within 10m from the drainage lines</li> </ul>	contractor.	ECO	
<b>SOIL EROSION</b>	Minimize habitat destruction and dust generation	<ul style="list-style-type: none"> <li>• An area that is not sensitive in terms of erosion need to be identified and marked out as the area for storing equipment and materials and parking of construction vehicles.</li> <li>• The area of soil that is disturbed should be</li> </ul>	Contractor ER Engineers ECO	Permits	

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		<p>kept as small as possible to reduce potential impact of erosion.</p> <ul style="list-style-type: none"> <li>• Special care need to be taken in sensitive areas e.g. Erodible soils, steeper slope, ridge lines and gorge steeper &gt;1:5 (Figure 1).</li> <li>• Trees and undergrowth should be left intact as far as possible as they have a soil-holding capacity, incorporate into landscaping of erven.</li> <li>• Take care not to remove ground cover and pebble mulch layer.</li> <li>• Creation of scars due to</li> </ul>			

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		groundwork during construction should be prevented.			
	Conservation of ridges and steep slopes	<ul style="list-style-type: none"> <li><b>NO</b> construction activities allowed in building restriction line (<i>Figure 1</i>).</li> <li>Area need to be demarcated by the surveyor.</li> </ul>	Monitoring of unsolicited entrance beyond building restriction line.	ER ECO Surveyor Town Planner	
<b>TRACKS AND ROADS</b>	Avoid unnecessary clearance	<ul style="list-style-type: none"> <li>The servitude for the road should be carefully considered, and then the surveyor must mark out the exact servitude, where trees are in the road reserve, the alignment needs to be changed to accommodate the</li> </ul>	An authoritative person must accompany the contractor while doing the bush clearing so as to avoid unnecessary damage.	Surveyor Contractor ER ECO Engineer	

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		<p>trees.</p> <ul style="list-style-type: none"> <li>Minimum access roads will be allowed.</li> </ul>			
<b>WATER POLLUTION AND SUPPLY</b>	Prevent and/or minimise pollution of ground and surface water resources.	<ul style="list-style-type: none"> <li>Cement, paint, oil spillages must be scooped up into waste bags and disposed of at appropriate disposal site.</li> <li>Activities that can lead to pollution should be avoided in the areas adjacent to drainage lines.</li> </ul>	<ul style="list-style-type: none"> <li>The area should be treated as a groundwater sensitive area due to fractures.</li> <li>Regular inspection.</li> <li>Check regularly for any leakages.</li> <li>Formal agreement signed with contractor.</li> </ul>	Contractor. ER. ECO.	
<b>VEGETATION</b>	Conservation of indigenous trees and shrubs.	<ul style="list-style-type: none"> <li>Indigenous trees are legally protected. No tree felling, wood gathering, burning, harvesting, or</li> </ul>	<p>Regular inspection.</p> <p>Formal agreement signed with contractor.</p> <p>The following trees that occur on</p>	Contractor Developer ER ECO	Permit requirements

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		<p>damaging to any plant species.</p> <ul style="list-style-type: none"> <li>• Trees with a trunk diameter exceeding 150 mm (1 meter above ground) shall be left intact.</li> <li>• At the outset of construction (or during construction as may be applicable), the ECO and the contractor shall visit all proposed access roads and other areas to be disturbed.</li> <li>• Areas to be disturbed shall be clearly demarcated, and no land outside these areas shall be disturbed or used for construction</li> </ul>	<p>the site are protected:</p> <ul style="list-style-type: none"> <li>• <i>Acacia erioloba</i></li> <li>• <i>Albizia anthelmintica</i></li> <li>• <i>Aloe littorals</i></li> <li>• <i>Boscia albitrunca</i></li> <li>• <i>Maerua schinzii</i></li> <li>• <i>Ozoroa crassinervia</i></li> <li>• <i>Searsia lancea</i></li> <li>• <i>Ziziphus mucronata</i></li> </ul>		

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		<p>activities.</p> <ul style="list-style-type: none"> <li>• Detailed instructions and final arrangements for protection of sensitive areas, keeping of topsoil and rehabilitation of disturbed areas shall be made, in line with the guidelines in this document.</li> <li>• The ECO shall be consulted before any new areas are disturbed which have not yet been visited.</li> <li>• No off-road driving shall be allowed.</li> <li>• A prescribed penalty will be deducted from the Contractors payment</li> </ul>			

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		<p>certificate for every mature tree removed without approval.</p> <ul style="list-style-type: none"> <li>No trees may be felled or live wood in the project area removed by any member of the construction team, including sub-contractors.</li> </ul> <p>Contravention of this arrangement is liable for a prescribed penalty.</p> <ul style="list-style-type: none"> <li>A prescribed penalty will be deducted from the contractor's payment certificate if it is shown that trees and/or branches have been broken down unnecessarily, or that</li> </ul>			



COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
		<p>any plants have been collected illegally, by any of the staff or sub-contractors.</p> <ul style="list-style-type: none"> <li>• Trees should be trimmed with the correct equipment, i.e. a chain saw. No axes may be used. Branches shall be neatly trimmed as close to the main branch as possible.</li> <li>• No wood may be collected from the construction area. The contractor must provide either meals or cooking gas for the workforce to cook their own meals (during lunch hours).</li> <li>• Informal vendors that</li> </ul>			

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		sell food will also not be allowed to collect wood from the construction area and surrounds.			
<b>CONSERVATION BIODIVERSITY</b>	<b>OF</b> To minimise damage to soil and biodiversity during the construction phase	<ul style="list-style-type: none"> <li>At outset of construction the ER &amp; ECO and the contractor shall visit all proposed access roads, and other areas to be disturbed. Areas to be disturbed shall be clearly demarcated, and no land outside these areas shall be disturbed or used for construction activities.</li> <li>The ER &amp; ECO shall be consulted before any new areas are disturbed which have not yet been visited to survey,</li> </ul>	Discussions with architect and engineers.  Inspections daily.	Architect Engineers  ER  ECO  Developer  Contractor	

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		<p>mark the areas requiring protection in the road reserve, access roads, campsite as well as areas identified and pointed out to the contractor by the engineer, ECO or Environmental Consultant.</p> <ul style="list-style-type: none"> <li>• All areas marked as Public Open Space (Figure 1) should be demarcated as NO GO areas.</li> <li>• No construction personnel to enter these areas.</li> <li>• Construction vehicles only allowed within the areas demarcated.</li> </ul>			

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		<ul style="list-style-type: none"> <li>• Poaching, collecting of wild animals or setting of traps is prohibited without a permit. Any staff members caught in such an activity must be handed over to the authorities and should be dismissed from the contract.</li> <li>• Avoid small mammal/reptile nesting/breeding sites where possible.</li> <li>• A prescribed penalty will be deducted from the contractor's payment certificate if it is shown that any of his staff or sub-contractors is involved in trapping,</li> </ul>			

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		hunting or any kind of collecting of wild animals in the vicinity of the work sites. Offenders will be handed to the authorities for prosecution.			
	Conservation of drainage lines	<ul style="list-style-type: none"> <li>Excavation of alluvial material from drainage lines not allowed.</li> </ul>	Regular inspections	Contractor ECO	
<b>VISUAL IMPACTS</b>	Minimise visual impacts	<ul style="list-style-type: none"> <li>All disturbed areas shall be reshaped to their original contours; as close as possible to the natural conditions before construction commenced, including the road reserve, detours and temporary access routes.</li> </ul>	Rehabilitation and design.	Landscape designer Contractor ER ECO	

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		<ul style="list-style-type: none"> <li>All trees removed should be replaced. See list of indigenous vegetation (<b>Appendix B</b>).</li> <li>Alien vegetation particularly the Downy thorn apple (<i>Datura innoxia</i>), Wild tobacco (<i>Nicotiana glauca</i>) and Cacti (<i>Opuntia</i> spp.) that has appeared in the project corridor during construction must be eradicated.</li> </ul>			
	Minimise amount of dust created	<ul style="list-style-type: none"> <li>Regular spraying with suitable dust suppressing agent for dust control during the construction phase</li> </ul>	Regular spraying.	Contractor ER ECO	
<b>NOISE</b>	Minimise and or	<ul style="list-style-type: none"> <li>No Construction should</li> </ul>	Regular inspection.	Developer	

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	mitigate increased noise levels	<p>take place after 18h00.</p> <ul style="list-style-type: none"> <li>Fit large construction vehicles with silencers</li> <li>A speed limit of 40 km/hour should be maintained.</li> <li>No construction workers allowed staying on the premises. All workers except for security members to leave the site area at 18h00.</li> </ul>	Contractor to sign agreement.	Contractor	
<b>MANAGEMENT AND MONITORING</b>	Non compliance with aspects of ESMP.	<ul style="list-style-type: none"> <li>The ER and ECO shall ensure that all aspects of the ESMP are implemented during construction.</li> <li>The ECO shall attend regular site inspections and meetings and</li> </ul>	<p>To ensure that the provisions of the ESMP are implemented during construction.</p> <p>The ECO will report performance to the ER, who, in turn will report this and any issues and concerns to the DEA on a monthly basis.</p>	Developer	

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		<p>minutes shall make provision for reporting on every aspect of the ESMP.</p> <ul style="list-style-type: none"> <li>• The contractor is also responsible for compliance to this ESMP by all sub-contractors. Make sure that all sub-contractors have a copy of this ESMP and that they understand its contents. Include the ESMP in the sub-contracts/agreements with sub-contractors.</li> <li>• The ESMP must be available at the site.</li> <li>• Management and supervisors must lead by example.</li> </ul>			

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<b>HEALTH AND SAFETY</b>	To ensure health and safety of workers and the public at all times during construction.	<ul style="list-style-type: none"> <li>• The Contractor shall submit a strategy to ensure the least possible disruption to traffic and potential safety hazards during construction.</li> <li>• The strategy should include a schedule of work indicating when and how road crossings (construction at existing intersections) will be made. The schedule should be updated and distributed to all stakeholders.</li> <li>• The Contractor shall also liaise with the traffic authorities for their approval in this regard.</li> <li>• Proper traffic and safety</li> </ul>		Contractor Developer CoW Traffic division	

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		<p>warning signs must be placed at the construction site to the satisfaction of the Engineer and the Roads Authority.</p> <ul style="list-style-type: none"> <li>• The Contractor must adhere to the regulations pertaining to Health and Safety, including the provision of protective clothing and shoes, failing which the contract may be ended immediately.</li> <li>• Dust protection masks shall be provided to task workers if they complain about dust.</li> <li>• Potable water must be available to workers to</li> </ul>			

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		<p>avoid dehydration. At least 5 litres of drinking water per person per day (working hours) should be made available during construction.</p> <ul style="list-style-type: none"> <li>• The contractor must enforce relevant health and safety regulations for these specific activities.</li> <li>• The contractor should also comply with relevant labour laws as stipulated by the labour Act.</li> </ul>			

## 4.2 OPERATIONAL PHASE

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	MONITORING ACTIONS AND METHODS	RESPONSIBILITY/ PARTNERSHIP	RESOURCES REQUIRED
<b>MANAGEMENT AND MONITORING</b>	All home owners to belong to	<ul style="list-style-type: none"> <li>Establish a Home owners association and develop an Estate management plan</li> </ul>	All home owners to subscribe to Home owners Association	Home owners Association	Estate Management Plan
<b>POLLUTION</b>	Prevention of pollution	<ul style="list-style-type: none"> <li>Spillages of any potentially toxic materials, whether by accident or through negligence, must be scooped up immediately into waste bags and disposed of at an appropriate disposal site.</li> </ul>	Inspection and regular clean up.	Home owners association	
	Prevention of groundwater pollution	<ul style="list-style-type: none"> <li>Sewerage lines need to be maintained</li> </ul>	Regular inspections of sewerage lines.	Home owners association ER MAWF	

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	Information dissemination to workers	<ul style="list-style-type: none"> <li>Awareness campaigns.</li> </ul>	Information sessions.	ER ECO	Awareness materials
<b>WASTE</b>	Effective waste management	<ul style="list-style-type: none"> <li>Integrated waste.</li> <li>Management plan to be developed for Residential Estate that addresses recycling, re-use and reduction of waste.</li> <li>Organic waste should be used for composting.</li> </ul>	<p>Regular inspection.</p> <p>Integrated waste management plan as part of Homeowners Guidelines and rules.</p> <p>Formal agreement on amount of waste to be disposed of.</p>	Home owners association CoW	Waste Management Plan
		<ul style="list-style-type: none"> <li>Any hazardous waste should be disposed of immediately at the Kupferberg site.</li> </ul>	Inspection and regular clean up.	Home owners association ECO	
		<ul style="list-style-type: none"> <li>All sewage to be collected at the pump</li> </ul>	Inspection daily.	Home owners association	

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		<p>station.</p> <ul style="list-style-type: none"> <li>All sewerage lines to be inspected for leakage to be cleaned-up.</li> </ul>		ECO	
<b>EROSION</b>	Prevention of erosion	<ul style="list-style-type: none"> <li>Special care need to be taken in areas with steep slopes.</li> <li>Minimise large impermeable areas.</li> <li>Reno mattresses or gabions should be used to stabilise soil in steep areas.</li> <li>Adequate, Innovative site drainage.</li> <li>Indigenous vegetation of all species should be left intact as far as possible.</li> </ul>	<p>Regular inspection for signs of erosion.</p> <p>Precautionary measures to be taken.</p> <p>Permits required removing any trees.</p>	<p>ER</p> <p>ECO</p> <p>Home owners association</p>	

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		<ul style="list-style-type: none"> <li>Pebble mulch layer left intact</li> </ul>			
<b>TRACKS AND ROADS</b>	Disturbance to habitats	<ul style="list-style-type: none"> <li>Do not drive off existing tracks care must be taken to avoid damage to existing vegetation especially shrubs and trees.</li> <li>No new access roads will be allowed.</li> <li>Speed limit of 40 km/hour to be enforced.</li> </ul>	Inspection daily.	Home owners association	
<b>WATER SUPPLY AND DEMAND</b>	Promote wise use of water resources	<ul style="list-style-type: none"> <li>Monitoring individual water use and act where necessary.</li> </ul>	Keep record of water use.	Home owners association CoW	
		<ul style="list-style-type: none"> <li>Promote wise use of water resources.</li> </ul>			

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		<ul style="list-style-type: none"> <li>Use of water-saving devices in toilets and low-flow showerheads or similar devices.</li> </ul>			
		<ul style="list-style-type: none"> <li>Water wise gardening.</li> <li>Use recycled grey water to decrease demand</li> </ul>	Water wise gardening design.	Landscape designer Home owners association	
<b>ENERGY CONSUMPTION</b>	Energy efficient	<ul style="list-style-type: none"> <li>Use renewable energy sources.</li> <li>Awareness campaigns on energy efficiency.</li> </ul>	Develop Energy Management plan as part of Homeowners guidelines and rules that addresses the reduction of energy use.	Home owners association ECO Engineers Architect	
<b>VEGETATION</b>	Preservation of indigenous vegetation	<ul style="list-style-type: none"> <li>No tree felling, wood gathering, burning, harvesting, or damaging to any plant species.</li> </ul>	Regular inspection. Remove any alien vegetation immediately.	Home owners association ECO	

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	Conservation of biodiversity	<ul style="list-style-type: none"> <li>No development should be allowed within the main drainage line area.</li> <li>Conserve all indigenous species</li> </ul>	<p>Integrated Conservation Management plan as part of Homeowners Guidelines and Rules.</p> <p>Develop a policy regarding the keeping of pets.</p>	Home owners association ECO	
<b>BIODIVERSITY</b>	Preservation of biodiversity	<ul style="list-style-type: none"> <li>No hunting, trapping, setting of snares or any other disturbance of any fauna species.</li> <li>Bird species should be conserved by identifying nesting areas and important habitats – development to be restricted there. Limit recreation activities at important bird areas.</li> <li>Restriction on numbers of pets – very important</li> </ul>	<p>Inspections daily.</p> <p>Incorporated into management plan.</p> <p>Provision of literature to increase awareness to staff and guests.</p> <p>Regular inspections.</p> <p>Provision of literature to increase awareness to staff and guests.</p>	Home owners association ECO	

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		<p>for biodiversity.</p> <ul style="list-style-type: none"> <li>Fence should allow for movement of smaller mammals.</li> </ul>			
<b>VISUAL IMPACTS</b>	Minimise degradation of landscape qualities	<ul style="list-style-type: none"> <li>Building and Design guidelines and rules – name examples of what it should contain e.g. washing lines, colours of buildings, type of building materials etc.</li> </ul>	Home owners" guidelines and rules.	Home owners association	
<b>SOCIO ECONOMIC ISSUES</b>	Minimise visual impact	<ul style="list-style-type: none"> <li>Sustainable architecture and design.</li> <li>Preserve skyline.</li> <li>Avoid high bulk residential development.</li> <li>Avoid monotonous designs and rather</li> </ul>	Each Developer to have a set of design and building guidelines and individual erf owners to stick to the guidelines	Home Owners Association	

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		<p>follow the contours of the surrounding landscape, thus creating a visual flow.</p> <ul style="list-style-type: none"> <li>• Avoid the use of highly reflective glass.</li> </ul>			
	Create recreational areas	<ul style="list-style-type: none"> <li>• Reserve open space and green corridors</li> <li>• Maintain hiking and cycling paths along green corridors</li> </ul>	Home owners association to adopt open spaces and green corridors	CoW Planning, Urbanisation & Environment division  Home owners Association	

## 5 ENVIRONMENTAL MONITORING (OPERATION PHASE)

ISSUE TO BE MONITORED	WHAT NEEDS TO BE MONITORED	MONITORING FREQUENCY	BY WHO
<b>Water sustainability.</b>	Water demand	Once in three months	CoW Planning, Urbanisation & Environment division NamWater
<b>Sewerage system.</b>	Sewerage lines and pump station for leakages.	Once a month.	CoW Planning, Urbanisation & Environment division Home Owners Association
<b>Erosion/Siltation.</b>	Monitor soil erosion rates Slope stability in steeper areas. Siltation of drainage lines.	Once in three months.	Home Owners Association
<b>Indigenous trees.</b>	Any damage to trees.	Regularly.	Home Owners Association
<b>Alien invasives.</b>	Recording of different species. Removal of unwanted species.	Once every three months.	Home Owners Association

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ISSUE TO BE MONITORED	WHAT NEEDS TO BE MONITORED	MONITORING FREQUENCY	BY WHO
<b>Implementation mitigation plan.</b>	<b>of</b> Ensure compliance with the mitigation plan. Apply corrective measures immediately where required.	Once every three months.	Home Owners Association

## 6 REFERENCES

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**IDC., 2007.** *Kappsfarm Draft Town Planning Amendment Scheme no.1. Prepared for Khomas Regional Council. Windhoek.*

**Lochner, P. 2005.** *Guideline for Environmental Management Plans. CSIR Report No ENV-S-C 2005-053 H. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town*

Model ESMP for Landscaping works:  
<http://www.environment.nsw.gov.au/resources/sustainbus/emp.pdf>

## APPENDICES

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## **APPENDIX A: RECOMMENDATIONS FOR BUILDING AND DESIGN GUIDELINES**

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### **1. INTRODUCTION**

In order to develop a unique cohesive character for the Klein Windhoek Extension 4 Residential development and to respond in an appropriate way to the sensitive environment it is important that a set of building and design guidelines be developed.

The Developer should develop these guidelines based on their understanding of the site's topographical, visual, ecological, geohydrological and other sensitivities. Natural resources should be incorporated into the design and the layout of the structures. Engineering solutions should be ecologically-minded.

These guidelines need to be thoroughly reviewed by the developer (City of Windhoek) and the Home Owners' Association to familiarize themselves with the guidelines and principles provided below. The principles should be integrated into the entire design concept, and standards and specifications should be set for each property. All new owners of properties will need to submit their designs to the developer and Home Owners' Association. Designs that do not adhere to the requirements prescribed in the EMP and the *Recommendations for Building and Design Guidelines* should not be allowed.

### **2. PRINCIPLES FOR PLANNING AND DESIGN**

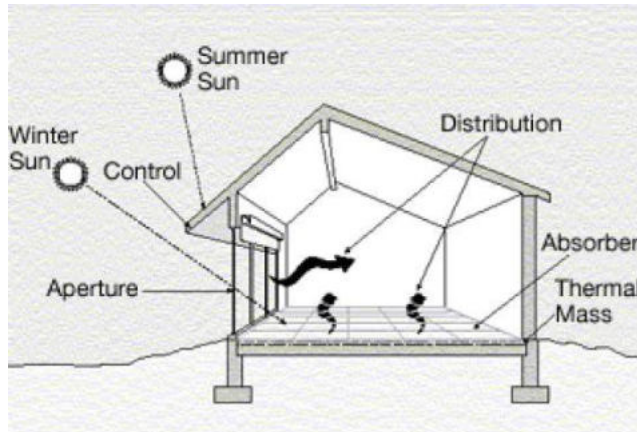
In order to realise sustainable development it is important to consider sustainable architecture. Sustainable architecture seeks to minimize the negative environmental impact of buildings by enhancing efficiency and control in the use of materials, energy, and development space. An eco-friendly space requires planning as much as commitment towards a better future.

Sustainable architecture is based on the following principles:

#### Energy efficiency

The green house/building has reduced dependence on electricity for its basic needs. Passive solar design uses the natural movement of heat and air to maximize solar heat gain in the winter and to minimize it in the summer.





Although design principles vary by climate and location, the basic strategies remain the same and should include the following:

- Window selection*
- Site orientation*
- Overhangs and awnings*
- Natural cooling*

The design allows for passive and active cooling, the maximum use of daylight and reduced need for energy-consuming building systems.

Houses on ridgeline need to limit number of south facing windows since these are highly reflective. One way glass should not be allowed.

Landscaping should also be used as an option for optimizing solar heat gain and shading.

#### Water Efficiency

Need to reduce the demand on potable water resources by using water conserving appliances including toilets, shower, taps, washing machines and dish washers. Reduce surface water runoff and landscape with indigenous plants to retain the natural features of the site as far as possible. Trees and shrubs that form part of the landscaping should only be of the approved species as included in Appendix B.

The use of impermeable paving and design paving should be minimised to compliment the design and the surrounds and to minimise run-off.

Water recycling systems for grey water should be considered.

Swimming pools need to make use of a recycling system in order to reduce demand due to high evaporation rates

Construct swimming pools that are more about building with nature and blending into the natural landscape and use alternative filtering systems instead of harmful chemicals.

#### Indoor air quality

The physical well-being of the occupants is the primary concern of this principle. Its area of concern is the general atmosphere within a house/building. Hazardous building materials are also avoided by this principle.

### Green materials

Sustainable architecture also considers the use of material that will not waste energy in its production, transport and use in construction.

Green materials also involve the use of nontoxic and renewable materials so that natural resources are not depleted.

### Green building systems

This includes the various active design considerations that seek to monitor and reduce power consumption, water use, temperature, air quality, etc.

Examples of green building systems are photovoltaic cells, solar water heaters, low-flush water closets and fixtures and water recycling systems.

### Good design

Good design, is designing buildings which have an influence on energy usage, repair and maintenance, and inevitably, on the property's value. Good design should also complement the natural environment and demonstrate the understanding of the site's topographical, visual, ecological, geohydrological and other sensitivities.

The lay out should follow the contours of the site and structures broken up into smaller elements, to go along the contours of the site and to avoid large paved and retained areas. Due to the steepness of this area retaining structures would be necessary but due to its high visibility, should be limited and finished naturally.

The building envelope should be shaped by the character of the development, i.e. nature estate, but should at least include the following:

- Only one dwelling will be permitted per site.
- The maximum coverage (footprint) of an erf should be 50%
- The property may not be less than 4 times the CoW's valuation of the land.

Extraordinary building lines should be adhered to where applicable. The architect is free to specify further building line restrictions to achieve privacy, sense of place, visual quality or other objectives. In order to claim the proposed development as being sustainable it is important to incorporate sustainable architecture as part of the development guidelines for this development.

### 3. INFRASTRUCTURE DEVELOPMENT GUIDELINES

#### 3.1. Roads

##### Environmental objectives

- A traffic study to assess the increased traffic impact on Metje, Anna and Gever streets and to determine an appropriate road pavement design.
- Speed reduction measures to control traffic speed and to allow for the movement of animals across the road.
- Alignment design measures to limit light pollution and noise pollution by vehicles.

##### Appropriate technologies

Appropriate technologies to improve the environmental profile consist of:

- Upgrading of the access roads to surfaced arterial standards with width limitations and speed reduction measures (e.g. speed humps) to control traffic speed.
- Construction of internal roads with width limitations and speed reduction measures such as sharp curves to reduce speed and align light pollution away from individual housing units.
- The alignment of the internal roads should also follow the terrain to reduce vertical curvature and therefore noise pollution by vehicles.
- Conspicuous warning signs to alert drivers or road users of the movement of animals across the road and at bridges.

#### 3.2. Water

##### Environmental objectives

- Water source and treatment optimisation.
- Infrastructure design optimisation.
- Infrastructure visibility mitigation.

##### Appropriate technologies

Appropriate technologies to improve the environmental profile consist of:

- The storage facility should be positioned to provide long term pressure and flow without boosting requirements.
- The storage facility can be recessed into the surrounding environment and re-surfaced with the excavated material and stockpiled topsoil.

- Avoid dead end situations in the supply system by using ring-feeder design principles.
- Each ring feed could also provide for automatic draining system if water is not used in the ring for a period that may be detrimental to the water health requirements. The drained water can be used of irrigation purposes.
- No waterlines or other related facilities should be positioned below the groundwater table to avoid intrusion of untreated water into the system.
- Adequate fire protection capacity is essential for the system.

### 3.3. Sewer

#### Environmental objectives

- Pollution prevention focused sewer infrastructure.
- High priority emergency management system for pollution incidences.
- High cycle preventative maintenance management system.
- Environmentally appropriate effluent management system.
- Storm water channels to be accommodated along internal road network as open channels lined with natural rock to ensure optimal water infiltration.

#### Appropriate technologies

- Appropriate technologies to improve the environmental profile consist of:
- All containment facilities such as manholes and pump stations should have a continuous casted concrete outer shell and poly-utherane inner lining to negate any possible seepage into the groundwater due to the operational wear of the facility.
- All pump stations should be dual chamber systems with dual pump systems and facilities for an external auxiliary pump that can be connected during emergencies.
- Design and install pre-determined connection points to the sewer system to assure the building contractors use standardised connections that are tested to be leak proof.
- Mark the connection points with clearly visible markers to avoid confusion and accidental incorrect connections.
- Assure that all internal lines and connections made are tested for leaks according to SABS methods before the water connection to the dwelling is allowed and certified.
- Put an accidental spill recording and management system in place as **a high priority emergency system** that will require immediate attention from the management body of the Klein Windhoek Extension 4 development.

- The accidental spill recording and management system must be executed by a technical maintenance team that is trained and skilled in toxic spill management.
- The sewer conveyance system must be inspected on a daily-section system that will allow for a full inspection of the system on a weekly basis. The objective is to do preventative maintenance on an immediate basis to prevent the occurrence of accidental spills. The inspection should include visual and operational inspections of the:
  - Conveyance and containment systems.
  - Mechanical components.
  - Electrical components.

### 3.4. Solid Waste

#### Environmental objectives

- Effective environmentally sensitive solid waste management system.
- Effective waste recycling management system.
- Off-site storage of waste during construction

#### Appropriate technologies

- Waste containers at dwellings must be closed and lockable to keep out game and especially baboons. If baboons have access to possible food sources in the waste containers it may lead conflict.
- Encourage home owners to separate waste that can be recycled and to be collected by Rent a Drum and transported to recycling facilities.
- Encourage home owners to separate plant material and garden refuse.
- Investigate the capacity of the landfill at Kupferberg for the ability to accommodate the increased solid waste load (construction and operational) as well as the ability to accommodate hazardous waste (construction phase).

### 3.5. Electricity

#### Environmental objectives

- Subsurface bulk and distribution system with low visual impact.
- Design limitations on public and private light emission.

#### Appropriate technologies

- Use sub-surface lines on both the bulk supply line and the distribution lines to minimise the visual impact and also the threat to large birds.
- Street lighting must only be used as guides on the road route. The lights must be covered as to provide focused light at ground level and to limit diffused light pollution. The light strength must be of low intensity.

## APPENDIX B: RECOMMENDED PLANT LIST

TREES	
SCIENTIFIC NAME	COMMON NAME
<b>Acacia Karoo</b>	Sweet thorn/Soetdoring
<b>Acacia erioloba</b>	Camel Thorn/Kameeldoring
<b>Acacia erubescens</b>	Yellow-bark Acacia/Withaak
<b>Acacia hereroensis</b>	Mountain Thorn/Berg doring
<b>Acacia sieberana</b>	Paper bark Acacia
<b>Albizia anthelmintica</b>	Worm cure albizia/
<b>Boscia albitrunca</b>	Shepherd's tree/Witgat
<b>Combretum erythrophyllum</b>	Bush willow/Rivier vaderlands wilg
<b>Dombeya rotundifolia</b>	Wild pear/Wilde peer
<b>Kirkia acuminata</b>	White seringa/Wit sering
<b>Mundulea sericea</b>	Cork Bush/Kurkbos
<b>Olea europeae</b>	Olive/Olien
<b>Ozoroa crassinervia</b>	Namibian Resin tree/ Namibiese harpuisboom
<b>Ozoroa paniculosa</b>	Common Resin bush/ Harpuisboom
<b>Pappea capensis</b>	Jacket plum/Doppruim
<b>Peltophorum africanum</b>	Weeping wattle/Huilboom
<b>Searsia lancea</b>	Karee
<b>Searsia marlothii</b>	Bitter Karee

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<b>Searsia pendulina = veminalis</b>	White karee/Wit karee
<b>Ziziphus mucronata</b>	Buffalo Thorn/Blinkblaarwag-n-bietjie
<b>SHRUBS</b>	
<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>
<b>Barleria spp.</b>	Bush violet/Bosviooltjie
<b>Bauhinia galpinii</b>	Pride of the Cape
<b>Carissa macrocarpa</b>	Big Num Num
<b>Croton gratissimus</b>	Lavender Feverberry
<b>Cyphostemma currori</b>	Kobas
<b>Dichrostachys cinerea</b>	Kalahari Christmas Tree
<b>Ehretia alba</b>	Puzzle bush/Deurmekaar bos
<b>Gardenia volkensii</b>	Savanna gardenia /bosveld katjiepiering
<b>Grewia flava</b>	Raisin bush
<b>Leonotis leonurus</b>	Wild dagga
<b>Polygala virgata</b>	Purple broom bush
<b>Sutherlandia frutescens</b>	Cancer bush
<b>Tarchonanthus camphoratus</b>	Camphor bush
<b>Rhigozum obovatum</b>	Yellow pomegranate
<b>HERBACEOUS PERENNIALS</b>	
<b>All indigenous Aloe species</b>	
<b>Bulbine capitata</b>	Scented grass bulbine