# DINOKENG PROJECT:
# DEPARTMENT OF ECONOMIC DEVELOPMENT

# ENVIRONMENTAL MANAGEMENT FRAMEWORK AND ENVIRONMENTAL MANAGEMENT PLAN FOR THE DINOKENG PROJECT AREA

DESIRED STATE REPORT

Second Draft

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DESIRED STATE REPORT


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**ABBREVIATIONS**

| | |
|---|---|
| **Blue IQ** | Blue IQ Projects (an entity within the Gauteng Department of Finance and Economic Affairs) |
| **CARA** | Conservation of Agricultural Resources Act (Act 43 of 1983) |
| **CITES** | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| **COT** | City of Tshwane |
| **C-Plan** | Gauteng Conservation Plan |
| **DED** | Department of Economic Development |
| **DFA** | Development Facilitation Act (Act 67 of 1995) |
| **DGR** | Dinokeng Game Reserve |
| **DITDF** | Dinokeng Integrated Tourism Development Framework |
| **DPA** | Dinokeng Project Area |
| **DWAF** | Department of Water Affairs and Forestry |
| **EIA** | Environmental Impact Assessment |
| **EMF** | Environmental Management Framework |
| **GDACE** | Gauteng Department of Agriculture, Conservation and Environment |
| **GIS** | Geographic Information System |
| **GPG** | Gauteng Provincial Government |
| **GSDF** | Gauteng Spatial Development Framework |
| **I&AP** | Interested and Affected Parties |
| **IDP** | Integrated Development Plan |
| **LSU** | Large Stock Unit |
| **MPRDA** | Mineral and Petroleum Resources Development Act (Act 28 of 2002) |
| **NEMA** | National Environmental Management Act (Act 107 of 1998) |
| **NEMBA** | National Environmental Management: Biodiversity Act (Act 10 of 2004) |
| **NEMPAA** | National Environmental Management: Protected Areas Act (Act 57 of 2003) |
| **NHRA** | National Heritage Resources Act (Act No 25 of 1999) |
| **NSBA** | National Biodiversity Spatial Assessment |
| **NWA** | National Water Act (Act 36 of 1998) |
| **RDP** | Reconstruction and Development Programme |
| **SANBI** | South African National Biodiversity Institute |
| **SANDF** | South African National Defence Force |
| **SDF** | Spatial Development Framework |
| **SEMP** | Strategic Environmental Management Plan |
| **SSI** | Stewart Scott International Engineers and Environmental Consultants |

# 1 INTRODUCTION

## 1.1 Project context

SSI Engineers and Environmental Consultants (trading as Bohlweki – SSI Environmental) was appointed by the Gauteng Department of Finance and Economic Affairs (Blue IQ Projects) to develop an Environmental Management Framework (EMF) and Strategic Environmental Management Plan (SEMP) for the Dinokeng project area (hereafter referred to as 'the Dinokeng Project Area' or DPA).

The area is situated beyond the provincial urban edge to the north-east of the City of Tshwane yet an increasing number of development applications have been received by the regulatory authorities. Due to the increasing development pressure within this area, it was evident that the Dinokeng Project and the Gauteng Department of Agriculture, Conservation and Environment (GDACE) need to develop a strategic environmental plan for the area to ensure that development does not compromise the environmental features and resources of the area. It was consequently decided that an Environmental Management Framework would be compiled, in order to satisfy this requirement for strategic spatial management guidance.

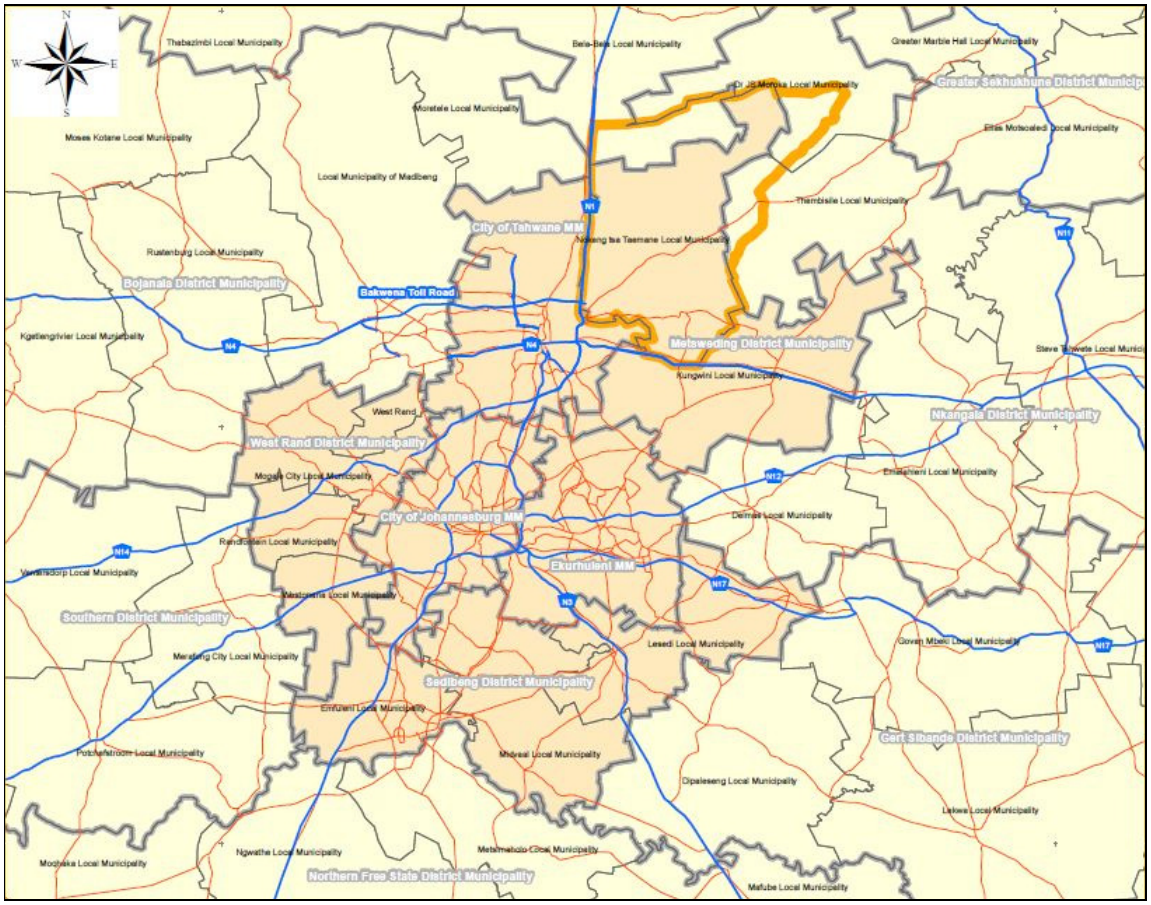


**Figure 1: Provincial context of the Dinokeng Project**

As such, an EMF is a framework of spatially represented information, connected to parameters such as ecology, hydrology, infrastructure and services. The main purpose of an

EMF is to pro-actively identify areas of potential conflict between development proposals and critical/sensitive environments.

Therefore, the purpose of this EMF is to provide a framework which will inform the Integrated Development Planning (IDP) process and Spatial Development Frameworks (SDF) within Dinokeng, as well as to provide a framework for decision making through:

- Providing definite criteria for decision making,
- Providing an objective environmental sensitivity overview,
- Defining and categorisation of environmental, social and heritage resources, economic and institutional aspects, and
- Formulation of management guidelines.

During November 2008, the Status Quo phase of the project was concluded with the first round of public participation. Feedback that was received was incorporated into the Status Quo Report, and informed the commencement of the desired state phase. The information generated during the desired state is intended to inform a management strategy and final environmental management framework.

## 1.2 Project Phasing

The basic approach in this project is the use of multi-disciplinary expertise to perform various specialised elements of the work scope, with a core group of strategic environmental planners responsible for the integration of the various contributions. The different project components are developed as follows:

*Status Quo*

Various subject-specific specialists are responsible for the gathering and assessment of information pertaining to the current status of the environment, infrastructure and development activities, as well as legal, policy and economic aspects. The primary reporting output is the Status Quo Report. At the same time, a Geographic Information Systems (GIS) team is responsible for a GIS interface that holds all the relevant information in a repository that can be constantly updated throughout the project, the collation and manipulation of which provides the required data for the intermediate and final project outputs.

*Public Participation (phase 1)*

The Desired State phase is preceded by Public Participation, where comments on the Status Quo report and input into the Desired State information are collected. It takes the form of a Public Open Day as well as focussed sessions with different role-players and focus groups (such as landowners; eco-tourism operators; conservancies; etc).

*Desired State*

Environmental management specialists are responsible for the assessment and integration of information into intermediate elements (feature descriptions, feature status, feature objectives, etc.) that feed into the GIS system and ultimately a Desired State Report.

*Draft EMF & SEMP*

The Desired State information feeds into the final Environmental Management Framework via the compilation of a Strategic Environmental Management Plan.

*Public Participation (phase 2)*

A second and final round of Public Participation ensures that the public and all stakeholders are provided with the opportunity to comment on the Draft Environmental Management Plan and EMF report. Again, this takes the form of a Public Open Day.

*Final EMF*

The results of the second round of public participation are used to verify and update the EMF report which can then be submitted to the National Minister for Environmental Affairs and Tourism for concurrence prior to official adoption by the Member of the Executive Council (MEC) for Environment in Gauteng.

# 2 STATUS QUO FINDINGS

This Status Quo report outlined the current situation within the Dinokeng Project Area, both in terms of a literature review and the various specialist analyses that were conducted. The status quo report has highlighted a number of key issues within the Dinokeng Project Area.

## 2.1 Legal review

The environmental legal review identified useful legal instruments and measures which may assist the Dinokeng Project in achieving the objectives of the EMF and facilitating sustainable development of the Dinokeng area. The current environmental legal framework provides various legal means to the Dinokeng Project Team to address risks to the sustainable development of the Dinokeng Project Area. However, in the context of the Dinokeng Project and EMF, the importance of co-operative governance is stressed as being essential to achieving the overall vision and objectives of the Dinokeng Project.

### *2.1.1 Legal origin and nature of the EMF*

It is the opinion of the consultants that an EMF is not a binding document *vis-a-vis* third parties *per se*. An applicant and/or an assessment practitioner and competent authority assessing an application for environmental authorisation does, however, have the obligation to take a relevant EMF into account in accordance with the National Environmental Management Act (NEMA) Section 24(4)(b)(vi) and Chapter 8 of the Environmental Impact Assessment (EIA) Regulations (Regulations published from time to time under Section 24(5) of NEMA).

If the Dinokeng Project Team requires a more formal and binding management instrument to manage development activities in the Dinokeng Project Area, the EMF may be used to identify the area in terms of section 24(2)(b) and (c) of NEMA. These sections state that the Minister, and every MEC with the concurrence of the Minister, may identify geographical areas based on environmental attributes in which specified activities may not commence without environmental authorisation from the competent authority, and geographical areas based on environmental attributes in which specified activities may be excluded from authorisation by the competent authority.

### *2.1.2 Environmental Impact Assessments*

The EMF, once adopted by the provincial MEC and national Minister tasked with Environmental Affairs, will have to be taken into consideration in environmental impact assessments in or affecting the geographical area to which the framework applies. It terms of Chapter 3 of the EIA Regulations the applicant (and more specifically the Environmental Assessment Practitioner) have to give notice in writing of the proposed application to any organ of state which has jurisdiction in respect of any aspect of the proposed activity, which could in this case include the Dinokeng Project. However, the Dinokeng management authority should liaise with other relevant authorities to ensure that it is notified of any new EIA applications in or close to the Dinokeng area. It is important for the Dinokeng Project to be listed as an Interested and Affected Party (I&AP) in the context of EIA in the Dinokeng area.

The legislation also provides the possibility for the Dinokeng Project to appeal a record of decision which it believes will impact negatively on the sustainable development of the Dinokeng area and Dinokeng Project.

The Development Facilitation Act, Act No.67 of 1995 (DFA) also provides the possibility for the Dinokeng Project to request an investigation in terms of activities which are believed to have been performed contrary to the procedures prescribed in the Act.

### *2.1.3 Roles and responsibilities of the relevant authorities in the context of the EMF and the Dinokeng Area*

The following intergovernmental forums could be used and/or established to assist the Dinokeng Project to facilitate the achievement of the objectives of the EMF and the Dinokeng Project:

- the Gauteng Premier's Intergovernmental Forum,
- the relevant District Intergovernmental Forum,
- a provincial intergovernmental forum,
- a interprovincial forum,
- an intermunicipal forum, and
- an intergovernmental support structure

It could also be an option for the Dinokeng Project to liaise with the relevant authorities to stimulate the establishment of an 'implementation protocol' for the Dinokeng Project and/or Dinokeng Project Area.

### *2.1.4 Biodiversity management*

The following mechanisms/ instruments found in the National Environmental Management: Biodiversity Act (NEM:BA)(Act 10 of 2004) could efficiently assist the Dinokeng Project Team to achieve the objectives of the Dinokeng Project:

- Declaration of the Dinokeng area as a Bioregion

- Development of Biodiversity plan for the Dinokeng area
- Implementation of a Biodiversity Agreement for the Dinokeng area

### *2.1.5 Protected areas management*

The declaration of a nature reserve and/or the declaration of a protected environment under the National Environmental Management: Protected Areas Act (NEM:PAA)(Act 57 of 2003) could be the most suitable to protect the Dinokeng area and achieve the objectives of the Dinokeng project. It is also suggested that the Dinokeng Project should assess the most suitable entity to manage the protected areas in the Dinokeng area. The Dinokeng Project could take this responsibility or the implementation of a co-management agreement could also be an efficient approach.

### *2.1.6 Management of heritage resources*

A nomination of places in the Dinokeng area would be necessary for such sites to be declared a national or provincial heritage sites under the National Heritage Resources Act (NHRA)(Act No 25 of 1999). The NHRA provides for effective general protection of monuments, burial grounds and graves which should assist the realisation of the objectives of the Dinokeng project.

### *2.1.7 Water management*

The National Water Act (NWA)(Act 36 of 1998) prescribes tools (e.g. water use licence), measures, and principles which should assist the Dinokeng Project in protecting water resources in the Dinokeng area.

### *2.1.8 Management of mining activities*

The current mining legislation, including the National Mineral and Petroleum Resources Development Act (MPRDA)(Act 28 of 2002) does not provide adequate legal means (especially for the Dinokeng Project) to alter mining activities which have been duly authorised by the relevant authority, in the Dinokeng area. Only a few environmental statutes (NEMA, NEM:PAA, NHRA) provide for restricted possibilities to expropriate these mining properties or rights, however, only the MPRDA and the NEM:PAA allows for the cancellation of minerals rights. Some of the legislation provides legal mechanisms for the management of environmental impacts from mining activities (e.g. rehabilitation and remediation obligation, development of environmental management programmes and plans, financial securities), and for the full life cycle of the activities. However, such mechanisms cannot be directly used by the Dinokeng Project itself as there are usually defined mandates allocated to responsible parties. It is suggested that the Dinokeng Project should liaise with the relevant authorities to improve collaboration in terms of the management of mining activities in the Dinokeng area.

NEMA, NEM:PAA, NEM:BA and NHRA do provide various legal instruments which could assist in the regulation of *new* mining activities in the Dinokeng area. The NEM:PAA provides for the control and limitation of activities in protected areas according to the type of protected area. Therefore, the Dinokeng Project Team could use one of the instruments to enable the control and limitation of mining activities in the Dinokeng area. The NHRA and NEM:BA also provide for similar provisions in terms of heritage resources and biodiversity management, which could also be used by the Management Authority to limit mining developments in the area.

Currently the EIA regulations (GNR 386 and 387) in terms of NEMA are not yet applicable to mining activities. There is consequently no statutory obligation *per se* to take into consideration the EMF in the application process for mining activities. However, the Dinokeng Project should review and comment on the environmental management plans and programmes of proposed mining developments in or around the Dinokeng area.

It should be noted though that the EIA regulations are being revised, and the proposed 2009 amendments to the NEMA EIA regulations propose to include mining activities in the spectrum of EIA in terms of NEMA, which will directly result in the obligation to consider the EMF in EIAs related to mining activities. Such amendment will advance the objectives of the Dinokeng Project.

### *2.1.9 Land Claims*

Various properties in the study area are subject to land claims in various stages of resolution. Some of the claims are located in the proposed Dinokeng Game Reserve (DGR) area. Case history suggests that these claims can still take quite some time to come to final decision and settlement. An immediate response or accommodation of the claims is therefore impossible. The cases need to be resolved in accordance with all due processes, but the opportunity does exist to have the final negotiated settlements take into consideration the socio-economic context and development trajectory envisaged for the Dinokeng Project.

## 2.2 Spatial planning and land-use

Spatial planning and land-use in Dinokeng is characterised by a lack of shared understanding and co-operation between the Nokeng tsa Taemane Local Municipality and the Dinokeng Project who are responsible for development and management of the area. This is demonstrated through the conflicting development frameworks governing parts of the Dinokeng study area, as well as the differing standards for subdivisions within the various development frameworks.

Threats to the Dinokeng vision come from illegal land uses on farm portions and the shortage of institutional capacity at the municipal level to address illegal land uses.

Mining activities within the area have had a large impact on the ecological condition and subsequent 'sense of place' of the region. The location of sand mining and quarrying activities impacts on ecological processes and sensitive environments (such as wetlands) and has resulted in the subsequent destruction of some of these habitats. The mineral resource base of the area creates conflicting ambitions for the area as the expansion of mining areas and activities is likely to impact the existing and future environmental condition. Ultimately, if these environmental impacts are not properly managed they will impact on the tourism potential of Dinokeng.

The proposed Moloto Rail Corridor will improve accessibility to the area by rail. However, the effectiveness of this will greatly increase if an additional railway station is developed in the Dinokeng area.

The region is experiencing high levels of urbanisation and the spread of urban areas to the rural periphery has impacted on the land available for conservation and tourism. Accompanying this increased urbanisation has been the growth and spread of informal settlements and illegal land invasions within the project area.

The development of the Dinokeng area as a tourism destination has been highlighted as the most economically, socially and environmental beneficial land use of the area. Existing plans include the expansion of tourism routes to connect nodes in settlements with high levels of poverty and unemployment.

## 2.3 Socio-economic state

Most of Dinokeng falls in Nokeng tsa Taemane Local Municipality. This municipality shows a more urban socio-demographic profile, similar to that of its neighbouring metropolitan municipality, the City of Tshwane (CoT), which is not reflected in the land use profile. This may be ascribed to the profile of people who migrate to these areas. As part of Metsweding District Municipality, this municipality together with Kungwini Local Municipality showed the highest percentage of in-migration as a percentage of the total population. The municipality is fast developing where it borders the CoT, and along the main road to Cullinan. Migration can be ascribed to people who want to escape city life, and to people who come from rural areas in search for jobs.

Lifestyle estate developments seem to be mainly driven by a need of people to escape from crime, as well as busy city life. These developments may however actually contribute to crime, as they showcase the contrast between the 'haves' and the 'have nots', which is a natural driver of criminal activities.

Addressing backlogs in basic service delivery is a challenge for all the municipalities in the area. Rural areas and informal settlements contribute to these backlogs.

The continued expansion and realisation of the Dinokeng project is likely to have positive impacts on the status quo of residents living in this area. With a vision that prioritises strategic economic infrastructure, the development of tourism offerings, public-private partnerships, community involvement, SMME development and skills programmes, the Dinokeng Project is a major facilitator to economic growth and better livelihoods for residents in the project area. However, the Dinokeng Project cannot deliver economic growth and prosperity on its own; neither is tourism alone the answer to socio-economic freedom. The Dinokeng Project's mandate is limited to tourism development (through investment in strategic tourism infrastructure), and not delivering such things as housing, education, water, sanitation or electricity. Local government structures need to play their part here and ensure that they fulfil their own mandate and functions in order to complement the Dinokeng Project's efforts and thereby assist in an integrated and sustainable development for the area as a whole.

## 2.4 Cultural-historic heritage

The cultural heritage of Dinokeng is a non-renewable resource. Cultural heritage resources are nationally important and should be protected and conserved as far as possible. Considerable degradation of especially living heritage resources however takes place during various forms of development, largely due to ignorance or inadequate documentation.

The area is considered to have a high tourism potential comprising natural, cultural and historical resources. The attractiveness of the area is that it contains a rich natural and cultural diversity attached to the Magaliesberg and rocky outcrops in the study area. Dinokeng's cultural and historical heritage includes Iron and Stone Age sites, relics of colonial diamond mining activities and Anglo-Boer War and World War II sites, as well as its history of black oppression and forced removal. Pro-active utilisation and development of the

Dinokeng cultural heritage resources will to a large extent depend on how resources are identified, developed and utilised.

## 2.5 Biophysical conditions

The Dinokeng Project Area provides suitable habitat for numerous threatened floral, faunal and invertebrate species. The environmentally sensitive areas/hotspots include Nature Reserves, Conservancies, rivers and drainage lines, riparian buffer zones, wetlands, natural vegetation areas and rocky ridges and hills. It is evident from the various assessments that the study area is representative of a high and intricate biodiversity as a result of the grasslands-bushveld ecotone, which is similarly supported by a diverse physical, geological and mineral landscape, as well as rich cultural/ historical past.

In addition, the habitat supports unusual reptile, mammal and insect species, often restricted to the project area range. Threats to this biodiversity include habitat destruction, fragmentation and degradation due to increased urban development, mining and quarrying, inappropriate intensive agricultural activities and alien plant invasion.

Water quality in and around Roodeplaat has a poor public perception due to publicised cases of algal and hyacinth blooms in the dam which rendered it unacceptable for human use. The outbreaks of these vegetative invasions are triggered by nutrient overloads that enter the reservoir from the Baviaanspoort water treatment works and the various watercourses feeding the dam from the catchment areas situated partly in the City of Tshwane and partly in Kungwini[1]. The blooms result in an increased biomass that has to be decomposed biologically as well as a measure of eutrophication that contributes to the load of dead vegetative and animal matter. This, however, does not imply that the water quality of the dam is beyond redemption, or out of control. The problem has more 'nuisance' value than serious heath and environmental risks, as the decomposing matter leaves a rotting smell, and the floating vegetation clogs machinery.

The two wastewater treatment plants that discharge more or less directly into Roodeplaat are Baviaanspoort and Zeekoeigat. Combined, these supply approximately half of the dam's 40 million $m^3$ capacity. By all accounts, Zeekoeigat is operating at a satisfactory standard with water discharges at acceptable level. Baviaanspoort, however, struggles with inconsistent effluent inflows which reduces the effectiveness of the treatment process and resultant quality of the water discharge.

In addition to the wastewater release, Roodeplaat also receives contaminated water from the Pienaars River, Moreleta/Hartbeest Spruit and Edendale Spruit which collect pollutants from the eastern suburbs of Tshwane, the industrial areas of Sivlerton-Waltloo, the farming areas of Donkerhoek and the poorly serviced townships of Mamelodi. This is due to bad or inadequate urban water catchment management practices. Especially problematic is the failing sanitation infrastructure in Mamelodi that add biological contamination directly to the watercourses. The problem relates to both sewer leaks and poorly designed networks that have too many points of failure (e.g. multiple pumpstations) due to fragmented planning.

[1] DWAF, 2003: Project Report: Phase 1 - Development of a strategy to control eutrophication in South Africa, Directorate of Water Quality Management.

A lack of adequate bulk sewer reticulation networks and fully operational water treatment plants in the Dinokeng area adds to the problem of the eutrophication of surface water resources. In addition, the reliance on septic tank systems and the continued installation of septic tanks in areas not serviced by bulk sewer reticulation can lead to groundwater contamination. Impoundments and dams, along with soil erosion, agricultural and mining activities, chemical and bacterial pollution and urban expansion are all affecting the surface water quality, and in turn the biodiversity of the region.

Wetlands are also specifically threatened in the study area. Typical impacts include degradation and damage due to irresponsible development, erosion due to altered hydrological regimes, sedimentation as a consequence of erosion, replacement of natural and indigenous vegetation, agricultural runoff and extensions, as well as mining activities.

The value of an intact, ecologically functioning natural resource base is generally underestimated. Ecosystems provide benefits to society such as the pollination of crops and natural vegetation, purification of water, flood attenuation and nutrient cycling. In the Dinokeng area, where the bulk of the local economy is directly related to the natural resource base, these services need to be fully appreciated. In particular, nearly all tourism activities or attractions are nature-based, and therefore will benefit from an ecosystem that is attractive, can 'take care of itself', whilst at the same time providing additional ecosystem services to various land uses.

Ecosystem services fall into four categories:

- provisioning services (e.g. water, food, drugs and genetic resources),
- regulating services (e.g. flood attenuation, herbivory, pest control and pollination),
- supporting services (e.g. primary production, nutrient cycling), and
- cultural services (e.g. recreational, spiritual and cultural benefits).

In consideration of the description of the various bio-physical features found in the study area, it can be seen that any future development of the area will be dependent on all four categories of services. Every reduction in the ecosystem services that are provided will imply that the service has to be acquired artificially or imported from outside the area, resulting in an inevitable financial burden.

With the focus on nature-based tourism, and a local economy that is primarily resource based, the area will rely on existing protected areas, as well as the expansion thereof in order to lay a foundation for the provision of ecosystem services. Whilst undeveloped or vacant land parcels contribute to the ecological reserve, there exists a higher likelihood that the ecological state will be managed appropriately within officially protected areas. These areas are more likely to have management plans in place, and as larger contiguous areas can ensure a greater resilience for species and habitats.

# 3 DESIRED STATE

## 3.1 Compilation of the Desired State

The formulation of a desired state report for the Dinokeng Project area relies on stakeholder engagement and thorough information analysis.

### *3.1.1 Public Participation*

Stakeholders were engaged at two Public Open Days and in the form of focussed consultation meetings. These were intended to allow Interested and Affected Parties (I&APs) to:

- Verify that issues and points of concern have been considered by the environmental specialists and technical investigations;
- Raise comments and issues of concern about the Status Quo Report;
- Identify other relevant interested or affected I&APs; and
- Express their views regarding the future socio-economic development and conservation of the natural resources in the Dinokeng area.

### *3.1.2 Information analysis*

The information analysis describes each environmental feature class as identified in the Status Quo report in terms of feature status, management objectives, legal and policy requirements, and development needs. The status of each of the features is determined through legislative requirements, accepted norms and quality standards, as well as through technical and specialist input. The feature objectives, which establish principles of how the features or environmental resources should be managed to improve its environmental status, were however determined during the I&AP consultation sessions.

By comparing the status of the features with their legal requirements and development needs, the type and extent of the required management intervention can be determined. Feature status can then be improved through the establishment of stringent management requirements.

## 3.2 Vision for the Dinokeng Project Area

Dinokeng is a Blue IQ initiative of the Gauteng Provincial Government to establish a premier tourist destination close to the urban centres of Gauteng. The project aims to promote economic growth, job creation and social upliftment through conserving and developing the historical, natural and cultural heritage of the area. It also aims to enable many South Africans to experience tourist attractions and resources for the first time.

## 3.3 Management objectives for identified features

### *3.3.1 Sensitive natural environments*

#### 3.3.1.1 Current state

The study area is representative of a high and intricate biodiversity as a result of the grasslands-bushveld ecotone, which is similarly supported by a diverse physical, geological and mineral landscape. Sensitive environments include proclaimed nature reserves, private nature reserves, conservancies, permanent wetlands, perennial rivers (Elands River and Pienaars River), non-perennial rivers/ streams (Elandspruit, Hartebeestspruit, Premiermynloop, Rooispruit and Krokodilspruit), dams (Roodeplaat, Rust-de-Winter, Mkhombo), seasonal wetlands (pans and drainage lines), primary vegetation, rocky ridges

and hill systems. The majority of threatened faunal species are likely to occur in these habitats.

Areas outside the DPA and conservation areas especially around the southern portions have extensive habitat transformation due to agricultural intensification (mostly maize farming) as well as mining and urbanisation. The majority of sensitive or secretive animal species including mammals, birds, reptiles and amphibians would have disappeared from these transformed agricultural habitats with some species having succeeded to migrate (immigrate) into the remaining natural areas. In most cases population densities are either below or in patches above natural population densities. The conversion of grassland into maize and wheat land has a negative impact on natural grasslands. Seed eating species (granivorous) such as queleas, doves and bishops largely benefit from maize and wheat crops as these supply food in large quantities to them. Many of these species flock in large numbers on fields and indeed become pests. The birds least likely to be affected by this transformation of grassland to agricultural field are the smaller species that are able to persist in small fragmented remnants of undisturbed habitats. Species most likely to show disrupted patterns of distribution are the larger species with larger home ranges (Barnes 1998). Some red data species such as the Blue Crane have been observed to forage and breed on agricultural lands and fields (Barnes 2000).

*Watercourses*

The surface waters from the south-western and western areas are drained primarily north-westwards to eventually flow into the Crocodile River, to flow northwards into the Limpopo River. The surface waters of the south-eastern and eastern areas flow northwards and eastwards to drain into the Olifants River. The Olifants River flows north-eastwards and eventually eastwards through the Kruger National Park and into Mozambique, after which it forms a confluence with the Limpopo River. The Limpopo River flows eastwards, through Mozambique, into the Indian Ocean. The Dinokeng area incorporates the source of these major river systems that have supply water resources that are shared trans-nationally and therefore could be regarded as an important conservation area in terms of surface water resources that needs to be appropriately managed to allow the systems to fulfil their ecological and conservational potential.

The perennial rivers (Elands River and Pienaars River) and non-perennial rivers/ streams (Elandspruit, Hartebeestspruit, Premiermynloop, Rooispruit and Krokodilspruit) must all be considered as sensitive environments. The drainage lines are considered to be of conservation importance for the following reasons:

- The indigenous vegetation of rivers (riparian vegetation) within the old Transvaal Province, and wetlands in general throughout the Grassland Biome, is in danger of being completely replaced by alien invasive species (Henderson and Musil, 1997, Rutherford and Westfall, 1994). Any remaining areas of indigenous riparian vegetation or marshland vegetation within Gauteng must therefore be regarded as sensitive habitats; and

- Drainage lines are longitudinal ecosystems, and their condition at any point is a reflection of not only upstream activities, but also of those within adjacent and upstream parts of the catchment (O'Keefe, 1986). Any impact on the drainage line within the study area is therefore also likely to impact on upstream and downstream areas.

The Dinokeng area has a land use that is dominated by agriculture of varying scales. Historically, emphasis was placed on agriculture (dominated by agronomy) that required a large amount of irrigation. This resource need was historically satisfied by the Department of Water Affairs and Forestry (DWAF), who constructed many concrete canal systems and networks that lead off the rivers and streams to increase the agricultural potential of the region. These canal networks were (and remain) predominantly gravity-fed systems and therefore flow "down hill" toward their assigned outfalls. To facilitate in the correct functioning of these canal networks, numerous impoundment structures needed to be constructed along the rivers and streams to allow for a gain in height difference between the source of the canal and its end point. This has consequently led to a relatively large amount of dam walls and weirs being located along the rivers of the region. Many artificial impoundments therefore exist that have augmented the aquatic habitat, but have also decreased viable riverine habitat. This has had consequential impacts on the aquatic biodiversity within the Dinokeng region as riverine-dependent species are displaced by the transformation of river habitat (running, relatively shallow water) to dam habitat (still-standing and relatively deeper waters). Riverine species are driven upstream in an effort to source suitably habitat and, if habitat of suitable quality and quantity is not sourced, these species will eventually be lost from the system.

The overall status of the Upper Pienaars and Moreleta rivers is 'Poor'. The main contributors to this status are from the highly urbanized and transformed land within the catchment. The small holdings, chicken and dairy farming along with illegal dumping of garden rubble and building rubble are problematic. Roodeplaat Dam has altered the upstream flow and bed conditions and also caused downstream sedimentation. Many indigenous fish species no longer occur due to urbanization and flows from sewage works. The poor water quality has also highly impacted the invertebrates.

The overall EcoStatus for the lower Pienaars River is 'Poor'. This is due to the Klipvoor Dam downstream, and outside of the Dinokeng area, where abstractions for agriculture has altered the natural flow pattern. Additionally, sedimentation is a problem due to overgrazing in the riparian area. Sand mining along the Boekenhoutspruit is also increasing the sedimentation. Alien species (mostly the bluegum and lantana species) are altering the riparian zone habitat, mostly in upper reaches. Sensitive fish species have been lost as a result of urbanization and flows from sewage works, and eels are lost due to dams and obstructions in the rivers. Water quality is very poor and the report calls for urgent intervention. The Ecological Importance and Sensitivity is Moderate as there is still a diversity of species in the river system and degree of protection and refugia still exist.

The only data for the Olifants River system, of which the Elands River is a tributary, is for 2001 (Water Research Commission). The segment of river in the Dinokeng study area is the least impacted of the Elands River and its ecological condition deteriorates downstream of impoundments like the Rust-de-Winter dam. The classification of the Elands River itself is 'Poor to unacceptable', with only the stretch of the river above the Rust-de-Winter dam in a 'Fair' condition. The Rust-de-Winter dam has had a large impact on the condition of the river; flow releases from the dam are often insufficient and even non-existent. This has impacted the natural flow regime of the river and creates undesirable conditions for biological communities.

*Wetlands*

Wetlands are found throughout the study area. The wetlands in the central areas of Dinokeng are however subjected to high silt loads from surrounding agriculture and mining

activities as well as agro-chemicals and chemicals as a consequence of mining activities and processes. These systems have therefore lost a large percentage of their contribution to the conservation of sensitive aquatic biota. Larger impoundments within these areas have also had largely negative ecological impacts on aquatic fauna (especially fish) conservation within the region.

In contrast, the wetlands in the northern Dinokeng region are regarded as being in the better state of ecological integrity due to the low human habitation and dominant land use of the immediate catchment area. There are however a large amount of instream barriers within these areas to facilitate the irrigation infrastructure that has had largely negative ecological impacts on fish conservation within the area due to fragmentation of the aquatic habitat. Several wetlands have been destroyed as well as severely degraded within the DPA mainly through agricultural, mining and urban activities. Artificially created dams have flooded the seasonal wetlands especially the endorheic pans and valley bottoms. Cattle trample sensitive hydrophilic vegetation as well as increase levels of turbidity and nutrients (eutrophication) which results in macrophytes or reed invasion.

The wetlands within the southern areas of the Dinokeng region can be categorised as typical urban-managed rivers and streams that are subjected to increased surface water runoff due to increased development within the area and bacterial and chemical contamination through failing or inadequate sewerage transport and processing systems and further urban runoff. Many of the rivers within the southern areas are highly eroded due to increased flooding extremes due to the increased urbanisation within the immediate catchment, leading to systems that are also highly silted. Poor water quality, poor habitat quality, flooding extremes and inadequate riparian habitat means that the river and stream systems within the southern areas support typically-low aquatic species diversity.

All remaining wetlands (permanent and seasonal) and their associated indigenous grassland and sedge dominated vegetation must be considered as a sensitive habitat. Indigenous marshland vegetation such as that found in the DPA comprises a habitat which is restricted in extent, highly productive and which contains a high diversity of plants and animals, many of which are restricted or heavily dependant on such habitats. The seasonal wetlands with their marshland or seepage vegetation (sedge and grass dominated) and the seasonal pools on valley bottom wetlands comprises the most important habitats, within the study area, for certain threatened species which may possibly occur, e.g. Giant Bullfrog, Rough-haired Golden Mole and the African Grass Owl.

*Ridges*

Ridges will be characterised by a particularly high biodiversity, and as such their protection will contribute significantly to the conservation of biodiversity in the area as well as the rest of Gauteng Province. For example, a wide variety of bird groups utilise ridges, koppies and hills for feeding, roosting and breeding. These groups include some owls, falcons, nightjars, swifts, swallows, martins, larks, chats, thrushes, cisticolas, pipits, shrikes, starlings, sunbirds, firefinches, waxbills, buntings, canaries, eagles and vultures. Ridges provide important habitats for sensitive species such as bats (roosting sites) and the eastern rock elephant shrew. Ridges and kloofs also form caves, an important habitat for highly specialised animals like bats.

Variable microclimate conditions have resulted in a vast array of invertebrate communities associated with the high plant diversity characterising ridges. Hills and koppies generally

have more insects (both in terms of individuals and species) than the immediate surroundings (Samways and Hatton, 2000).

*Vegetation types*

Three of the seven vegetation types represented within the DPA have a national conservation status of Endangered, namely **Marikana Thornveld, Springbokvlakte Thornveld** and **Rand Highveld Grassland**. While these vegetation types potentially comprise 36% of the surface area of the DPA, much of the area has been transformed or degraded through urban expansion, cropland agriculture and mining.

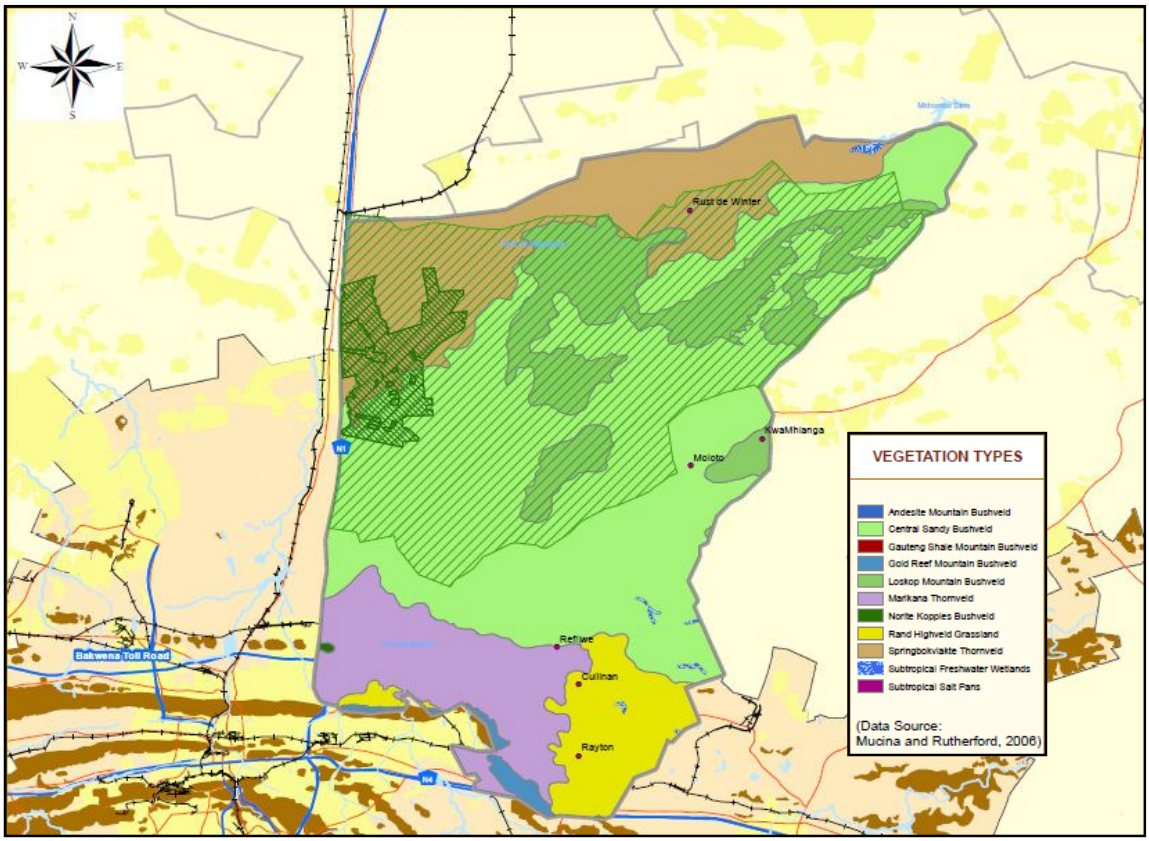


**Figure 2: Vegetation types in Dinokeng**

Marikana Thornveld is currently protected within the Roodeplaat Dam Nature Reserve, Buffelsdrift Conservancy and Seringveld Conservancy, while Springbokvlakte Thornveld is protected in parts of Rust-De-Winter Nature Reserve and Ditholo Nature Reserve (South African National Defence Force (SANDF) Air Force property). No provincial conservation areas exist within the DPA that protect Rand Highveld Grassland, although small areas of this vegetation type are protected within the Brandbach and Cullinan Conservancies.

### 3.3.1.2 Management objectives (desired state)

Biodiversity is the life blood of Dinokeng – both as the foundation of the tourism economy in the areas as well as in terms of the provision of critical environmental services. The conservation of biological diversity through the appropriate development and management of the various veld types, biomes and ecosystems present in the study area will ensure that

ecosystem services remain functional. These provide habitable living space, clean and abundant water, natural consumable materials, fertile farming land and the like.

It is therefore necessary to have management and land use practices that ensure the conservation of sensitive areas, including current and future protected areas, irrespective of public/ private ownership, along with the conservation and protection of water-related resources. Similarly, agricultural activities should ensure that no further degradation of sensitive habitats such as ridges, wetlands, grasslands and open bushveld habitats occur. Correct stocking levels should be implemented especially in the Rand Highveld Grassland vegetation unit to prevent overgrazing and habitat deterioration.

With the DGR as cornerstone, the Dinokeng Project focuses on the provision of an all-inclusive Big-5 game reserve experience. This product will however not be an attractive offer if the natural resource base is not taken care of. The objective is therefore to maintain a visually pleasing natural veld environment that has the necessary biodiversity to support a sizeable game reserve with large game species without outrageously intensive management practices.

There exists the potential to integrate conservancies into the larger tourism network for the DPA. The increase in land under conservation would be of a direct benefit to the conservancies as well as associated migratory animals. However, it would mean that management of the conservancies would have to become part of a broader management plan of area as a whole and the co-operative relationship between GDACE, the Dinokeng Project and the conservancy owners would have to be extended and reinforced. These enlarged areas could potentially form important conservation areas for several faunal species; including threatened (Red-data) faunal species. The existence and value of independent conservancies should however not be under valued. It is however important to focus on what is actually happening within these conservancies that will assist the broader conservation effort.

*Watercourses*

The riparian areas and their buffer strips in the Dinokeng Project area are under threat from habitat transformation from current mining and agricultural activities, alien vegetation invasion (*Melia azadarach, Acacia mearnsii*) as well as wood harvesting and collecting.

An evaluation of the migratory barriers along the various rivers and streams is therefore recommended to determine the necessity of them from a socio-economic perspective. It is recommended that those found to serve insignificant purposes be removed. The impoundment structures that serve a significant purpose should be provided with a fish bypass facility in the form of various fishway options. This is deemed a viable mitigatory option to facilitate and enhance general fish conservation within the Dinokeng area.

In general, the management of all watercourses should:

- Control development within the riparian zone;
- Improve the solid waste facilities and educate people on the impacts of littering;
- Stabilize bank erosion;
- Identify and control sources of pollution;

- Identify and find means to conserve wetlands needing protection;
- Remove alien vegetation;
- Maintain ecological corridors for aquatic and non-aquatic species; and
- Facilitate public access.

Comprehensive surface runoff and stormwater management plans indicating the management of all surface runoff generated as a result of development prior to entering any natural drainage system (i.e. stormwater and flood retention or attenuation ponds) will assist in managing the quality and quantity of surface water resources. These plans must be compiled for all developments, and must also consider the possible alteration of run-off rate, possible volume of debris and potential siltation problems.

*Wetlands*

Wetlands should be protected and rehabilitated where possible. The rehabilitation of degraded wetland habitats as well as improvement of water quality entering into these systems should be implemented (Working for Wetlands, etc.). Farmers should be encouraged to fence off parts of the wetlands preventing further disturbances of livestock as well as providing habitat for wetland associated fauna, and no further dams should be permitted without appropriate studies. Rehabilitation should include the removal of alien invasive vegetation as well as introduced animal species, such as alien fish species from existing dams.

*Vegetation types*

The three key vegetation types that need to be afforded protection within the DPA are Gold Reef Mountain Bushveld, Central Sandy Bushveld and Rand Highveld Grassland.

- Gold Reef Mountain Bushveld is a key vegetation type for several highly threatened plant species and occur on the quartzite ridges along the southern border of the DPA;
- Central Sandy Bushveld and Loskop Mountain Bushveld are relatively untransformed over large parts of the DPA and are conserved on private and state land; and
- Rand Highveld Grassland, an endangered vegetation type, is currently highly transformed and does not receive formal protection within the project area, although small areas are conserved within the Brandbach and Cullinan Conservancies.

Two other vegetation types, while not apparently supporting many threatened plant species, have a national status of Endangered and are thus in urgent need of conservation:

- Springbokvlakte Thornveld is still represented by a number of significant untransformed areas of land within the DPA, particularly on the Ditholo Nature Reserve and the following farms: Boekenhoutkloof 87 JR, Haakdoornfontein 65 JR, Kliprand 76 JR, and De Witskraal 86 and 88 JR.
- Marikana Thornveld is protected within the DPA in Roodeplaat Dam Nature Reserve and the Buffelsdrift and Seringveld Conservancies. Potential key portions of land are: Buffelsdrift 281 JR, Roodeplaat 293 JR, Kameelfontein 297 JR, and Doornpoort 295 JR.

While urbanisation and the expansion of urban areas have had a relatively low impact within the DPA, they are a major cause of transformation within Marikana Thornveld and Springbokvlakte Thornveld outside of the DPA.

While the Nokeng tsa Taemane SDF limits urban development to the south-eastern part of the DPA, the expansion of the Cullinan/ Refilwe urban areas could cause loss and degradation of patches of untransformed Rand Highveld Grassland. However, this is less likely if urban development does not expend east of the Elands River.

#### 3.3.1.3 Legal and policy requirements

*Ridges policy*

The guidelines which are applicable to the use and development of the different classes of ridges identified in the GDACE Development Guideline for Ridges are set out below.

Class 1 ridges (less than 5% development)

- The consolidation of properties on Class 1 ridges is supported.
- Further development activities and subdivisions will not be permitted on Class 1 ridges.
- Only low impact activities with an ecological footprint of 5% or less will be permitted in the 200 metre buffer zone of the ridge.

Class 2 ridges (5%-35% transformed)

- The consolidation of properties on Class 2 ridges is supported.
- The subdivision of property on Class 2 ridges will not be permitted.
- Development activities and uses that have a high environmental impact on a Class 2 ridge will not be permitted.
- Low impact development activities, such as tourism facilities, which comprise of an ecological footprint of 5% or less of the property may be permitted. (The ecological footprint includes all areas directly impacted on by a development activity, including all paved surfaces, landscaping, property access and service provision).
- Low impact development activities on a ridge will not be supported where it is feasible to undertake the development on a portion of the property abutting the ridge.

Class 3 ridges (35%-65% transformed)

- The consolidation of properties on Class 3 ridges is supported.
- The guidelines for Class 2 ridges will be applied to areas of the ridge that have not been significantly impacted on by human activity.
- The guidelines for Class 4 ridges will be applied to areas of the ridge that have been significantly impacted on by human activity.

Class 4 ridges

- The consolidation of properties on Class 4 ridges is supported.
- The subdivision of property on Class 4 ridges will not be permitted in areas of the ridge where the remaining contiguous extent of natural habitat is 4ha or more.
- Further development activities will not be permitted in areas of the Threatened and/or protected ecosystems ridge where the remaining contiguous extent of natural habitat is 4ha or more.

*C-Plan*

GDACE's Conservation Plan makes provision for ecological sensitivity modelling and subsequent classification which, although it does not prescribe any development controls, highlights specific sensitivities to inform development activities and control in terms of relevant legislation.

The conservation planning is based on ecological networks (migration corridors, ridges and watercourses), habitat units (pristine and/or critical undeveloped areas, wetlands) and locations of rare or endangered species. All areas designated as 'irreplaceable' in C-Plan must be kept undeveloped in order to achieve the conservation targets of the province (e.g. conservation of a particular species or habitat type). 'Important' sites are critical as a buffer zone around irreplaceable sites and as 'second best' option should some irreplaceable areas be lost to development.

*EIA regulations*

The EMF, once adopted, will have to be taken into consideration in environmental impact assessments in or affecting the geographical area to which the framework applies. It terms of sub-regulation 22 and 28 of GN R385 (for basic assessment and scoping) the applicant (and more specifically the Environmental Assessment Practitioner) have to give notice in writing of the proposed application to any organ of state which has jurisdiction in respect of any aspect of the proposed activity, which could in some cases include the Dinokeng Project.

However, the Dinokeng Project should liaise with the relevant authorities to ensure that it is notified of any new EIA applications in or close to the Dinokeng area. It is important for the Dinokeng Project to be listed as an Interested and Affected Party in the context of EIA in the Dinokeng area. The Dinokeng Project should review EIA applications and comment on them if adequate. The legislation provides the possibility for the Dinokeng Project to appeal a record of decision which it believes will impact negatively on the sustainable development of the Dinokeng area and Dinokeng Project.

*NEM:BA*

The National Environmental Management: Biodiversity Act provides for different legal instruments for the protection of declaration of a bioregion, listing of ecosystems, norms, standards, biodiversity management framework and biodiversity management plans. The following process is recommended for the Dinokeng Project Area:

- Declaration of the Dinokeng area as a Bioregion;
- Development of Biodiversity plan for the Dinokeng area;

- Implementation of a Biodiversity Agreement for the Dinokeng area; and
- In this perspective, the Dinokeng Project Team will have to liaise with the relevant authorities to investigate the possibility of implementing such measures for the Dinokeng Project Area.

*NEM:PAA*

The National Environmental Management: Protected Areas Act provides for different legal instruments for the protection of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. The declaration of a nature reserve and/or the declaration of a protected environment could be the most suitable to protect the Dinokeng area and achieve the objectives of the Dinokeng project.

*Water Act & Water Services Act*

The National Water Act makes provision for water uses that require permits, uses that are exempted through general authorisations, as well as the management of catchments, water uses and polluting activities. All relevant permitting must therefore be taken into account. The general intention of the act is however to manage and monitor water uses in order to ensure equitable access and a sustainable environment.

The Water Services Act, on the other hand, specifies the ways in which supply, management and disposal of water must be conducted. This is particularly relevant to the local authorities and any other water supply and treatment body.

In particular, the Water Services Act aims to protect each person's right to basic water supply and sanitation.

*Department of Water Affairs and Forestry (DWAF)*

Delineation of the riparian zone must be done according to "DWAF, 2005: A practical field procedure for the identification and delineation of Wetland and Riparian areas", and a 100m buffer zone from the edge of the riparian zone for rivers/ streams outside the urban edge and a 32m buffer zone from the edge of the riparian zone for rivers/ streams within the urban edge protected from degradation or development.

Impact assessments of proposed developments must include an evaluation of the current hydrological regime and potential changes thereof, including the effect of that change on the downstream habitat and integrity of the system.

*Weeds & Invasive Species Regulations*

Regulations have been published in terms of the Conservation of Agricultural Resources Act that control the spread of weeds and invasive species. In terms of the regulations, identified species must be removed and/or its propagation controlled by land owners.

*Conservation Ordinances*

The Transvaal Nature Conservation Ordinance, 1983 (Ordinance 12 of 1983) specifies various measures and controls that apply to veld and game management practices in the province of Gauteng. These include measures for game reserve management, game and plant management and trade, fishery, etc. Further regulations have also been made in

respect of the Ordinance to control the activities or specific issues or species relevant to the Ordinance.

*Provincial Avifauna Policy*

**Table 3-1: GDACE Management Objectives (Desired State) for birds**

| Species | Habitat and buffer requirements |
|---|---|
| **Blue Crane** | 400ha of contiguous suitable foraging habitat around Blue Crane breeding sites (usually in a wetland) |
| **African Grass-Owl** | 100ha of suitable foraging habitat with a minimum terrestrial buffer of 170m from the edge of a wetland/stream |
| **African Marsh-Harrier** | Wetlands larger than 100ha that are identified as suitable habitat for this species must be buffered by 200m of terrestrial habitat. |
| **White-backed Night-Heron** | A buffer zone of 50m must be provided from the edge of the riparian zone |
| **White-bellied Korhaan** | The extent and location of the open space network set aside to accommodate the breeding and foraging requirements of this species must be motivated. Contiguous habitat patches must be >100ha. |
| **African Finfoot** | A buffer zone of 50m must be provided from the edge of the riparian zone |
| **Lesser Flamingo** | A buffer zone of 32m must be provided from the edge of the wetland temporary zone if the wetland is present within the urban edge and of 50m if the wetland is present outside the urban edge. |
| **Greater Flamingo** | A buffer zone of 32m must be provided from the edge of the wetland temporary zone if the wetland is present within the urban edge and of 50m if the wetland is present outside the urban edge. |
| **Black Stork** | For wetland foraging sites, a buffer zone of 32m must be provided from the edge of the wetland temporary zone if the wetland is present within the urban edge and of 50m if the wetland is present outside the urban edge. |
| **Half-collared Kingfisher** | A buffer zone of 50m must be provided from the edge of the riparian zone |

*Red Data Plants Policy*

GDACE compiled a development guideline for sites where red listed flora are found. Accordingly, specific application, design and management measures apply, depending on the location of the site (inside/ outside urban edge) and the species of concern. The policy also makes provision for appropriate buffer zones around known locations of red list plants.

3.3.1.4 Development parameters

As a general rule, no net loss of sensitive environments may occur. By implication, this rule applies to rivers, wetlands, ridges and the remaining pristine vegetated areas of the most endangered veld types present in the study area.

The success of the DGR and broader Dinokeng Project will depend on the viability of the natural resource base for the envisaged nature-based tourism development framework. The Dinokeng area may therefore not degrade, lose or fragment its natural habitat and intact ecosystems beyond certain thresholds/ tipping points. These occur where:

- Veld management interventions become financial burdens in excess of the overall project income opportunity;
- Service infrastructure investment exceed overall project income opportunity;
- The natural resource quality can not sustain the presence of Big-5 game species;
- Nature-based tourism loses its economic viability due to the unattractiveness of the resource;
- The quality of the veld and biome types present in the area fails to meet National and Provincial biodiversity conservation targets; and
- River quality falls below recreational or potable water quality standards (as relevant).

Consequently, no further destruction of any wetland habitat within the DPA will be allowed, and similarly, agricultural activities should ensure no further degradation of sensitive habitats such as ridges, wetlands, grasslands and open bushveld habitats. Correct stocking levels should be implemented especially in the Rand Highveld Grassland vegetation unit to prevent overgrazing and habitat deterioration.

No further developments should be allowed within any Class 1 and 2 ridges within the DPA. Specialist studies must be completed for any further developments within a ridge system and describing the following:

- the ecological conditions – including the functional, hydrological and compositional aspects – of the ridge;
- flora and fauna – including any mammals, birds, reptiles, amphibians and invertebrates – that are present on the ridge;
- the impacts of the proposed activity on the flora and fauna as well as the ecological conditions;
- the stability of the slope and any implications thereof for the application; and
- the cultural, historical, open space and visual value aspects as well as the current use and value of the ridge for social purposes and the extent to which the proposed activity will impact on these uses or values.

Watercourse management requires specific management or intervention responses relative to the current state of, and pressures on the two main river systems present in the study area. These are:

**Table 3-2: Specific management responses for river systems**

| River System | Required Management Responses |
|---|---|
| **Pienaars River/ Moreleta Spruit** | Control development within the riparian zone<br>Improve the solid waste facilities and educate people on the impacts of littering<br>Stabilize bank erosion<br>Identify and control sources of pollution |

| | |
|---|---|
| | Identify and find means to conserve wetlands needing protection<br>Remove alien vegetation<br>Required Management Responses (lower Pienaars)<br>Clearing of alien vegetation<br>Management and control of overgrazing<br>Manage and enforce compliance of sand mining activities<br>Identify pollution sources and enforce water quality standards |
| **Elands River** | Clearing of alien vegetation<br>Water release management from Rust de Winter Dam, including determination of the ecological reserve and in-stream flow requirements |

### *3.3.2 Biodiversity sensitivities (Specific Species)*

#### 3.3.2.1 Current state

The Dinokeng Project Area is host to a variety of fauna and flora species of conservation concern. Most are associated with the general list of sensitive environments, such as watercourses and ridges, but may also occur in other areas.

There are currently eight (8) species of invertebrates that are threatened, rare and of conservation concern in Gauteng province. These include seven species of butterfly and one species of *cetonid* beetle. Of these eight species, three are well known to occur in the Dinokeng area. Twenty-one Red List or Orange List plant species have been confirmed within the DPA.

In the absence of any avifauna or herpetofauna that are endemic to the province, nineteen threatened bird species, two threatened reptile species and 1 threatened amphibian species that are breeding residents, regular visitors or regular migrants to Gauteng (Jacobsen, 1996; Tarboton, 1997) were prioritized for conservation attention in the province.

Numbers of bird species have declined in the DPA due extensive habitat degradation and loss. Human activity has transformed grasslands in South Africa to a point where few pristine examples exist (Low and Rebelo, 1996; Barnes, 1998). Factors such as agricultural intensification, increased pasture management (overgrazing), decrease in grassland management and land-use alteration (urbanisation). Continuing developmental pressure on sensitive wetland and surrounding grassland habitats are largely responsible for the decline of the majority of bird species in Gauteng and the DPA.

Jacobsen (1982) reported that Giant Bullfrog numbers were declining in Gauteng, North West, Limpopo and Mpumalanga provinces, which at that time, formed part of the Transvaal Province. Harrison *et al.* (2001) estimated that the area of its habitat and population sizes had declined by more than 50% over the past 100 years, particularly in regions subjected to extensive crop agriculture or urban and industrial development, such as Gauteng, Free State and North-West Provinces. Major road networks bisect suitable breeding and foraging areas, resulting in mass road fatalities of migrating adult and juvenile bullfrogs. Several road fatalities of adult Giant Bullfrogs were observed on the N1 adjacent to the western boundary of the DPA as well as adjacent to Moloto on the eastern boundary during the 2008/2009 wet season.

The Giant Bullfrog is currently assigned as a Near-Threatened species (IUCN Red List, 2007). Giant Bullfrogs have been recorded from the Dinokeng Grid Squares and adjacent Grid Squares during previous surveys as well as during the South African Frog Atlas Project

(SAFAP). Suitable seasonal wetland habitats exist for Giant Bullfrogs around the Buffelsdrift Conservancy, and several adult Giant Bullfrogs have been observed in the Moloto, Cullinan (Zonderwater) and Rayton areas (pers. obs.). An adult male Giant Bullfrog 160mm in snout-vent-length (SVL) was discovered at Kwalata Game Ranch to the north of Dinokeng; with a clutch of several hundred tadpoles measuring approximately 65mm (The Calabash, April 2008).

3.3.2.2 Management objectives (desired state)

*General Fauna*

In setting conservation targets, the aim should be to prevent all priority threatened species from qualifying for a higher threat category in future. In order to achieve this within the context of Gauteng and the Dinokeng area, sufficient suitable habitat must be identified and appropriately managed to prevent further population declines and range reductions. For many species, improved management and mitigation of threats within transformed landscapes might well be sufficient to facilitate local population recoveries.

The open space system in the urban areas and surrounding farm lands in the Dinokeng project area must be developed to ensure that it incorporates all sensitive natural environments linked to each other through a continuous spatial system or biological corridors. Biological corridors allow for the flow of species (genes) over time between suitable habitats usually along rivers, drainage lines, ridges or mountains. It is imperative that future developments are excluded from these important areas. Ecological systems need to be linked in order to function properly and also to ensure sustainability of the original biodiversity.

*Reptiles*

More comprehensive or updated reptile surveys should be conducted in the DPA. Indiscriminate killing of snake species during previous agricultural and urbanisation activities are likely to result in the disappearance of the larger and the more sluggish snake species within the project area. An educational programme should be implemented especially pertaining to Southern African Pythons.

*Amphibians*

More intensive surveys are required throughout the entire DPA in order to establish the breeding localities as well as estimates of the current conservation status of Giant Bullfrogs as well as other frog species within the DPA.

*Invertebrates*

Sensitive invertebrate habitat in the Dinokeng area can be regarded as any area harboring a protected invertebrate species or, alternatively, any area that supports unique invertebrate diversity. The long term survival of sensitive invertebrate habitat, Red Data invertebrate species, populations, assemblages or communities is therefore dependent on areas that support unique invertebrate habitat include rocky ridges, wetland systems or riparian zones.

Conservation of all wetland and riparian zones in the entire Dinokeng region with sufficient buffer zones will ensure the long term survival of any *Metisella meninx* or *Gegenes hottentota* populations that may be present as well as other invertebrates specialized to live in aquatic conditions. Additionally, conservation of all undisturbed rocky ridges, particularly

the eastern most Magaliesberg ridges that are located in the southern part of the region will ensure long term survival of all invertebrates that are specialized to live in this type of habitat.

#### 3.3.2.3 Legal and policy requirements

The regulatory requirements for individual sensitive fauna and flora species are similar to those listed under the listing for 'Sensitive natural environments' above.

#### 3.3.2.4 Development parameters

A buffer zone of 1000m terrestrial habitat around suitable Giant Bullfrog breeding wetlands should be designated as sensitive and conserved and adequately managed. Fences and walls also prevent the natural migration of adult and juveniles from foraging areas and suitable breeding sites (habitat fragmentation). Habitat deterioration due to changes in the seasonality of wetland sites (damming or increased surface run-off), deterioration of water quality due to pesticides and pollutants lead to the disappearance of bullfrog populations. Human predation of adult bullfrogs is another causal factor in population declines. This is especially prevalent in the rural parts of southern Africa (Limpopo as well as in Gauteng/ Hammanskraal). Bullfrogs are also caught illegally for the local and international pet industry. Continual destruction and deterioration of suitable breeding and foraging areas will result in the disappearance of Giant Bullfrog populations throughout southern Africa, especially on the Highveld in the Gauteng Province.

No further destruction of ridges and rocky outcrops should occur as these provide critical habitats for remaining rupicolous reptile species including snakes, skinks and geckos. Termite mounds (especially moribund mounds) should be conserved wherever possible. If certain termite mounds have to be destroyed a rescue and recovery operation should ideally be implemented. Collected specimens should be rescued and relocated in suitable habitats away from development in the proposed DPA. Electric fences should place the live wires at least 20cm above the ground to prevent possible electrocution of pythons. Areas of suitable habitat (differentiate between breeding, foraging, aestivation, etc.) for each Red List species must be conserved, together with appropriate buffers and corridors. 500ha of suitable foraging habitat around each confirmed locality of the Southern African Python must be conserved and adequately managed. This sensitivity mapping rule only applies to areas located outside the urban edge.

Two of the eleven known populations of *Ichnestoma stobbiai* are located in the Dinokeng region. One of these populations is located in the De Wagensdrift sub-region on the Farm Hartbeesfontein approximately 14km east of Temba (S25 24 40.8 E28 24 19.9). The second population is located in the Rust de Winter sub-region near to the Elands River in-between Buffelsdrift and Rust-de-Winter (S25 11 54.0 E28 34 32.0). It is imperative that these populations are protected as *Ichnestoma stobbiai* remains one of the most threatened animals in Gauteng Province. It is however highly unlikely these are the only two populations of *Ichnestoma stobbiai* in the Dinokeng region. Concentrated efforts by GDACE and the Scarab Research Group of the University of Pretoria revealed five new populations of this species in Gauteng in 2006 and 2007. Similar efforts in the Dinokeng region are likely to reveal more populations of this very specialised beetle. Until such an effort is made, no comprehensive invertebrate sensitivity map can be compiled for the Dinokeng region.

To ensure conservation of sensitive areas, including current and future protected areas, irrespective of public/ private ownership, along with the conservation and protection of water-related resources, the following is proposed:

- River quality may not fall below recreational or potable water quality standards (as relevant);
- Alien plant control must maintain, but preferably improve, the status quo of infestations;
- Prevent all priority threatened species from qualifying for a higher threat category in future;
- In short, no net loss of sensitive environments may occur (rocky ridges, wetland systems or riparian zones);
- The status quo of all sensitive habitats and threatened species populations must be improved;
- Protect the identified populations of Ichnestoma stobbiai with sufficient buffers and veld management; and
- Application of provincial conservation strategies.

Systematic and representative wetland monitoring programmes need to be implemented on the associated wetlands within the DPA. Such monitoring programmes need to be pro-active and identify the current impacts and potential threats from future developments. Research needs to look at the catchment scale and assess the health and functioning of wetlands and establish a link between rehabilitation and sustainable livelihoods.

All suitable habitats for terrestrial Red List mammal species observed or potentially occurring within the DPA should be conserved and designated as sensitive. All caves, including a 500m buffer zone, must be designated as sensitive

The removal of the majority of natural rock in the agricultural lands severely restricts refuge habitat for the majority of reptile species. The frequent burning of the vegetation in the project area will have a high impact on remaining reptiles by actual burning as well as increased predation levels. Fires during the winter months will severely impact on the hibernating species, which are extremely sluggish. Fires during the early summer months destroy the emerging reptiles as well as refuge areas, increasing predation risks. Illegal reptile collecting is also a factor which should be considered especially pertaining to juvenile African Rock Pythons which are highly sought after for the local and international pet trade. Termite mounds are also harvested for the feeding of wild or aviary birds.

More comprehensive or updated reptile surveys should be conducted in the DPA. Indiscriminate killing of snake species during previous agricultural and urbanisation activities are likely to result in the disappearance of the larger and the more sluggish snake species within the project area. An educational programme should be implemented especially pertaining to Southern African Pythons.

The conservation of biological diversity through the appropriate development and management of the various veld types, biomes and ecosystems present in the study area will ensure that ecosystem services remain functional as well as the faunal diversity within the

DPA. These provide critical faunal habitats, habitable living space, clean and abundant water, natural consumable materials, fertile farming land and the like. By implication, the Dinokeng area may not degrade, lose or fragment its natural habitat and intact ecosystems beyond certain tipping points. These occur where:

- Veld management interventions become financial burdens in excess of the overall project income opportunity;
- Service infrastructure investment exceed overall project income opportunity;
- The natural resource quality can not sustain the presence of Big-5 game species;
- Nature-based tourism loses its economic viability due to the unattractiveness of the resource;
- The quality of the veld and biome types present in the area fails to meet National and Provincial biodiversity conservation targets;
- River quality falls below recreational or potable (DWAF) water quality standards;
- The potential failure to meet provincial/ national conservation targets may result in the loss of intrinsic value of biodiversity and loss of ecosystem functioning resulting in local extinction of species and global/ national extinction of endemic species;
- The degradation of ecosystems leads to the loss of landscape quality/amenity;
- Degradation leads to the loss of goods and services provided by wetlands, rivers and natural habitats;
- There may be a decrease in productivity (economic) and long-term sustainability due to overexploitation of natural resources and degradation of natural environments;
- The degradation and loss of wetlands may result in degradation of water resources and water quality – there may be a consequent increased prevalence of human diseases, and the loss of biodiversity and ecosystem processes associated with these wetlands;
- There may be a long-term loss of tourism revenue due to the degradation of natural habitats and mismanagement of natural areas; and
- The development of reserves and community-based conservation programmes assists in poverty alleviation, for example the Working for Water Programme. Currently 2320 individuals are employed by this programme in Gauteng, comprising 8.22% of the national total employed by the programme.

The following indicators are proposed for future monitoring of fauna & flora:

- Population trends of selected threatened species such as *Python natalense, Tyto capense, Pyxicephalus adspersus* need to be monitored so that changes in threatened status can be detected;

- Extent of alien invasion in DPA - i.e. a map showing spread of aggressive alien invasive species. A potential indicator could be percentage of DPA invaded by alien species; and

- The percentage of provincial targets met for conservation of threatened species, vegetation types, ridges and wetlands. This monitoring will be conducted in conjunction with GDACE's systematic conservation planning efforts. As a general rule, no net loss of sensitive environments may occur.

### *3.3.3 High potential agricultural areas*

#### 3.3.3.1 Current state

The majority of agricultural activities and cultivated lands are situated in close proximity to the major watercourses namely the Hartebeestspruit, Pienaars River, Edendalspruit, Premiermynloop, Rooispruit and Krokodilspruit. Production methods consist of both dryland farming, albeit limited, and irrigation, with the latter conventional as well as rotational irrigation. Main crops relate to maize (mielies), potatoes, wheat, soya beans, planted pastures (Eragrostis), forage crops (lucerne) and a variety of vegetables such as carrots, lettuce and tomatoes. Other activities include sheep, cattle, goat, chickens, stock breeding and ostrich farming. A number of stables for horses and equestrian facilities are found within the study area.

The Dinokeng area lies on the broad boundary zone between highveld and bushveld, and the grazing capacity (measured in hectares required for one large stock unit or 'lsu') decreases northwards, from around 7-8 ha/lsu in the south to around 11-12 ha/lsu in the north (ARC-ISCW, 2004). This classification however does not apply to game farming, where more detailed specialized knowledge is required, mainly in terms of relating plant species composition in both the grass layer and woody layer to the requirements of various grazing and/or browsing species of game.

There is a great difference between land types in terms of both the soils occurring as well as the associated agricultural potential. There is also a significant difference in the **dominance** of the agricultural potential classes within each land type, so that certain land types may be strongly dominated by one potential class, while others may have a more even distribution between the three classes.

The only land type where there is a predominance of high potential soils (>80% of the land type) is **Ae20**, occurring in the north of Dinokeng, where deep, red, friable loamy soils are found. The other areas with significant occurrences of high potential soils (between 40-45% of the land type), occur in the south, namely land types **Ba12, Ba13, Bb16** and **Bb17**. Virtually every other land type will contain smaller areas of high potential soils, but these will usually be scattered and not contiguous zones or blocks.

Areas that were under cultivation are shown on the map "Cultivation and Degradation" in the Status Quo document, as recorded by the National Land-Cover Database (CSIR, 1999). These areas are concentrated in the south (especially south-east) and far north of Dinokeng, and correspond more or less with the higher potential land types as identified above.

The Gauteng Department of Agriculture, Conservation and Environment has also demarcated a number of agricultural hubs throughout the province. These hubs relates to the creation of centres of high quality agricultural activity, where niche market agricultural products such as

vegetables, including indigenous vegetables, flowers, herbs and spices, will be farmed. The first of these hubs were launched in the Metsweding District in 2007, of which a substantial part lies in the south-eastern part of the Nokeng tsa Taemane municipal area. This agricultural hub forms part of the Elandshoek, Cullinan, De Wagendrift and Kameelfontein/ Wallmansthal subregions as identified by Volume C of the Dinokeng Framework.

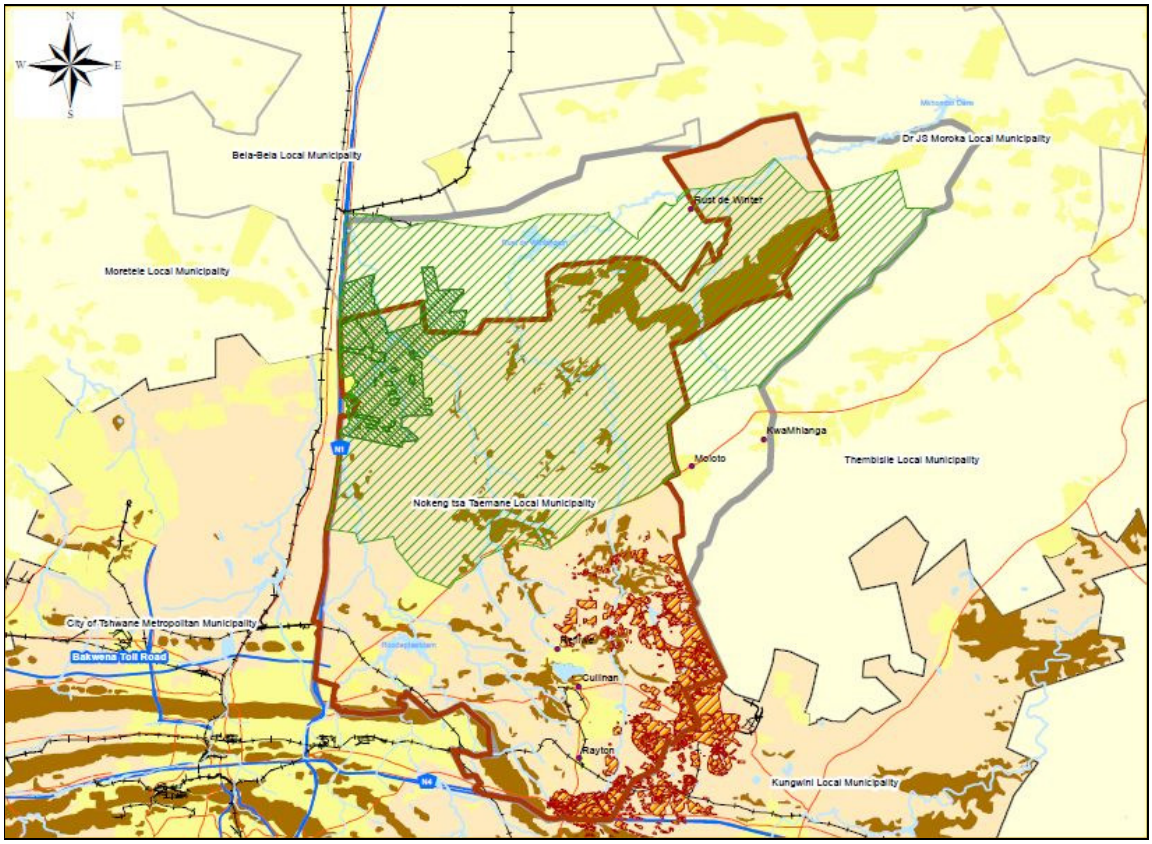


**Figure 3: Location of the GDACE Agricultural Hub**

3.3.3.2 Management objectives (desired state)

The Nokeng/ Kungwini Agricultural Hub is identified in the eastern part of the DPA. The purpose of the agricultural hub is to conserve land that has high potential for agricultural development and discourage urban development and other incompatible land uses within the defined area. It is clear that from a provincial perspective there is a strong focus on agricultural development in the region, specifically as an economic sector.

The Metsweding Spatial Development Framework has demarcated a substantial part of the municipal area as a District Open Space System with the aim of protecting the conservation resources that exist in the district and to protect the valuable agricultural land that are found in the district for future generations.

Due to the relative scarcity of large areas of high potential agricultural land in Dinokeng, it will be desirable to carefully monitor the zones where good soils occur, in order to preserve such soils for agriculture, both in the context of Dinokeng, as well as in the broader aspect. Where expansion is planned, increased food growing capacity will be required, both for food security and to minimise the need for food to be brought in from elsewhere. 'Good Soils' are

defined as those that can sustainably be used for a wide variety of purposes, with little or no danger of degradation e.g. erosion. Ideally, they should be medium-textured (10-30% clay), not have a strong structure, and be well-drained, with at least 750 mm depth to any restricting layer.

The general focus of the DGR, and Dinokeng Project as a whole, will however be on game farming. The intention is to have a large enclosed game area comprising of private and state land, which can be managed as an unfragmented entity. Any high potential agricultural areas falling within the DGR will therefore have less priority than game farming or tourism related uses. That does not preclude the persistence of island farms though, but normal farming activities will need to co-exist with adjacent game areas.

#### 3.3.3.3 Legal and policy requirements

Both the National Environmental Management Act (Act 107 of 1998) and the Conservation of Agricultural Resources Act (CARA)(Act 43 of 1983) require of landowners to obtain a permit for any agricultural land to be used for another purpose. However, where such conflict occurs close to an existing non-agricultural centre and where there is a significant economic benefit to a development, the pressures on agricultural land can be severe.

*NEMA*

The development of agricultural or undeveloped land, either in general (of a certain size) or specific (certain defined developments), usually require environmental impact assessment authorisation under the NEMA EIA Regulations.

*CARA*

The regulatory scheme of the Act involves control measures that relate to the utilisation and protection of land that is cultivated, utilisation and protection of vegetation and the protection of water resources against pollution on account of farming practices. Several control measures have been published.

*GAPA 3*

GDACE has done an analysis of agricultural resources in the province, and identified the larger contiguous areas of high potential agricultural lands as either Important Agricultural Sites or as Agricultural Hubs depending on the size and viability and location (access to markets etc.). Seven hubs were identified in Gauteng, of which one falls within the study area. Land development inside an agricultural hub must be supportive of the agricultural focus, and not sterilise or fragment viable intact areas of agricultural lands.

*Subdivision of Agricultural Land Act*

This Act has been repealed by the Sub-division of Agricultural Land Act Repeal Act No 64 of 1998 which will only become effective from a date yet to be published. The existing legislation is therefore still applicable and primarily provides for the control of sub-division and use of land deemed to be agricultural land. According to the Act, the National Department of Agriculture must approve the division of land portions that were not part of municipal areas prior to the demarcation of wall-to-wall municipalities in 1994.

#### 3.3.3.4 Development parameters

Agriculture, both in food production and game farming forms, represents one of the core components of the envisaged Dinokeng Project Area's economic base. It relates directly to the tourism and conservation management, as well as socio-economic development and therefore needs to be managed, allocated, accommodated and supported in conjunction with these three factors. The conservation of agricultural production through the sustainable cultivation and use of high potential soils will ensure optimum food, forage and fibre production, both for the region as these provide both an income and employment for a significant proportion of the population.

Specifically, the Nokeng/Kungwini Agricultural Hub, and high potential agricultural areas outside the DGR area must be mapped and managed as food production priority areas, whereas the DGR management will ignore high potential land to a great extent.

In addition, if properly planned and managed, the re-settlement of new, small-scale farmers would lead to the improvement of the well-being of many of the communities in the area.

### *3.3.4 Cultural-historic heritage*

#### 3.3.4.1 Current state

The area is considered to have a high tourism potential comprising natural, cultural and historical resources. The attractiveness of the area is that it contains a rich natural and cultural diversity attached to the Magaliesberg and rocky outcrops in the study area. Dinokeng's cultural and historical heritage includes Iron and Stone Age sites, relics of colonial diamond mining activities and Anglo-Boer War and World War II sites, as well as its history of black oppression and forced removal. To pro-actively utilise and develop the Dinokeng Cultural Heritage Resources will to a large extent depend on how resources are identified, developed and utilised.

The cultural heritage of Dinokeng spans a period of more than a million years. It covers the entire cultural development of people from Stone Age until today. It includes pre-historic African history, colonial conquest and more recent historical events. It therefore depicts the interaction between the first humans and their adaptation and utilization to the environment, the migration of people, new technologies, warfare and the struggle for survival, as well as evidence of ethnic and racial conflict but also of living and working together. The record also covers a depiction of the conquering of black people by whites, British imperialism and the struggle for freedom connected to the rise and fall of apartheid; incorporating the struggle for land, forced removals and unequal economic development. Finally, it ends with the development of mining, migrant workers and the finding of the world's largest diamond.

#### 3.3.4.2 Management objectives (desired state)

As the study has shown, the potential for heritage tourism is great in the Dinokeng area, but identification and documentation of the legacy in the area are prerequisites for the preservation and/or utilisation of the resources. This is especially true for oral histories, which disappear with each old person being buried. The Dinokeng project can set an example for the rest of Africa to follow.

It has to be emphasized that to create a unique African experience, in line with Marketing and Tourism proposals, it is necessary to follow an African integrated approach where nature

is culture. In this model both natural and cultural resources are one and equal in significance, conservation status, utilization and edutainment.

Only if this model is pursued, will it be possible to create something unique and of national importance. A visit to Dinokeng should be an experience which only Dinokeng can offer. This experience should not follow existing practice as found all over southern and eastern Africa where tourists visits game parks and only see and experience the natural heritage of Africa. Africa has far more to offer than big game and open spaces. Africa has the longest cultural history in the world. Africa is the Cradle of Humankind and can offer a glimpse into more than a million years of human cultural development and practise where people adapted to the environment and the utilization of its natural resources.

To pro-actively utilize and develop the Dinokeng Cultural Heritage Resources into regional, provincial or even national important resources will to a large extend depend on how these resources are identified, developed and utilized in a sustainable way. Eventually this will determine the uniqueness and quality of the experience that these resources will offer to inhabitants as well as tourists.

#### 3.3.4.3 Legal and policy requirements

*NHRA*

The National Heritage Resources Act makes provision for relevant levels of protection of heritage resources (national estate, declaration of heritage sites, declaration of protected area, declaration of heritage area). It will be necessary for the Management Authority to submit a nomination of places in the Dinokeng area to be declared national or provincial heritage sites, or to submit places as protected areas or/and an heritage areas.

Generally speaking though, various artefacts or elements of the social and natural environment are regarded as heritage resources and are protected by the Heritage Act, and require permits before they may be disturbed (unless the control is duplicated by other regulatory processes). These include:

- structures older than 60 years;
- archaeological and palaeontological sites and material and meteorites;
- graves of victims of conflict and graves older than 60 years;
- public monuments and memorials; as well as
- any heritage objects as declared by the SAHRA from time to time.

In addition, the following activities require authorisation from the relevant Heritage Resources Agency unless the provisions of other legislation cover the same activities:

- The construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- The construction of a bridge or similar structure exceeding 50 m in length;
- Any development or other activity which will change the character of a site:

- Exceeding 5 000 m² in extent;
- Involving three or more existing erven or subdivisions thereof; or
- Involving three or more erven or divisions thereof which have been consolidated within the past five years; or
- The costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

- The re-zoning of a site exceeding 10 000 $m^2$ in extent; or
- Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

3.3.4.4 Development parameters

All activities in the study area must conform to the parameters laid down by the Heritage Act, including any tourism development that will use heritage resources as (part of) a product offering. Important heritage resources need to be protected formally.

Ideally, all heritage sites should be recorded and at least briefly investigated. SAHRA must be involved wherever development is likely to affect heritage artefacts, sites or bodies of knowledge. Any works affecting heritage must be recorded and the details of the heritage features documented appropriately for future reference. Tourism development should take heritage resources into account as part of the regional offering and tourism product.

### *3.3.5 Development Planning*

3.3.5.1 Current state

The DPA comprises two main towns, namely Cullinan (includes the township Refilwe) and Rayton (includes the township Phumzile), which are situated in the southern part of the DPA. These are the main service centres for the entire rural area in the Nokeng tsa Taemane municipal area. Although extensive urbanisation has already taken place in the Roodeplaat Dam area closer to Pretoria, these two areas are the most important urban nodes within the municipal area. The adjacent and surrounding farms vary from relatively smaller subdivisions in the southern part of the study area close to the N4 National Road to larger farms/ portions in the northern parts with extensive agricultural activities. Many commercial or business related activities occur adjacent to the main roads.

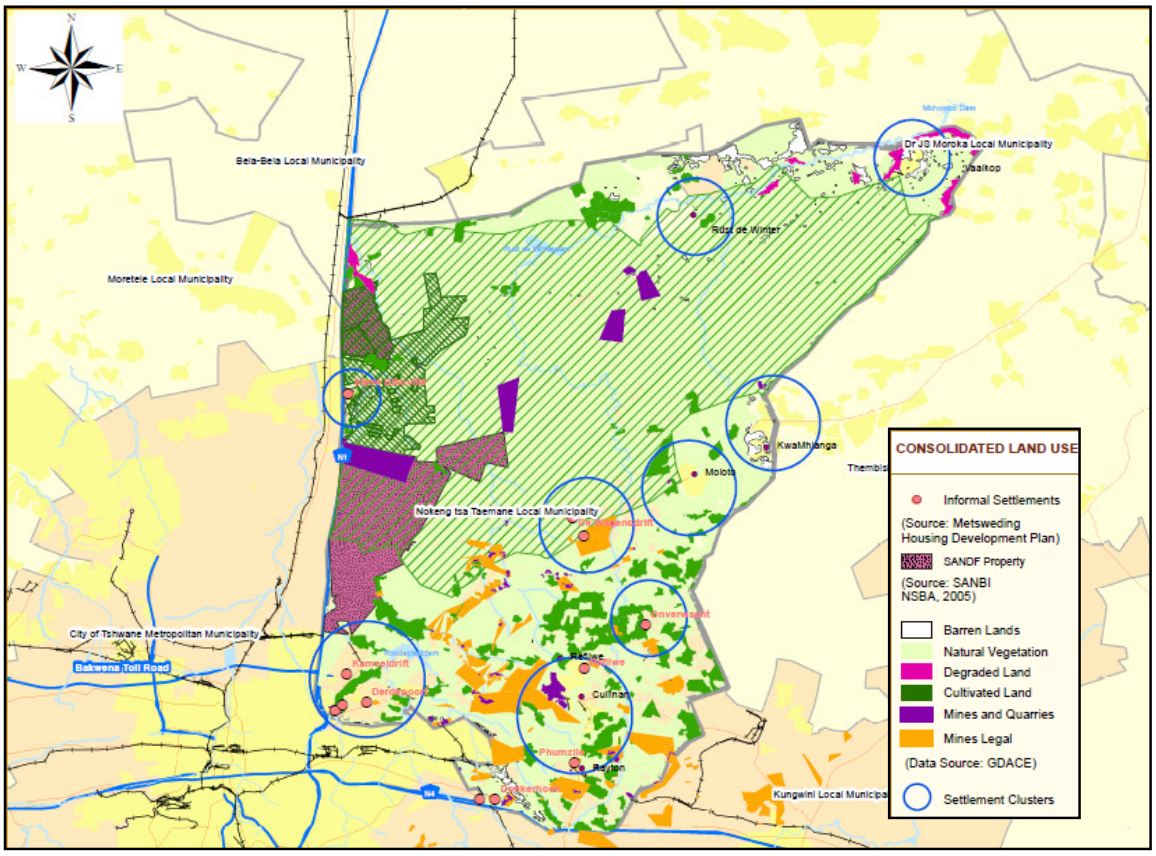


**Figure 4: Land use in Dinokeng**

Four spatial development frameworks or development plans exist that manage development and land use in the Dinokeng area, namely –

- Dinokeng Integrated Tourism Development Framework, 2001, in particular Volume C: Land Use, Environmental Management and Infrastructure Development Framework, which was commissioned by Gauteng Provincial Government;
- The Metsweding Spatial Development Framework;
- The Nokeng tsa Taemane Urban Areas Spatial Development Framework; and
- The Nokeng tsa Taemane Rural Areas Spatial Development Framework.

The fact that there are different spatial development frameworks for the area is detrimental to the successful implementation and management of the Dinokeng project. As such, the current situation is that the Nokeng tsa Taemane spatial development frameworks are not aligned with the Dinokeng land use framework and there exist areas of conflict between provincial and local development proposals for the area.

One of the key characteristics of the Dinokeng study area is the fact that it comprises a large number of natural features such as dams, rivers and mountains/ ridges, which lends itself to the creation of an eco-tourism economic intervention such as the Dinokeng Game Reserve. These natural features also play a strong role in spatial development, as they act as natural

structuring elements. The relationship between these features can be seen on the maps generated as part of the Status Quo Report phase of this EMF study.

Generally speaking, the Dinokeng area can be characterised as thus:

- The DGR in the North and conservancies in the central parts;
- Mixed uses, with some light industrial activities immediately next to the Zambesi/N1 interchange;
- Recreation and residential (smallholdings and exclusive estate) use around Roodeplaat Dam;
- Mining and urban clustering around Rayton, Cullinan & Refilwe;
- Heritage tourism uses around Cullinan;
- Military lands along the N1;
- Extensive sand mining areas between Roodeplaat Dam and Cullinan;
- Marginalised residential areas around Hammanskraal, Moloto and Rust-de-Winter;
- Extensive farming areas in the central and North-Eastern portions;
- Access to the area from the N1 highway, primarily at the Zambesi and Hammanskraal interchanges, with the central Moloto Road, Derdepoort/ Cullinan Road and Doornpoort/ Mamelodi railway line traversing the area; and
- Natural structuring elements in-between.

According to the IDP (2008/2009) there are ten (10) informal settlements within the Nokeng tsa Taemane LM that require intervention. These are:

**Table 3-3: Informal Settlements in Nokeng Tsa Taemane**

| Settlement name | Relocation property |
|---|---|
| **Plot 123 Leeuwfontein 299 JR** | |
| **Plot 174-175 Kameeldrift 298 JR** | plot 174 and 175 Kameeldrift 298 JR (17 Hectares) |
| **Steve Bikoville** | |
| **plot 78 Dewagensdrift** | plot 79 Dewagensdrift 417JR (21,4 hectares) |
| **Donkerhoek** | |
| **Rust de Winter** | |
| **Onverwacht-Ellison Steinberg** | |
| **Refilwe Hostels and Refilwe Informal Settlements** | plot 80 Oog van Boekenhoutskloof Alias Tweefontein 288 JR (75 Hectares) |
| **Phumzime** | plot 137 Elandshoek 337 JR |

Large scale development in the City of Tshwane bordering Dinokeng is evident along the Zambesi road towards the east, into the Nokeng tsa Taemane area. According to the strategy, growth in the north of the City is probably most profound, as this is a critical point

of entry into the Province and the City. The City is also growing eastward, as Mamelodi is an area of choice for those who want to be closer to their work.

The City of Tshwane and the municipalities on its borders experience population growth in areas close to economic activity, mainly along major routes. In an attempt to be close to economic activities, growth in settlements along the N1 and growth of informal settlements on the periphery of City of Tshwane occur and is expected to continue. Settlements removed from economic activities are growing, and it is likely that these inhabitants will not escape the poverty cycle.

There are residential estate developments occurring within the area classified as Roodeplaat Nature Reserve. These developments were approved by the municipality and GDACE for formalisation of land parcels around the dam.

The major areas where development planning for the Dinokeng area differs between the two authorities are -

- There is a lack of shared agreement between the Provincial Government and Nokeng tsa Taemane Local Municipality as to the boundaries of the Dinokeng project area and the nature of development to be permitted;

- The local authority and provincial government have different views on the nature and extent of urban development to the south of the Roodeplaat Dam and the railway line. The district and local municipalities have recognised the area to the south of the railway line as an urban development area, and have included it as such in the respective spatial development frameworks. The provincial government on the other hand looks to restrict development in this area;

- The proposal of the local municipality to allow urban development along Cullinan Road (R513) between Roodeplaat Dam and Cullinan as part of a new proposed consolidated spatial development framework for the southern part of Nokeng tsa Taemane is in conflict with the Dinokeng development framework, and will need to be jointly resolved between the two parties concerned; and

- The standards and parameters for the subdivisions of farm portions throughout the Dinokeng project area differ between the various development frameworks. Generally speaking, the municipality allows for smaller subdivisions than that proposed by the Dinokeng development framework.

#### 3.3.5.2 Management objectives (desired state)

The entire area covered by the Dinokeng project should comprise a single ruling spatial development framework that is jointly owned by the provincial, district and local authorities. This framework must be approved by the local authority and as such have legal standing as part of the municipality's integrated development plan.

Until such time as a single framework exists for the entire Dinokeng area, the efficient and sustainable management of the area from a development perspective will be compromised. This spatial development framework should-

- Look at the inherent development potential of particular areas for economic and residential development and make appropriate development proposals for those areas, in line with the principles of the National Spatial Development Perspective;

- Find an appropriate development solution for the area to the south of Roodeplaat Dam, taking into consideration the local as well as regional context of the area, both from an environmental and economic development point of view;

- Develop standards and parameters for subdivisions in the rural environment; and

- Look at existing rural settlements and how those should be dealt with to provide rural housing opportunities.

Divided zones and urban sprawl should not be created. By implication, incompatible land uses must be identified timeously, and appropriate decisions or solutions identified.

The development of more housing estates, housing for different socio-economic classes, accommodation and facilities should be assessed in the broader context of the project. The success of the project will be at risk when a smooth, integrated spatial development is not achieved and habitat and natural resources are inadequately protected to sustain the intrinsic characteristics of the area.

The construction and operation of accommodation, visitor centres, infrastructure, and other services has a direct impact on the environment, e.g. vegetation removal, animal disturbance, elimination of habitats, impacts on drainage, pollution etc., and the sense of place of the area. The number of visitors allowed in the reserve should be determined and should inform the spatial framework. These numbers should be such that a balance is created between the economic, natural and social environment.

It is generally proposed that the majority of future residential and economic development in the region be promoted along the Moloto route. The intention is that the Moloto route should serve as a local activity spine to Thembisile. At a more detailed level the bulk of growth and development initiatives should also be focused towards the western portion of the Moloto route, which includes the settlements of Moloto, KwaMhlanga, Enkeldoornoog, Vlaklaagte and Tweefontein. The census figures indicate that there is a trend for settlement to concentrate in this area rather than further towards the east. The main reason for this is the fact that this is the part of Thembisile nearest to the economic activities of Gauteng Province (Thembisile IDP, 2007/2008).

Urban development west of Rayton towards Roodeplaat direction is also encouraged, whilst further development east of Rayton, Zonderwater Prison and north of Refilwe is discouraged. Development along the transportation links between Rayton and Cullinan also appears inevitable. The issue of development to the south of the Roodeplaat Dam can be turned into an opportunity if it is dealt with correctly. There is a need within the hierarchy and typology of residential opportunities permitted and provided for in an urban area to also make provision for low density, estate type living for people who want to be closer to a rural environment but yet have functional linkages with the urban environment. These developments typically take place on the periphery of the urban areas, close to the rural areas, as is the case with the location to the south of the railway line. Having a permanent residential population on the doorstep of the Roodeplaat Tourism Hub could be beneficial for the Hub from an initial viability and economic sustainability perspective. One of the proposals made as part of the Dinokeng proposals was the development of a boardwalk type development along the Roodeplaat Dam. Such as development, along with many of the recreational facilities envisaged around the dam could only benefit from a regular customer base. However, what is important is to retain the environmental integrity of the dam itself and not permit any development to the north of the railway line, to only permit very low

density developments to the south of the railway line, and to have detailed planning and design framework for the area that protect aspects such as visual corridors, vistas, gateways etc.

Refilwe is considered to be an area that has tremendous potential for so-called township tourism. There is already a proposal to redevelop the main access route into Refilwe as a vibrant activity street with a strong focus on tourism. Investment is however required to kick-start this development.

The northern and eastern parts of Nokeng tsa Taemane Local Municipality are however reserved for agriculture, and non residential uses should be limited to tourism, eco tourism and agriculturally oriented uses. Agricultural activities within the DGR will cease once the reserve is fully functional.

The focus on the provision of housing should not only be on housing delivery but also on housing development with a greater positive impact for the residents to be able to sustain their livelihood within that particular locality. Future housing delivery and development should take place within the vicinity of social facilities and economic opportunities to make it easier for the community to easily commute in order to obtain the services and employment opportunities.

When all the Townships have been completed and taken up, the number of households in the municipality area may double in the next five to ten years. Housing developments for the next 10 years will centre on the 3 primary urban nodes of Rayton, Refilwe and Cullinan, as well as Onverwacht Settlement:

- Low income housing (with efficient basic service delivery) for Refilwe Township (1607 houses);
- Middle to higher income housing for Rayton and Cullinan (761 houses). Recent trends indicate the need for housing in Rayton could grow even more as it is an increasingly popular area for those working in Tshwane; and
- 79 houses for Onverwacht.

There must be a match between where people are located and where economic activities are taking place. Opportunities are created locally through the informal and small business sectors, which do not require high education and training levels. An increase in the local population will result in an increase in the local economy and productivity increases, which in turn creates job opportunities as the demand for certain services increase. By implication, the Spatial Development Frameworks of municipalities should reflect this in a co-ordinated manner, and be adhered to. Infill development should the focus, whilst the urban edge concept is used to determined and manage urban sprawl.

The necessary support must be put in place to manage an increase in income generation through rates and taxes and to execute and financially manage maintenance.

Developments must be controlled in a manner that does not detract from the chosen sense of place, as this will assist in increasing tourist numbers to the area. The development of Cullinan and other tourism areas must similarly take place within the broader context of Dinokeng.

Lastly, all land tenure problems must be solved in order to ensure security of tenure and to unlock the value of developable land.

*Subdivision*

The subdivision of farm portions will have to be standardised into a single subdivision policy for the area, which is approved by the local municipality and hence will have the necessary statutory powers. A common understanding of what is feasible from an agricultural as well as conservation point of view needs to be achieved and agreed on since it is clear that there is a discrepancy between what the local authority is prepared to approve and the minimum standards set by the Dinokeng Framework. The local municipality is for example prepared to support subdivisions up to 20 hectares in the northern part, whereas the Dinokeng Framework proposes a minimum of 50 and 100 hectares in the two northern sub-regions.

Smaller subdivisions such as one and two hectares should be permitted around existing urban areas, to act as transition zones between the urban and rural areas and also to provide rural lifestyle opportunities in the area. In the remainder of the area only large subdivided portions should be permitted, the exact parameters of which should be agreed on between provincial management authority and the local government.

Subdivision of properties has the potential to unlock economic development and potential, but only if the local service infrastructure can accommodate the resultant densification, and new investment can be captured in the local economy. Creating low-cost properties for commuters from urban centres, for example, is not an economically sustainable solution as the excessive commuting places additional strains on the local roads infrastructure, without commensurate compensation in the form of local cash spending and rates collection.

The Local Authority(ies) therefore needs to do a strategic assessment of the subdivision policy, in order to determine where and how subdivision should be allowed. The findings must be reflected in the SDFs. The size and structures of sub divisions must be determined according to land use planning standards and the level of municipal services that can be delivered. In respect of all developments, sub divisions included, appropriate standards of engineering services must be adhered to.

3.3.5.3 Legal and policy requirements

*General legislative framework*

There exist a multitude of legislation and policies which govern development planning and land use management in South Africa and in Gauteng. The most important of these, which have a bearing on the nature of development planning in Dinokeng, are –

- The Chapter 1 Principles of the Development Facilitation Act, 1995;
- National Environmental Management Act, 1998 (Act 107 of 1998);
- Gauteng Planning and Development Act, 2000 (Act 3 of 2000);
- National Spatial Development Perspective; and
- White Paper on Spatial Planning and Land Use Management, 2001

In terms of legislation, municipal planning is a function of the local municipality. The agreement and cooperation between the local municipality and provincial government insofar as jurisdiction and management is one of the issues that need to be resolved in order for Dinokeng to be a success.

Planning and policy principles that should be applied are as follows:

- Land development must support and facilitate economic growth and development that will contribute to a reduction in unemployment and halve poverty;
- Government investment must therefore focus on areas with economic growth potential;
- Land development must take place in an integrated manner, both spatially and institutionally;
- The use of existing resources and infrastructure must be optimised;
- Urban sprawl must be discouraged and more compact and efficient cities must be promoted. To this end, development must be channelled into nodes and corridors;
- Historically distorted development patterns must be corrected by means of physical and social integration and the redirecting of investment to areas of highest value and accessibility;
- The creation of socially and economically viable and sustainable human settlements must be ensured;
- Land development must support public transport infrastructure and services;
- Economically, socially and environmentally sustainable development must be encouraged;
- Integrated land development in rural and urban areas in support of each other must be promoted; and
- Environmentally sustainable land development practices and processes must be encouraged.

*DFA*

The Development Facilitation Act contains numerous provisions relating to environmental issues and protection. The Act is underpinned by a set of "general principles for land development and conflict resolution" that apply to the state and local authorities alike and act as guides to administration of all land use plans and serve as guidelines for authorities in the carrying out of their administrative land development functions.

The principles *inter alia* states that all land development policy, administrative practice and law should promote both efficient and integrated land development in that they encourage environmentally sustainable land development practices and processes as well as sustainable land development at the required scale. Sustainable protection of the environment should also be promoted.

*Local Spatial Planning*

The Local Government: Municipal Systems Act requires of municipalities to compile and maintain Integrated Development Plans and Spatial Development Frameworks. In the Dinokeng area, Local Spatial Development Frameworks exist for Roodeplaat as well as the Cullinan/ Rayton area. On top of that, Metsweding has its own SDF which can be considered a regional SDF. These outline the general spatial planning for the study areas, and the relationship between municipal infrastructure, land uses and future expansion areas.

The act and approved planning documents however also place burdens on the relevant municipalities in terms of commitments to service delivery and infrastructure development.

The most pressing issues that emerge from the comparison of the Dinokeng Framework with these planning frameworks are:

- Common understanding and agreement on the boundary of the Dinokeng project. area and the nature of development to be permitted needs to be established. The Nokeng tsa Taemane Local Municipality considers the Dinokeng project area to cover the area to the north of the Moloto Road, while the Gauteng Provincial Government has included the whole of Nokeng tsa Taemane;

- Pressure for proposed urban development to the south of the Roodeplaat Dam and the railway line is perhaps the greatest area of challenge in terms of land use planning and development. Both the Metsweding District Spatial Development Framework and the Nokeng tsa Taemane Rural Areas Spatial Development Framework have indicated this area as an urban development area but it is excluded from the Gauteng Urban Edge. This also then impacts on the proposals made by the Metsweding Municipal Housing Development Plan, which have proposed settlement development in this area. This area is generally seen to be an extension of both the Zambesi and Platinum Development Corridors in the adjoining Tshwane municipal area, and the urban development is an extension of the developments to the east of the N1; and

- Smaller areas of contradiction, which can readily be solved through discussion and joint decision, are the boundaries of the remaining urban development areas, the standards for subdivision of farm portions, the location of rural service centres and the nature of land uses permitted in the rural areas.

The developments around Cullinan and Rayton are logical expansions of the main towns, and it is desirable for growth to occur in these areas to prevent stagnant and dying towns. However, in terms of the Gauteng Spatial Development Framework, 2001, these towns should not extend into the rural areas. There are clear urban development boundaries which have been demarcated for both towns by both the provincial urban edge as well as the Nokeng tsa Taemane Urban Areas Spatial Development Framework. As long as these boundaries are enforced, urban sprawl should not be an issue in these areas.

It should be kept in mind though that the Demarcation Board has published a notice in Provincial Gazette on 29 May 2008, indicating a general support for the new proposed demarcation of municipal boundaries in Gauteng whereby most of the Metsweding District Municipality will be incorporated into the City of Tshwane after the 2011 municipal elections. If this incorporation goes ahead, it means that the decision making and planning authority for the Dinokeng Project Area will in the future rest with the City of Tshwane.

*Specific spatial plans*

The "*Thembisile Vision - Vision 2014"* which is relevant to the **Thembisile** IDP process indicates, amongst other development guidelines, the following:

- By 2008 no village household should not have access to clean potable water;
- By 2010 there must be decent sanitation for all, and in Mpumalanga all bucket systems must be eradicated by the end of 2005;
- By 2012 there must be electricity in all households;
- By 2014 poverty, unemployment and skills shortages should be reduced by 50% respectively; and
- By 2014 improved services to achieve a better National Health Profile and a reduction of preventable causes of death including violent crimes and road accidents, should be achieved.

Further guidance on immediate environmental priorities states that:

> *"First priority should be to focus on the areas around the Moloto road to clear litter dumps as 90% of all visitors to Thembisile drive along this route. Secondary to the above the refuse removal service should then be expanded to the various residential areas. As far as Environmental Management is concerned, the municipality should compile an Environmental Management Strategy for the area to regulate and manage mining and agricultural activities, drain waterlogged areas where urban expansion is required, and also to investigate the possibility of expanding the existing nature reserves to form one, comprehensive Regional Open Space System (Thembisile IDP page 77)."*

The **City of Tshwane IDP** (2006-2011 pages 16-29) provides the following planning parameters:

- *"As far as bulk infrastructure and services are concerned it is generally accepted that Tshwane is well served, but, is struggling to cope with growing demand for new infrastructure, whilst also, having to upgrade ageing infrastructure.*
- *Storm water and flood management is a critical component of urban development as it can contribute significantly to human suffering and loss of life. A little more than half of all roads in the City have storm water drainage systems, which spatially, are located in the formalised urban areas. The peripheral areas are lagging behind accounting for a backlog estimated at R 1, 2 billion, of which R1 billion is required in the northern areas alone. In addition, a large percentage of the current storm water drainage system is under capacity due to densification trends and outdated design criteria. Addressing the enormous backlog in storm water drainage, in especially the northern areas, is extremely urgent.*

- *Water provision ranks as one of the most primary services to be provided by a municipality, as it is a basic need for living and a critical component in achieving a measure of healthy living. It is estimated that there are presently almost 29 000 households in Tshwane without access to a basic level of water service, and almost 96 000 households without a basic access to sanitation. It evidences, that the City struggles to provide adequate water infrastructure to its residents which are growing at a rapid rate.*

- *Targets have been set to ensure that 100% of households have access to basic sanitation facilities.*

- *Electricity is primarily supplied by the City, although peripheral areas to the north and south-west are supplied by Eskom. Urban expansion, economic development, population influx and increase in household demand, have placed enormous pressure on power supply, so much so, that the City can barely cope with meeting status quo demand. In addition incorrect load forecasts for Centurion have led to an insufficient supply in the area resulting in power supply interruptions. While statistics do not necessarily show the shortfall, the IDP needs analysis reveals that residents are widely dissatisfied with existing service delivery. Concerns / needs include electricity outage, insufficient supply, illegal connections, lack of street lighting and cable theft leaving residents in the dark. Of all needs identified in the IDP process, electricity needs rank the highest (viz. prevalent within most wards).*

- *The City is currently impacted by various pollution sources and large quantities of liquid and solid hazardous and non-hazardous waste. This pollution impacts on water, air and land. The appropriate management and prevention of this pollution is vital to ensure clean and healthy living. The needs analysis has shown that waste management, viz. illegal dumping, proper service provision and the re-cycling of waste are prevalent community concerns.*

- *In dealing with all sub-sectors of bulk infrastructure and service provision the City's strategic objective is to "provide quality basic services and infrastructure" in terms of which it has listed the following key performance areas:*

    - *Eradicate / reduce infrastructure backlogs;*
    - *Provide quality infrastructure for growth;*
    - *Ensure maintenance of existing infrastructure;*
    - *Ensure optimal resource utilisation;*
    - *Formalise informal settlements*
    - *Explore alternate sources of energy (non-conventional); and*
    - *Optimise labour intensity and community involvement."*

The **Nokeng tsa Taemane** IDP (Review 2008-2009) reflects on the need to ensure basic services and hopes to address these shortages through the various departments' goals driven plans that include:

Economic development goals:

- To facilitate the diversification of the formal economic sector.
- To facilitate local economic development by giving expression to Government and Provincial Local Economic Development Initiatives.
- To facilitate community economic development programmes.
- Marketing the Nokeng tsa Taemane Local Municipality.

Environmental goals:

- To ensure the sustainability of both the natural and built environment of the Nokeng tsa Taemane Local Municipality.
- Preserve the ridges and valleys within the Nokeng tsa Taemane Local Municipality.
- Recognition and support of private and public environmental organisations and initiatives.
- All residents must be incorporated into a formal waste removal system for the different types of waste generated.
- Unacceptable pit latrines and providing waterborne sewerage to all households in the next 5 years.

Tourism implementation plans:

- Dinokeng initiative: Promote tourism to unlock potential.
- Eco-tourism centre may possibly be considered as part of Dinokeng initiative.
- Dinokeng initiative should be supported and accommodated as far as possible.
- Gateways into and through towns not maintained.
- Stations at Rayton and Cullinan are not optimally utilized.
- No basic skills training facilities within the area.
- Employment initiative required in the entire area.
- Investigate Indigent Policy to assist people who cannot pay for services.
- Potential for economic development must be unlocked.
- LED funding must be accessed through business plans.

*Provincial Planning*

Gauteng Province Department of Economic Development (DED) is responsible for planning on a provincial level, and have initiatives such as the Gauteng Spatial Development Framework (GSDF) and Urban Edge project that determine and shape the overall economic development in the province. The Dinokeng Project forms part of the overall development strategy of Gauteng both in terms of the spatial development planning that accommodates the initiative, but also in the sense that the Dinokeng Project management authority functions as a part of the Department of Economic Development. The provincial planning frameworks are aligned with the Dinokeng initiative, and no areas of contradiction have been identified.

The only sticking point is the provincial Urban Edge which is a discrete development boundary that is intended to contain urban development within designated urban areas. The demarcated urban edge (revised in 2007/2008) follows the N1 Highway and Magaliesberg mountain range, which excludes the whole of the Dinokeng Municipality (except for local islands around Rayton, Cullinan and Refilwe). This is particularly problematic as it disregards the existing mixed use nature of the area around Roodeplaat Dam, as well as the LSDF for the greater Roodeplaat area.

Recommendations from the DED have indicated to the Metsweding, Nokeng and Kungwini areas that they must compile a single consolidated SDF for the Metsweding area, as opposed to three different and overlapping plans. There is, however, no recent concrete provincial planning framework applicable to the study area. The Gauteng Spatial Development Framework (GSDF) dates from 2000, and is currently in revision, with the GSDF Perspective and G2055 Vision not specifically engaging on the areas as it is a non-critical component of the Gauteng economy and not part of the development core.

*Mining*

Existing mining activities are regulated through the Mining and Petroleum Resources Development Act. They are required to comply with the permits issued, and environmental management programmes associated with the authorisations.

NEMA, NEM:PAA, NEM:BA and NHRA provide various legal instruments which could assist in the regulation of mining activities in the Dinokeng area.

The NEM:PAA provides for the control and limitation of activities in protected areas. The level of protection varies according to the type of protected area. Therefore, the Dinokeng Project could use one of the instruments to enable the control and limitation of mining activities in the Dinokeng area. The NHRA and NEM:BA also provide for similar provisions in terms of heritage resources and biodiversity management, which could also be used by the Dinokeng Project to limit mining developments in the area.

Currently the EIA regulations are not applicable to mining activities. However, proposed amendments to the EIA regulations propose to include mining in the spectrum of activities that require EIA authorisations in terms of NEMA.

Until such time as a legal mechanism is in place to regulate mining activities from an environmental perspective, the Dinokeng Project Team should review and comment on the environmental management plans and programmes of proposed mining developments in or around the Dinokeng area.

#### 3.3.5.4 Development parameters

Infill should be the focus in the Dinokeng area, and urban/rural sprawl should not be encouraged. Should the population grow to a point where infill is no longer possible, then development should not occur in areas identified for possible future integration into the DGR. Instead, expansion areas can be located between the Cullinan road and the N4, to the east of Moloto, around Mkhombo Dam (outside any conservation areas) and west of the N1. These areas should then be developed for mixed residential development to ensure that people from all levels of society have access to housing. Both high-end and low-medium cost housing should be located close to main routes and economic activity, e.g. Mamelodi, Hammanskraal, and Pretoria.

Lifestyle estates should also be focused in these areas close to the N1 and N4 in order to reduce their cumulative social and environmental impacts. As a mitigation measure, lifestyle estate developers should build a number of low-medium cost houses in an area demarcated by the municipality. It also goes without saying that no housing developments should be allowed within the DGR.

However, no lifestyle developments should be allowed until the Municipalities have adequately assessed the state of, and planned their targets for, services delivery.

Proposed DGR accommodation nodes (inside and outside of its borders) must complement the ambience of the DGR. For example casinos, fun fairs, shopping malls and large hotels should not be considered for the area. Initially, proposed accommodation nodes should comply with the current DGR spatial plans in terms of where nodes are located.

The land around Roodeplaat dam should not be further developed for lifestyle estates, or other types of housing. The focus should be on tourism activities and facilities in support of the larger Dinokeng project.

Agricultural land should not be densified (in terms of property sizes and population), especially not to the east and north of the DGR. Densification should only be allowed if clear confirmation is provided that it will encourage sustainable small scale farming.

The following interventions are proposed:

- The Municipal Housing Development Plan for Metsweding District Municipality must be reviewed to deal with strategic issues such as land identification for housing development as well as addressing pertinent issues of mixed income housing developments;

- A buffer area round the DGR has to be determined to ensure that encroachment on the DGR borders is managed. Applications for development plans in the core area and buffer area have to go through one responsible body to ensure integrated management between different municipalities;

- The way in which the municipalities will work jointly with GDACE and GDED to manage the area must be formalised, potentially through means of a committee with representatives from the different municipalities, stakeholders and GDACE;

- The urban edge must be determined to manage growth. Consideration must be given to the development trends and the ability and capacity of the municipalities to manage such growth;

- The standards for subdivisions throughout the Dinokeng project area will have to be standardised into a single subdivision policy for the area, which is approved by the local municipality and hence will have the necessary statutory powers. A common understanding of what is feasible from an agricultural as well as conservation point of view needs to be achieved and agreed on;

- Agreement should be reached between the Dinokeng project and the Department of Minerals and Energy with regard to the issuing of licenses for mining in the Dinokeng area;

- An influx management plan;

- A Fire Management Plan; and

- An increase in crime should not be tolerated. Should an increase be evident, steps should be taken to increase the capacity and capability of the police services.

To monitor and manage potential impacts as a result of the DGR, all applications for development and planned developments should be communicated to the local communities via most often used local communication vehicles. All EIAs should prove that they have used these channels of communication. A formal grievances procedure should be set up as part of an ongoing participation process.

### *3.3.6 Individual Land Uses*

#### 3.3.6.1 Nature Reserves

*Current State*

The Roodeplaat Dam and Nature Reserve contains abundant fish, bird and mammals including larger game species such as aardvark, Burchell's zebra, kudu, waterbuck, warthog, impala, blue wildebeest, common duiker and steenbok. Over 170 bird species have been recorded around the dam and nature reserve. The Rust de Winter Nature Reserve contains suitable habitats for several mammal, bird, reptile and amphibian species. Other nature reserves include Leeuwfontein as well as Mdala Nature Reserve and Mkhombo Dam area. The various conservation areas have their own particular legislation and policies that ensure the area's protection, namely that conservation interests should supersede individual interests.

Two other areas of particular concern are farms in the Rynoue agricultural holding and those in/adjacent to the Buffelsdrift Conservancy.

*Management objectives (Desired State)*

Biodiversity conservation forms an integral part of the core project focus namely a nature-based tourism economy. Conservation planning and management therefore needs to maintain and enhance the state of the natural environment found in Dinokeng. All areas demarcated by the Provincial Conservation Plan as 'Irreplaceable' or 'Important' must be conserved, along with ridges and watercourses. This will ensure that viable and connected units of sensitive habitat remain in the area.

Adequate and responsible management of existing nature reserves that includes carrying capacities (game numbers), fence repairs, the implementation of a natural fire regime as

well as an alien vegetation removal programme is required for each reserve area. The reserves must also form part of larger conservation networks in order to reduce the fragmentation of ecosystems and habitats, and maximise the resilience of those systems.

Formal conservation status must be assigned to the DGR.

#### 3.3.6.2 Conservancies

*Current State*

Conservancies are valuable resource protectors and have established a good record in the conservation of natural habitats as well as threatened faunal species. Various conservancies are identified and described within the Dinokeng Integrated Tourism Framework (DITF), namely:

- Amakulu Conservancy
- Kameeldrift Conservancy
- Leeuwkloof Vallei Conservancy
- Bobbejaansberg Conservancy
- Brandbach Conservancy
- Cullinan Conservancy
- De Tweedespruit Conservancy
- Seringveld Conservancy
- Buffelsdrift Conservancy and Buffelsdrift Game Reserve

*Management objectives (Desired State)*

The potential exists to integrate individual conservancies into the larger tourism network for the DPA. The increase in land under conservation would be of a direct benefit to the conservancies as well as associated migratory animals. However, it would mean that management of the conservancies would have to become part of a broader management plan of the area as a whole and the co-operative relationship between GDACE and Blue IQ and the conservancy owners would have to be extended and reinforced.

Conservancies are recognised under provincial associations (e.g. Gauteng Conservancy Association) and a national body (National Association of Conservancies of South Africa). These bodies provide support to their member conservancies in the form of organisational support and the formation of a peer support network. They also have resources available for prospective or existing conservancies that include general guidance on establishing and running a conservancy, as well guidance on conservancy management planning. These information sets can be accessed at www.nacsa.org.za.

#### 3.3.6.3 Residential

*Current State*

The following forms of residential development can be found in Dinokeng:

- Residential developments in Cullinan and Rayton towns;
- Residential development to the south of Roodeplaat Dam, mostly in the form of new residential estates;
- Rural residential, ranging from agricultural holdings to farm houses on large farm portions;
- Rural villages; and
- Informal settlements.

There is a clear concentration of settlements along Moloto Road, around the dams and in the southern and south-eastern part of the study area. The larger formal settlement areas can be found in the southern part of the study area, namely Cullinan, Rayton and developments around the Roodeplaat Dam. Throughout the rest of the project area there are a few dispersed rural villages and informal settlements. The residential developments to the south of the Roodeplaat Dam are the result of outward expansion of the built-up areas in the Tshwane metropolitan area, and the functional relationship of these areas is with Tshwane and not so much Nokeng tsa Taemane. Currently, the rate of growth in the informal settlements outside of the major settlement area in the Nokeng tsa Taemane area is not as large as it is in the metropolitan areas, and the informal settlements are generally small.

The urban sprawl extending from the Tshwane municipal area across the N1 along Zambesi Road to the south of the Roodeplaat Dam is the most contentious area as far as planning and development are concerned. This area is close to the Roodeplaat Dam, which is one of the major tourism hubs of the Dinokeng project, and as such the vision of the Dinokeng Framework is one of high natural environmental quality and tourism facilities.

Up to 21% of the households in Nokeng tsa Taemane and surrounding municipalities live in informal dwellings on individual properties. Of Nokeng tsa Taemane's households, approximately 15 500 (20%) households live in informal dwellings. The reduction of informal dwellings is occurring at rate lower than 1.0% per annum (from 2001-2007). In addition, there are ten (10) informal settlements within the Nokeng tsa Taemane Local Municipality that require intervention. Inadequate housing negatively affects habitat and natural resources, as well as air quality.

*Desired State*

Residential expansion from the Tshwane metropolitan area around Mamelodi and Zambesi Drive into Nokeng tsa Taemane is a reality that requires a sustainable management strategy. The nature, density and intensity of residential development that may be permitted in these areas as well as a realistic urban development boundary that takes both environmental conservation and development needs into consideration needs to be determined. From a development planning perspective, the railway line could act as such a development boundary, with only low density developments permitted to the south of the railway line. A

detailed planning and design framework is required for the area which would ensure that aspects such as visual corridors, vistas, gateways etc. are protected.

Residential uses must be directly related to the economic activities in the area in order to ensure economic sustainability over the long term. This implies that the residential uses should be clustered around service centres or attached to tourism or farming activities, except in the far South Western corner where it will necessarily represent an expansion of the Tshwane urban complex. Residential uses that require extensive commuting to the urban centres must be discouraged, as should 'lifestyle estate' developments that can not show evidence of sustainable and high quality local economic investment. Housing estates must be planned and managed in accordance with the spatial development frameworks of the municipalities.

The number of informal dwellings should be monitored. Informal settlements need to be managed to prevent further expansion, whilst in-situ upgrading should only take place where these informal settlements are part of or adjacent to an existing urban environment. Families living in informal settlements located in rural areas should be relocated to housing developments in either urban areas or defined rural settlements, where such families are employed within the rural environment. Should growth in informal settlements be evident, relocation should be facilitated to areas where services are readily available, and an increase can be handled. These areas should primarily be along the N1, in the Hammanskraal area and on the northern border of the COT (west of the N1). An influx management plan should be developed and used as a guideline.

There are residential estate developments occurring within the Roodeplaat Nature Reserve area (Nokeng tsa Taemane Draft IDP Review, 2008/2009) and they are seen as directly in conflict with the overall development vision of a nature-based tourism experience. These developments were approved by the municipality and GDACE for formalisation of land parcels around the dam. There is a need therefore, for the municipality to work jointly with GDACE to manage the area. According to the municipality, further subdivisions within the proclaimed area must be curbed and the existing development footprint must be maintained (Nokeng tsa Taemane Draft IDP Review 2008/2009).

Both the eradication of informal settlements and the need for accommodation of new residents will require urban expansion and housing development. Nokeng tsa Taemane LM has approved 13 Townships and there are 12 under consideration. It has been estimated that to date, these proposed developments constitute 1 177 hectares of developable land with an estimate yield of 29 425 erven. This implies that when all the Townships have been completed and taken up, the number of households in the municipality area may double in the next five to ten years. The Municipality therefore has to take tough decisions to allow for urban development or alternatively maintain the existing development form. Mixed housing developments should receive particular attention.

Housing developments for the next 10 years will centre on the 3 primary urban nodes of Rayton, Refilwe and Cullinan (Onverwacht settlement has also been included):

- Low income housing (with efficient basic service delivery) for Refilwe Township (1607 houses);
- Middle to higher income housing for Rayton and Cullinan (761 houses). Recent trends indicate the need for housing in Rayton could grow even more as it is an increasingly popular area for those working in Tshwane; and

- 79 houses for Onverwacht.

The IDP (Review 2008/2009) maintains the proximity to Moloto should be perceived as strength, because of the large population and potential market base in that area on the periphery of Nokeng tsa Taemane.

In terms of densification and development (Nokeng tsa Taemane IDP 2008 and Metsweding Draft IDP 2006-2011), the following is noted:

- Urban development within the western part of Rayton towards Roodeplaat direction will be encouraged, and further development in the east of Rayton, Zonderwater prison and north of Refilwe will be discouraged;

- There are various local economic development opportunities that may arise out of the Agricultural Hubs that have been identified. The municipality should work jointly with National Department of Land Affairs to package a programme for small farmers' assistance; and

- The Nokeng IDP proposes that an investor be approached to establish a resort. The proposal is that the resort be linked to a game farm, hunting activities and a hotel.

Based on the municipal housing waiting list the current housing need and demand within Bela-Bela is estimated at 2 100 for the low income earners and 400 for the middle income earners. The current housing projects that are targeting to address housing backlogs for the people within these categories are listed below:

- Bela-Bela Extension 7 – 350 residential stands;

- Radium – 350 residential stands;

- Pienaarsrivier – 68 residential stands;

- A service provider has been recently appointed to unblock the blocked projects i.e. Lesedi project (280), Hostel (30), Pienaarsrivier (50) and Spa Park (70); and

- The other projects that are still at the proposal stage include SPA Park, Bela-Bela Extension 8 (900 residential stands) and Bela-Bela Extension 9, the remainder of portion 25 of the farm Het Bad 465 KR, GholfBaan Park, Apiesdoring Park(erf 1067 Warmbath Ext 5) and part of the remainder of erf 655 Warmbath Proper.

The Bela-Bela IDP (2008/2009 page 29) aims to provide housing with the following guidelines in mind:

> - *"The focus on the provision of housing should not only be on housing delivery but also on housing development with a greater positive impact for the residents to be able to sustain their livelihood within that particular locality. This implies that the future housing delivery and development that takes place within Bela-Bela should be incorporated within the vicinity of social facilities and economic opportunities to make it easier for the community to easily commute in order to obtain the services and employment opportunities.*

- *The provision of housing should be an integrated approach to development using the delivery of shelter as a primary focus but including amongst other things basic service delivery (i.e. potable water, appropriate sanitation and access to electricity), obtaining or upgrading of land tenure rights, ease access to adjacent community and economic services, job creation plus skill transfer (i.e. during construction stages) and the outcomes should also build self esteem by the end users."*

#### 3.3.6.4 Mining

*Current State*

The Metsweding district is rich in minerals, particularly alluvial sand, alluvial diamonds, clay and stone, and mining activity occurs across Dinokeng, ranging from small, often illegal, prospecting operations, quarries and sand mining to large, well-established and productive mines. There are currently over 200 of mines operating in the Dinokeng project area most of which are sand, clay, stone and gravel mines. This includes the Cullinan Diamond Mine which is also a significant tourism anchor.

However, whilst mining clearly plays an important economic role in the area (contributing 20.5% of Nokeng's Gross Geographic Product in 2004[2]), it also threatens to undermine the tourism potential of Dinokeng, unless carefully managed. Of concern is the visual and physical scars left on the environment by open cast/pit/riverine mining activities which have long-term effects, especially on the ecology and industries such as tourism and agriculture.

Mining operations not only impact on the vegetation and ecosystem, but also impact on the road system and aesthetic value of the environment. Mining activities such as mine dumps, slimes dams, quarrying and sand mining cause barren surfaces which are alien to endemic biota since very little (if any) natural vegetation is left after mining activities took place, especially if limited rehabilitation takes place. The rehabilitation of mines is often not attended to after they have closed down since they no longer provide any source of revenue, and often the species used for rehabilitation are not indigenous or endemic to the area. This type of environment is hostile to the indigenous fauna and only occasional strays may be encountered peripherally before thorough rehabilitation has taken place.

*Desired State*

Mining has as much a right to existence as other land uses, but only when the mining operations are conducted legally, and do not contribute negatively to the overall economic well-being of the local community. The mining activities in Dinokeng therefore need to be audited, and illegal mining operations dealt with as required by law. No illegal mines must be left operating in the area.

Should there be a cessation of mining activity within the project area it is very difficult to estimate overall job losses but is likely to be small compared to the overall job creation benefit of the Dinokeng Project. Provision must be made to absorb workers who lose their jobs as a result of the closure of legal mines into the DGR project (or similar).

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[2] Metsweding, 2006: Metsweding Local Economic Development Strategy.

The Department of Mining and Energy must consult the local stakeholders and consider the impact of prospective new mining activities on the local economy prior to allocating any new prospecting or mining rights.

Dormant mines, and mines that pose environmental and aesthetic threats must be rehabilitated. This is especially relevant for areas where tourism is envisaged, agricultural areas and areas where the biodiversity is threatened.

No new mining activities should be permitted in the Dinokeng project area, in particular in or near areas of high tourism potential, due to the detrimental visual impacts these mining activities have on the environment. This is particularly relevant for proposed new mining activities within any sensitive habitats including wetlands, rivers, ridges etc. Mining operations must therefore be operated strictly within the framework of comprehensive Environmental Impact Assessments (EIAs) and Environmental Management Plans (EMP) with strict control over the adequate rehabilitation of mining areas once the lifetime of the mine has expired.

All existing, legal mines must have an environmental management framework in place that addresses mitigating measures to address visual impact and a rehabilitation programme.

#### 3.3.6.5 Recreation & Tourism

*Current State*

According to the Integrated Tourism Development Framework (2001) for the DGR, the estimated Gross Geographical Product (GGP) for Dinokeng was approximately R137 million per annum in year 5 and R230 million in year 20, which represents about 2.5% of the GGP including the City of Tshwane. The Dinokeng Annual Report (2006) showed dramatically increased economic production with an estimated potential tourism spend of R3 million per day or 1.09 billion rand a year (at full capacity). This was a substantial increase from previous estimates and projections.

Tourism in the Dinokeng area currently takes the form of eco-tourism, business tourism (conferences and team building), recreation and heritage tourism. The eco-tourism is focused on the large number of game farms and lodges which are dispersed throughout the Dinokeng area. These lodges are also predominantly the focus areas for business tourism. Recreation activities include aspects such as nature trails, cycling, biking, golfing, boating and fishing. What is evident from the spatial distribution of the tourism facilities is the close relationship with the major routes in the area. This is an indication that accessibility to the tourism facilities is a major location decision factor. Cullinan town is also an important tourism destination in the area, with the focus being in heritage tourism and weekend getaways for residents of Gauteng urban areas.

A summary of tourism supply information (April 2008) provided by the Dinokeng Project indicates the following[3]:

[3] Please note that due to the dynamic nature of the tourism industry, these numbers should be used only as an indication of the size of the local industry, and not as an absolute reference. The situation in reality probably includes a number of establishments that have not yet been registered or graded.

- There are 274 diverse tourist attractions in Dinokeng contributing to a critical mass of offerings to interest visitors, including 60 graded establishments.

- Of these 274 attractions, 152 tourism attractions offer accommodation. There are 3 256 beds in 85 tourism attractions where the number of beds are known. The exact number of beds in 67 attractions is not known and is estimated at 2 546 beds based on an average of 38 beds per establishment after excluding outliers (Attractions with a disproportionately high number of beds in a category were excluded and the average calculated after exclusion). This makes an estimated total number of beds for the destination is 5 792.

**Table 3-4: Accommodation facilities**

| | |
|---|---|
| **Guest houses** | **40** |
| **Hotels** | 3 |
| **Self Catering** | 24 |
| **B&B** | 13 |
| **Country lodges** | 23 |
| **Game or hunting lodges** | 21 |
| **Camping & caravanning** | 17 |
| **Group camp** | 11 |
| **Total** | 152 |

- There are a total of 91 places to eat. There are 1 262 restaurant seats distributed between 24 restaurants where the number of seats is known. The exact number of seats in 67 places to eat is not known and is estimated at 52 seats per establishment making a total of 3 484 seats after exclusion of outliers (Restaurants with more than 100 seats were excluded and the average calculated after exclusion). The estimated total number of restaurant seats is 4 746 seats.

- There are 56 wedding venues with a capacity ranging from 15 to 1 500 guests and a combined total of 3 683 wedding and events seats.

- There are 78 conference venues with a capacity ranging from 18 to 500 participants.

- There are 2 488 conference seats distributed between 43 conference venues where the number of seats is known. The exact number of seats in 35 conference venues is not known and is estimated at 57 seats per establishment making a total of 1 995 seats after excluding outliers (conference venues with more than 200 seats were excluded and the average calculated after exclusion) and a combined total of 4 483 conference seats.

*Desired State*

Dinokeng forms part of an important linkage to tourism activities in the area and serves as a driver for further tourism development in surrounding areas. It is a major thrust in Nokeng tsa Taemane's economic development drive, and a number of job opportunities for residents are created, promoting investment in the area. In terms of the Metsweding District Municipality's Integrated Development Plan, 2007 – 2012:

> *"The 'new' economy in the region is Tourism. Existing visitor attractions, ranging from recreation-oriented activity at Roodeplaat Dam to mining and*

*heritage tours in Cullinan, also offer opportunities for further development. The types of opportunities are concentrated in adventure, eco-tourism, and cultural heritage tourism."*

The level of job creation in the area from tourism activity is already significant, with about 274 tourism attractions currently directly employing an estimated 3 388 permanent and 1 129 casual employees in the Dinokeng area. This number is likely to increase. In addition, further accommodation developments may only be allowed if the applicant is able to prove that access to infrastructural services is possible, and that this will not take from the needs of the current inhabitants/community.

Job creation should first of all focus on rural families. The aim should be to provide one tourism job per household. A census survey of all households in Nokeng tsa Taemane should be completed and updated annually for this purpose. This database of households should also be used to determine training needs. Developments should also provide jobs for at least 80% of the local community – in this respect a social and labour plan should be prepared and submitted. Alternatively, a business plan to assist with setting up and growing a local SMME should be submitted by the applicant and an annual report submitted to monitor and evaluate the success of the business.

The Dinokeng project is seen as an integral partner by both the District and Local Municipalities, providing a pivotal role in developing an eco-tourism industry in the area. It is envisaged that Dinokeng will create linkages throughout north- eastern Gauteng in support of eco-tourism and cultural heritage corridor development.

Tourism establishments must however be managed:

- in an environmentally sustainable manner especially in ecologically sensitive areas;
- according to a grading system and belong to a local tourism body;
- in a way that promotes a sense of isolation and adventure; and
- in accordance with the spatial development frameworks as well as the development of the DGR.

Most district and local municipality level development plans provide little guidance as to how, where and when preferred industries such as tourism will be developed and how this influences with other municipal activities such as town planning, development of facilities and infrastructure, and approval of projects and business activities. In order to support tourism industry development, provincial governments must assist local authorities in the development of concrete rules that support the industry related objectives of the Dinokeng project.

Following from the above point, coordinated economic development (in the form of industry related incentives and disincentives) across all affected provinces is key. The combination of a core Dinokeng project zone and buffer zones with restrictions or prohibitions on certain undesirable industries are important tools for the promotion of the tourism industry.

#### 3.3.6.6 Military

*Current State*

Several portions of land that form part of military facilities are present in the study area. Chief amongst these are the Wallmansthal and Ditholo training areas due to their strategic locations adjacent to the N1 and close to the Tshwane urban complex. Training activities include overpasses by heavy aeroplanes, live ammunition manoeuvres, and emergency response actions.

Some parts of Wallmansthal, Ditholo and the properties around Rust-de-Winter are the subjects of land claims which have not yet reached finalisation.

Environmentally speaking though, it appears as if the extensive training areas provide relatively well maintained and protected habitat due to the limited use of the natural resources on these properties as well as the limitations on access to the sites.

*Desired State*

The SANDF has expressed their concern regarding incompatible land uses encroaching onto their properties at Wallmansthal and Ditholo. Their activities include live ammunition training and low level overpasses by aircraft, as well as related activities such as fire fighting. Ideally, therefore, they require adequate buffer zones that will put all adjacent land uses out of harms way, as well as access routes and points that will allow for emergency responses. Some of their facilities are located within the DGR, and will need to be appropriately fenced so as to separate them from the surrounding game areas.

Land claims are present on the military areas, and these must be finalised and resolved in order to provide security to whoever emerges as land owner or beneficiary. This process, along with the drive for publicly-owned portions of the DGR might require that land be purchased from the military.

#### 3.3.6.7 Legal and policy requirements

All new residential development shall adhere to the principles of sustainable human settlements, as set out in *Breaking New Ground: A Comprehensive Plan for the Development of Sustainable Human Settlement*, as well as the applicable local design standards. Nokeng tsa Taemane, for example, requires inclusionary housing and mixed-use development plans for any sizeable development proposal.

Resident/community-based controls will be present in the conservancies. These might range from codes of conduct for day-to-day activities or design standards and criteria, to management plans for game within fenced-off areas. These governing policies must be adhered to and considered in development of the area.

Natural resource management on any property with sensitive elements such as watercourses or pristine grassland will be guided and controlled through the various pieces of environmental legislation. This includes Nature Conservation Ordinances, EIA authorisation procedures, CITES permits, CARA permits, etc.

As indicated in the Status Quo report, the current mining legislation does not provide adequate legal means (especially for the Dinokeng Project) to alter mining activities which have been duly authorised by the relevant authority, in the Dinokeng area. Some of the

legislation provides legal mechanisms for the management of environmental impacts from mining activities but these mechanisms do not fall under the jurisdiction of the Dinokeng Project itself. New mining activities may be controlled through the regulatory processes of NEMA, NEM:PAA, NEM:BA and NHRA. Current developments with regards to the EIA authorisation processes must be kept in mind though, as the 2009 proposed amendments make provision for a closer relationship between mining and environmental permitting, and an obligation to consider the recommendations of Environmental Management Frameworks, but at the same time the allocation of 'exemption' rights to the Minister of Mining and Energy.

The Dinokeng Integrated Tourism Development Framework (DITDF) provided a framework for environmental management and land-use development. The DITF consolidated enablers, critical issues, challenges and opportunities related to taking Dinokeng. Of relevance for the EMF are:

- Tourism research and information should not only be used for marketing and product development purposes, but to also inform and adapt the EMF. Not addressing the needs and expectations of tourists will negatively impact on the project. In addition, the detailed Social Management Framework developed by Grant Thornton (2005) should be considered in the development of the Environmental Management Framework;

- Infrastructure development cannot follow tourism growth, but must proceed in parallel if growth is to be sustained. Adequate infrastructure is critical to keeping the promise to visitors, and ensuring the quality of the visitor experience is maintained. The EMF should address best practice levels of maintenance to ensure that the impacts on the natural environment and on people's experience are minimized;

- The EMF should consider marketing issues. The EMF should ensure that it contains a framework within which the overarching theme of 'All of Africa' can be used as a marketing strategy, that the traditional African culture is maintained as well as the wildlife, landscapes and adventure industry;

- Ongoing capacity building and education within communities should be addressed. Incentives to stimulate Community Based Tourism (CBT) operations and the sustainable implementation of activities should be considered. The interdependence between environmental, communal, industry, economic and policy issues should be considered to ensure sustainable tourism development. The natural and cultural environment should be enhanced, while meeting basic human needs, promoting equity and resulting in an improved quality of life for all; and

- A formal monitoring plan is needed to give effect to a monitoring and evaluation programme. The EMF should be seen as a flexible document which may be adapted to pro-actively react to monitoring results.

#### 3.3.6.8 Management objectives

The Dinokeng Project must partner with the District and Local Municipalities, in order to provide a pivotal role in developing an eco-tourism industry in the area.

The provision of housing should be an integrated approach to development using the delivery of shelter as a primary focus but including amongst other things basic service

delivery (i.e. potable water, appropriate sanitation and access to electricity), obtaining or upgrading of land tenure rights, ease access to adjacent community and economic services, job creation plus skill transfer (i.e. during construction stages) and the outcomes should also build the self esteem of the end users.

If legal opportunities for formal and informal income generation are not created, and skills are developed to achieve income generation, the project will not be sustainable. It is recommended that several training programs targeted at residents are designed and implemented on order to maximise local positive impact. These programs should be based on the Dinokeng skills audit and should focus on:

- Providing practical skills to local matriculants in areas such as business, accounting, game ranging and guiding.
- Unskilled and semi-skilled hospitality related occupations.
- Entrepreneurs involved in Community Based Tourism (CBT) enterprises, small tourism focused shops and markets.
- Basic building, earthworks and construction activities.

Any employment initiated at all levels by the project should target local residents whenever possible. Integrated rollout of skills development programmes and recruitment is therefore necessary to ensure the success of local recruitment ventures.

As visitor numbers increase, so do the demands for basic services such as policing, fire, safety and health care should be met. The ability to carry increased costs and possibly higher tax burdens should not be exceeded.

Visitor management regulations should consider and manage the potential socio-cultural impacts (e.g. prohibitions on use of fuel wood). Local traditions should not become commercialized, and lose their integrity or authenticity.

Tourism information centres and facilities should not only serve as important conduits for dissemination of information to tourists should help to collect important information on the market trends within the area, including traveller demographics, product strengths and weaknesses and itineraries.

### *3.3.7 Infrastructure*

#### 3.3.7.1 Water

*Current state*

Over 80% of households in all the municipalities, except for Dr JS Moroka LM, have access to piped water inside the dwelling, yard, or outside the yard (Community Survey, 2007). Nevertheless, the water services backlogs within municipalities are still not at the desired state. For example, about 15 000 households in Nokeng LM need water services. For the majority of the municipalities, approximately 13.0% of their households have access to water

below RDP[4] standard. Although it is only 3.0% for the City of Tshwane, it is still a substantial number of people (approximately 50 000 people). There is a stark contrast between neighbouring municipalities DR JS Moroka and Thembisile: respectively 29.0% and 4.0% households are below RDP standard despite both being part of Mpumalanga.

*Desired State*

Getting to the desired state does not only require new infrastructure, but also requires an upgrade of the current infrastructure. The backlog also raises concerns about water availability and the availability of funds. For example, for Nokeng tsa Taemane LM it has been estimated that there is a need for 10 mega litres of water for the whole municipal area. This would require an amount of R72 million to accomplish.

The development of the area should strive for the following development standards:

- All households have access to water above RDP standard.
- All households have access to clean potable water.
- Existing infrastructure is maintained and current infrastructure upgraded where needed.
- Approval of developments takes into account the availability of water.
- Groundwater quality is monitored.
- Storm water drainage systems and flood management is adequate, and is upgraded where necessary – also in rural areas. It is considered and implemented where densification takes place and assessed.
- Communities are educated about responsible water usage. Water conservation behaviour is encouraged.
- Local labour and community involvement is optimised to upgrade, maintain, and implement water infrastructure.

3.3.7.2 Sewerage

*Current State*

The number of households in all municipalities that have access to sanitation facilities above RDP[5] standard is encouraging. Above 80% of households in all municipalities have access to sanitation facilities above RDP standard.

[4] With regards to water, above RDP standard is piped water in the dwelling, in the yard, or <200meter from the dwelling

[5] With regards to sanitation, above RDP standard is a flush toilet, dry toilet, chemical toilet, and pit latrine with ventilation. Below RDP standard is a pit latrine without ventilation, a bucket latrine, or no latrine

In Nokeng tsa Taemane, although there has been an increase in households with toilets above RDP standard, 6% is still using the bucket system or have pit latrines without ventilation or have no toilets. The only areas that are currently serviced with regard to sewer borne sanitation are Townships of Rayton, Cullinan and Refilwe. The whole of Kameeldrift area (Kameeldrift, Derdepoort, Roodeplaat, and surrounding areas) do not have sewer borne sanitation.

Municipalities that show a representation similar to Nokeng tsa Taemane are Kungwini and Bela-Bela. For the rest of the municipalities, 1-2% of households have access to sanitation facilities below RDP standard – again taking note that this is still a substantial absolute number for the City of Tshwane.

*Desired State*

There is a need to construct a new sewer treatment plant around the Kameeldrift area or alternatively to connect to the City of Tshwane sewer lines on a negotiated basis (Nokeng tsa Taemane 2008/2009). It has been estimated that 9.2 mega litres of sanitation capacity is required in the whole municipal area. This would cost R174 million. In Refilwe there is a need to upgrade the current sewer works or where possible construct a new one as the existing sewer treatment works has reached its full capacity.

Wallmansthal soil allows for waterborne sewerage only, and no pit latrines. A total of 120 households in Wallmansthal still have to be serviced (Nokeng tsa Taemane IDP Review, 2008/2009).

The development of the area should strive for the following development standards:

- All households have access to sanitation above RDP standard
- The estimated 9.2 mega litres of sanitation capacity for Nokeng tsa Taemane is provided.
- Other sewer networks are upgraded where needed. The focus is not so much on providing waterborne sewerage, but on providing adequate sewerage in an environmentally responsible manner.
- Communities are informed and educated about the benefits of alternative sewerage systems.
- Existing infrastructure is maintained.
- Local labour and community involvement is optimised to upgrade, maintain, and implement sewerage infrastructure.

#### 3.3.7.3 Waste management

*Current State*

In terms of refuse removal, areas of concern are Nokeng tsa Taemane, Dr JS Moroka and Thembisile Local Municipalities. These municipalities have more households with a communal/own refuse dump/no rubbish disposal than households with refuse removal services.

In Nokeng tsa Taemane there are 5 150 households within the municipal area that require refuse removal services. This includes most of the informal settlements with the exception of Steve Bikoville. The areas that are currently serviced include Rayton, Refilwe and Cullinan. Nevertheless, dumps and littering were observed in Refilwe (field trip 2008). Steve Bikoville is also receiving attention in respect of refuse removal services (Nokeng tsa Taemane IDP Review, 2008/2009).

*Desired State*

The development of the area should strive for the following development standards:

- All households are incorporated into formal waste removal systems for the different types of waste generated, taking into account the context of communities;
- All litter dumps are cleared, with a focus on the Moloto Road;
- Landfill sites are managed according to standard and permit requirements. Falling dust and gases that are emitted are limited. Regular methane monitoring is done in the landfill;
- Air quality is monitored and managed;
- Illegal dumping sites are identified and cleared;
- Waste is recycled; and
- Communities are informed and educated about waste management and the potential impacts on the environment and tourism.

3.3.7.4 Electricity

*Current State*

Like water, the majority of the community has access to grid energy (electricity), with over seven in ten households having access to electricity for lighting. Nokeng tsa Taemane LM has the lowest number of households with access to electricity for lighting. Access to electricity is more prevalent in areas with high incidence of households, as a result of urban/more densely populated areas being better serviced.

The households that use wood and coal for heating are generally higher for most of the municipalities (except for Nokeng tsa Taemane Local Municipality and City of Tshwane) compared to households using these sources for lighting. In Nokeng tsa Taemane 64% of households use electricity/solar energy/gas for heating purposes and 69% use electricity/solar energy/gas for cooking purposes. Wood and coal are not popular to use for cooking, except for households in Thembisile and Dr JS Moroka Local Municipalities.

*Desired State*

The development of the area should strive for the following development standards:

- All households have access to electricity;

- The ability to supply electricity is considered when urban expansion applications are received;
- Load forecasts are done to ensure sufficient supply to the area;
- Illegal connections are identified and dealt with;
- Existing infrastructure is maintained;
- Street lighting is implemented in areas where it is needed;
- Alternative sources of energy have been explored and are implemented; and
- Local labour and community involvement is optimised to upgrade, maintain, and implement sewerage infrastructure.

#### 3.3.7.5 Transportation

*Current State*

The Dinokeng area has a good network of roads and other infrastructure. The Dinokeng project area is situated next to the N1, which is one of the biggest transport corridors in the region, linking Gauteng to the Limpopo province and beyond. Such corridors often open up significant economic opportunities, especially along sections where development up to the present has been minimal.

A new railway line is planned along the Moloto road, which will contribute to the importance of the road as a local/regional transportation corridor.

From an historic point of view the NZASM railway line to Delagoa Bay passed through the area. Remains of this railway line can still be seen on the farm Pienaarspoort 339JR. To safeguard this railway line against Boer attacks the British forces build blockhouses, which have unfortunately disappeared. It is along the same railway line that the two concentration camps for black people were built.

*Desired State*

The DGR is an "urban game reserve", as a growth in population and activities around the DGR, close to economic opportunities, are expected. Transport that will allow for less traffic on the road should be considered, but the implementation of the EMF should be carefully monitored, e.g. the railway line along the Moloto road. The Moloto Rail Corridor provides an opportunity to bring in rail as a major mode of transport into the Dinokeng area, and the rail travel itself can become a lucrative tourism operation.

With the accelerated urban growth and the ease of accessibility to the area provided by the Bakwena Platinum Corridor Toll Road (to the west) and various road upgrading projects (such as the R513 Cullinan road) the capacity for provision of bulk municipal infrastructure services is severely stressed. Similarly, the provision of portable water for urbanisation and the agricultural sector is a significant challenge. Uncoordinated and fragmented housing developments further lead to sub-optimal municipal infrastructure development and provision.

The Thembisile LM considers that, if properly developed, the belt of conservation areas can serve as a core area around which to develop a future eco-tourism and recreational precinct for the Thembisile Municipality (Thembisile IDP 2007-2008). Roads that interlink the tourism belt are, however, not in a good condition.

According to Gautrans there are several freeways in planning (implementation timeframes are well into the future though), which would have a substantial impact on tourist circulation. These are:

- The PWV2, running east-west probably just south of Roodeplaat Dam;
- The PWV 17, running north-south to just north of the PWV2, and east of Mamelodi; and
- The PWV 19, running north-south approximately half-way between Cullinan and Bronkhorstspruit

Development will naturally benefit from good access from the N1 highway that can be turned into visible gateways. Additionally, railway infrastructure needs to improve, in order to lighten the commuter load on the existing roads, but also potentially allow for an alternative mode of access. Residents of the Northern part of the study area have indicated a need for better road maintenance.

The Moloto Rail Corridor Project which has been approved by National Cabinet in April 2008 will introduce a railway line along Moloto Road (R573) and to the north of the Dinokeng project area, which will greatly enhance accessibility to the area via rail. The lack of planned railway stations on the Moloto Rail Corridor in the Dinokeng project area could however be considered to be a potential restriction. In terms of the current proposal, there will be two railway stations in the Dinokeng area, one at Zambesi Road (location not yet determined) and one at Moloto. It could even be that the proposed Zambesi Station falls outside the Dinokeng project area. An additional railway station for tourism purposes, in the vicinity of De Wagensdrift, should be negotiated.

An airport facility may be possible, but this will need to be carefully considered in terms of strategic location next to Tshwane and the impact of aircraft on the DGR and other land uses in the area. Already, a portion of the farm Doornpoort which lies just West of the N1 and adjacent to the 'Petroport' (Total filling station straddling the highway), is under investigation by the City of Tshwane Municipality for just such a purpose.

#### 3.3.7.6 Legal and policy requirements

Municipal services are provided under the auspices of section 153 of the Constitution, which places the responsibility for basic service provision on the shoulders of the Local sphere of government, as well as well the Local Government: Municipal Systems Act (Act 32 of 2000) which demands basic services that, if not provided, will endanger public health, safety or the environment. Generally speaking, this extends to air quality control, waste management systems, electricity reticulation, water and sanitation services as well as municipal roads infrastructure (which often includes stormwater management systems).

Section 3 of the DFA prescribes general principles applicable to all land development which should be considered and integrated in the development of the EMF, including policy, administrative practice and laws that should promote efficient and integrated land development in that they:

- optimise the use of existing resources including such resources relating to agriculture, land, minerals, bulk infrastructure, roads, transportation and social facilities; and

- contribute to the correction of the historically distorted spatial patterns of settlement in the Republic and to the optimum use of existing infrastructure in excess of current needs; and

In terms of section 3 of the Water Services Act 108 of 1997, everyone has a right of access to basic water supply and basic sanitation. Every water services institution must therefore take reasonable measures to realise these rights. Every water services authority must, in its water services development plan, provide for measures to realise these rights.

With regards to transportation, the National Land Transport Interim Arrangements Act (Act 45 of 1998) places an onus on decision-making bodies in terms of Section 26 of the Act to require and implement Traffic Impact Studies and public transportation plans.

Waste management falls within the parameters of the newly enacted (10 March 2009) National Environmental Management: Waste Act (Act 59 of 2008), which sets out the general framework for the full life cycle management of waste. Additionally, liquid waste has to comply with the parameters set by DWAF for the release of treated effluent.

#### 3.3.7.7 Development parameters

The servitudes for power lines, roads, etc. should be indicated on development plans submitted for approvals. Power lines should preferably not run through the DGR, and should it be necessary, the borders of the DGR should be followed. Visual impacts on tourist facilities and activities should be kept to a minimum. Visual, social and economic impact assessments should be compulsory specialist studies as part of the EIA for a development.

Services on the periphery will sustain an insufficient and costly spatial form. Whilst the primary object might be to enhance and improve the quality of life, specifically by responding to backlogs, it might just achieve the opposite in the long term. The provision of bulk services according to developer/ market demands and their willingness to pay for the infrastructure provision might result in an ineffective city form if it is not done in accordance with a clear spatial vision. Often, "leap frog" developments are permitted provided that the developer installs the bulk infrastructure required to link the development to existing service networks. This then results in development that is not necessarily desirable from a spatial efficiency and sustainability point of view.

The availability or non-availability of engineering services directly impacts on economic growth. The provision and cost at which it is provided can thus be used as an instrument to attract or discourage economic growth and development in specific locations.

Socio-economic development in Dinokeng is dependent on various factors that create the conditions for the development to occur. These factors therefore act as critical tipping points or triggers for collapse if they are not managed appropriately. Some of these tipping points occur where:

- Informal settlements grow and are not managed, leading to water pollution and littering;

- Water quality is below standard and water quantity is inadequate;

- Water resources are over exploited;
- The sewerage system is overburdened, and leakage occurs;
- People are forced to rely on natural resources such as wood, rivers and streams for their basic needs. This leads to pressures on the natural vegetation and an increase in downstream water pollution as up-stream communities use rivers and streams for personal hygiene, sanitation and other household chores (e.g. laundry);
- The lack of easy access to sources for heating, cooking and lighting contributes to the poverty cycle, which in turn negatively affects nutrition, health and productivity;
- Air pollution, water pollution, leaching from landfill sites, poisoning of groundwater systems and soil are above acceptable standards;
- The inflow of people is not managed formally, also in terms of traffic congestion and road safety, environmental pollution, and sense of place;
- An imbalance is created between the natural and built environment that do not meet tourist expectations and local needs;
- Crime increases and quality of life is reduced; and
- Opportunities local people are not created for and that they are unable to make these opportunities their own.

### *3.3.8 General opportunities & constraints*

#### 3.3.8.1 Co-operative Governance

Dinokeng cannot deliver economic growth and prosperity on its own; neither is tourism alone the answer to socio-economic freedom. Dinokeng's mandate is limited to tourism development (through investment in strategic tourism infrastructure). The project is not responsible for delivering such things as housing, education, water, sanitation or electricity. Local government needs to play its part here and ensure that it fulfils its own mandate and functions in order to complement Dinokeng's efforts and thereby assist in an integrated and sustainable development for the area as a whole.

The challenge is to develop a sustainable tourism destination in the area where quality of life is increase, and economic growth occurs without irreversible damage to the natural environment.

The Dinokeng development together with the municipalities should develop a management policy which should be adhered to - "*The policy should realise the importance of striking an appropriate balance between developing the area and retaining it as an unspoilt tourism destination if it is to realise the economic and social benefits of tourism visitation to the area (GPG, 2005/6, p43).*"

Similarly, the Dinokeng Integrated Tourism Development Framework (2001) emphasises that the success or failure of Dinokeng in terms land development and environmental management will for the most part be determined by the relationship with local government (who are largely responsible for these development issues), GDACE and private owners.

Harnessing the region's inherent comparative and competitive advantages in the areas of tourism, conservation and agriculture is critical.

# 4 ENVIRONMENTAL CONTROL ZONES

## 4.1 Environmental sensitivity zones

With the Status Quo information complete, the various information layers are converted into environmental sensitivity maps. Ultimately, the idea is to compare the sensitivity evaluation with the desired state mapping, in order to identify potential areas of conflict, a comprehensive spatial planning framework, and an environmental management plan.

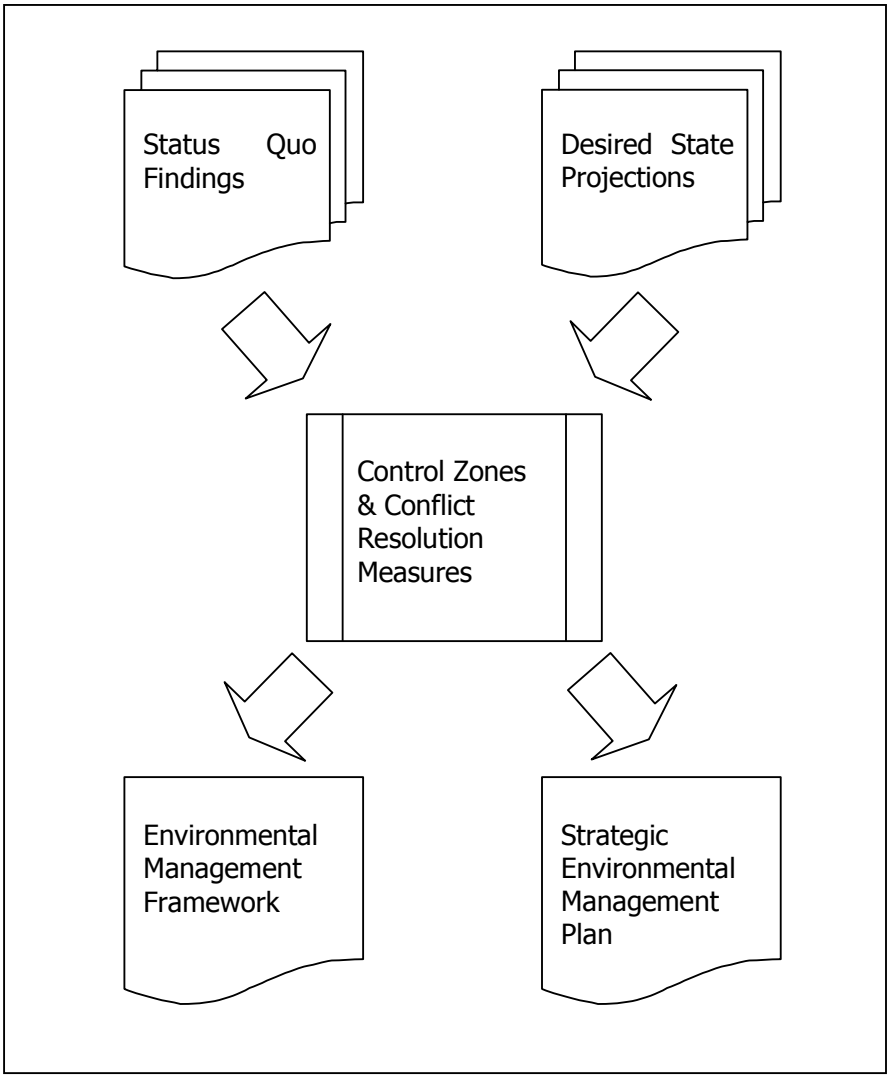


**Figure 5: Environmental framework and management plan compilation process**

The Dinokeng study area lies across the Gauteng and Mpumalanga Provincial boundaries. Environmental sensitivity data is generated at a provincial level (Gauteng C-Plan and Mpumalanga Conservation Plan) which has resulted in inconsistencies and gaps in the data.

In order to overcome this and ensure consistency during the analysis it was necessary to develop a model for ecological sensitivity.

The most robust method of determining the sensitivity was by using a combination of the sensitive environmental features (see Dinokeng Status Quo Report) and the biodiversity fragmentation index developed as part of the National Biodiversity Spatial Assessment or NSBA (SANBI, 2004). The sensitive environmental features include the priority vegetation types (Springbokvlakte Thornveld, Marikana Thornveld and Rand Highveld Grassland), ridge systems, rivers and wetlands.

## 4.2 Legal context

According to the current EIA Regulations (Regulation 71), an Environmental Management Framework must, *inter alia*,

> *"…indicate the kind of activities that would be undesirable in the area or in specific parts of the area;"*

This is given further legitimacy by section 24(2) of NEMA that indicates:

> *"The Minister, or an MEC with the concurrence of the Minister, may identify…*
>
> *(b) geographical areas based on environmental attributes, and as specified in spatial development tools adopted in the prescribed manner by the environmental authority, in which specified activities may not commence without environmental authorisation from the competent authority;*
>
> *(c) geographical areas based on environmental attributes, and specified in spatial development tools adopted in the prescribed manner by the environmental authority, in which specified activities may be excluded from authorisation by the competent authority…*
>
> *Provided that where an activity falls under the jurisdiction of another Minister or MEC, a decision in respect of paragraphs (a) to (d) must be taken after consultation with such other Minister or MEC."*

The geographical areas and spatial development tools referred to in section 24(2) are defined in section 24(3) of NEMA:

> *"The Minister, or an MEC with the concurrence of the Minister, may compile information and maps that specify the attributes of the environment in particular geographical areas, including the sensitivity, extent, interrelationship and significance of such attributes which must be taken into account by every competent authority."*

An Environmental Management Framework primarily qualifies as 'information and maps' that inform assessments for environmental authorisations, but may be used to inform the Minister or MEC in terms of the identification of 'geographical areas' when interpreted or used as 'spatial development tools'. The requirement for the identification of geographical areas based on environmental attributes is satisfied through the demarcation of various control zones – i.e. areas of particular contiguous sensitivity or land use that become structuring elements in the final management framework and management plan.

## 4.3 Identification of control zones

The identification of control zones for the Dinokeng Project draws on the information generated during the status quo and desired state analyses, but combines and compares the various layers of information to highlight specific points or areas of convergence or divergence between land uses or state of conservation. The particular process of information analysis chosen for the Dinokeng study is described in Table 4-1 below.

**Table 4-1: Information analysis for the purpose of demarcating Control Zones**

| Initial Data layer(s) | New Layers | Motivation |
|---|---|---|
| **Status Quo information** | Summary maps:<br>• Ecological Sensitivity<br>• Development<br>• Conservation, Tourism & Heritage | The three summary layers are indicative of the three major constituents of any landscape, namely the natural resource base, the socio-economic reality, and the socio-cultural/recreation framework. |
| **Desired State information** | Projection maps:<br>• Ecological<br>• Development planning<br>• Tourism & Heritage<br>• Agriculture<br>• Infrastructure | The different maps represent the various 'perspectives' or 'themes' that were identified during the status quo and desired state analyses as likely to grow or expand in future. The themes will be comparatively analysed to identify areas of constraint or opportunity |
| **Desired state themes plus Summary maps** | Conflict areas | These areas will constitute Control Zones where particular interventions are required. Strategic management actions will be identified, and/or the most appropriate zones specifically selected in order to prevent planning conflicts (e.g. excluding agricultural expansion from the DGR). |
| **Desired state themes plus Summary maps** | No conflicts | If there are no conflicts between the sensitivity and desired state layers, the control zones may be accepted as viable planning guidance. |

As indicated, conflicts between land uses are identified by comparing the desired state development ideals and trends with the sensitivities that were found during the status quo analysis. Graphically, this process may be represented in a matrix, as shown below in Table 4-2. Before final control zones can be demarcated, the various conflicts need some measure of resolution as a form of strategic guidance for development management within the control zones. Clear strategic guidance will minimise uncertainty in decision-making and give direction to land use planning.

**Table 4-2: Conflicts identified between desired land use and status quo sensitivities**

| | | Status Quo Summary | | |
|---|---|---|---|---|
| | | **Ecological** | **Development** | **Tourism & Heritage** |
| **Desired State** | **Ecological** | | Environmental sensitivities related to ecosystem services and local conservation requirements | |
| | **Development planning** | Development between Roodeplaat, the N4 and Cullinan<br>Mining activities in the Cullinan area | | Developments that detract from the sense of place of the Cullinan node |
| | **Tourism & Heritage** | | | |
| | **Agriculture** | Agricultural activities east of the Eland River | | Agricultural activities in the DGR |
| | **Infrastructure** | Fragmentary linear infrastructure installation | | |

## 4.4 Resolution of conflicts

### *4.4.1 Infill development in the area between the N1, N4, Cullinan and Roodeplaat*

One of the potential conflict points with regard to the development around Cullinan is the municipality's view that development should be permitted along Cullinan Road in the form of infill and ribbon development between the City of Tshwane and Cullinan, as opposed to the current development framework for Dinokeng that seeks to restrict development to existing urban nodes.

A number of concepts shape the development form in this area –

- the consolidation of existing economic nodes
- infill development between nodes
- densification of rural, semi-rural and agricultural properties
- incompatible land uses
- the need to contain urban sprawl by co-locating residential uses, services and employment opportunities
- major transportation links

However, unbridled development and infill in this area will result in the loss of the remaining natural open space areas (in public or private ownership) indicated on the Dinokeng ecological summary map. Non-negotiable ecological features in this development zone are wetlands, watercourses, large intact areas of untransformed habitat and corridors between the pristine areas. These elements are not only required in order to maintain the unique biodiversity associated with the particular veld type represented in the area, but also critical for the provision of ecosystem services that form the basis for sustainable economic development.

Three development options exist for this area:

**Scenario A** – Maintenance of a rural landscape through strict urban development boundaries tightly wrapped around existing nodes to prevent as much development spread and infiltration as possible

**Scenario B** – Resignation to the fact that the area is a spill-over from the Tshwane urban area, with no limits to densification, urbanisation or urban land use infiltration

**Scenario C** – Acknowledgement of the importance of each, and interaction between, the different land uses and environmental features, resulting in development patterns that follow a (peri-) urban design framework which designates critical elements and locations as well as optimal spatial design.

The current development trends in the area indicate that there is a strong drive for urban expansion into this area, as evidenced by the spill-over of Mamelodi to the north of the Mountain, the rapid densification of the Roodeplaat node and ribbon development along the road links. A complete moratorium on development would therefore be hard to enforce and difficult to motivate. In short – development, in some form or another, is coming to this area.

A complete submission to unbridled development through a *laissez faire* development approach will bring its own complications though. The Roodeplaat area represents the edge of the urban development of the Tshwane urban area. This implies that a limit should be placed on the expansion of urban uses, in accordance with planning practice that advocates the consolidation and compaction of urban development. At the same time, however, consideration should be given to the natural urban to rural transition area which necessarily consists of a progressively lower intensity and density of landuses, as well as equal recognition for rural uses and accommodation of the remaining sensitive environmental features.

With the impending incorporation of the Nokeng municipal area into the Tshwane Metro, the need and opportunity to manage development according to a more established urban planning regime arise. In particular, it offers the opportunity to impose development controls similar to those currently enforced in the Tshwane area, as well as an incentive for a more global perspective on planning in the Roodeplaat area. The compilation of an urban and spatial design framework is therefore both desirable and pro-active as it would give structure to the densification and urbanisation of the focus area without compromising the integrity of the environmental and social networks.

The municipality indicated that they are in the process of consolidating the two existing spatial development frameworks (Rural Areas SDF and the Urban Areas SDF), on advice of the Gauteng Department of Economic Development. This process will look at the

development of a corridor along Cullinan Road as the link between the Roodeplaat Dam urban area and the Cullinan/Rayton area. This review, and any other similar spatial planning processes, must necessarily take the ecological network into consideration.

Considering the inevitable development, the Dinokeng Project has to consider ways in which the compatibility of urbanisation and ecological sensitivity can be enhanced. These could include:

- Buffer zones

The purpose of buffer zones is to reduce the negative impacts of one land use on an adjacent use. This may be achieved through hard, impervious barriers, or filters that progressively reduce the penetration of the undesirable effects. Buffers will therefore differ in size and nature, depending on how rapidly the effects need to be reduced, and the nature of the undesirable effect. In the focus area, a strong emphasis will be placed on buffers that will reduce the effect of development and urban land uses on more natural open spaces, but the opportunity will also exist to use open spaces themselves as buffers between incompatible land uses such as industrial and residential activities.

- Avoiding incompatible land uses & encouraging compatible land uses

Local authorities must pro-actively identify individual land uses or land use categories that are incompatible. The spatial planning on the part of the authorities must then spatially segregate these in the landscape instead of waiting for the conflicts to arise first. Pro-active spatial planning in the form of Local or Regional Spatial Development Frameworks will provide upfront guidance to developers and authorities alike on where certain types or classes of development will be allowed, or not. As a result, the planning of services infrastructure will be simplified since there will be a better understanding of the capacity requirements. Naturally, it also becomes possible to cluster developments with similar resource and services needs, thereby making the provision of bulk resources such as water and the removal of waste products more cost-effective, and easier to fit into the overall land use pattern.

- Clustering of densification

In development scenarios where the actual development (transformation) footprint can be reduced to less than the total extent of the development or property, it becomes possible to separate development and open space within the same development project. This is achieved through a concentration of development activities in order to allow for larger intact untransformed areas. At the same time, should development be directed to previously disturbed areas such as cultivated fields or mining areas, the landscaping and construction can occur in-between the remaining untransformed areas that still offer natural habitat and refugia for wildlife. The application of this principle in appropriate areas would pre-empt the envisaged incorporation of the area into the City of Tshwane's municipal area, as the City already implements such a 'cluster-and-space' policy in semi-rural and rural areas. 'Appropriate' areas implies locations where local untransformed open space must be preserved, and the development density can be lower that what is found in typically urban areas.

- Integrated municipal services planning and installation

Generally speaking, any integration of cost-intensive capital projects will result in savings. For instance, in the case of the installation of underground ducting or piping, the integration of the design and actual works with road upgrade projects will improve the long-term viability of the road structure and limit the number of times that the road will need to be excavated for further services installations. The consolidation of services servitudes further reduces the amount of space required, opening up more land for development.

- Low impact development

Integrated planning can also offer opportunities for more environmentally responsible designs – so-called 'low impact development'. This involves the use of infrastructural and landscaping features for the promotion and optimisation of urban ecosystem functioning. Road verges, for example, may be used as grassed swales in order to improve stormwater management capacity and groundwater recharge. Planning service networks over a large area will also avoid patch-work designs that require the installation of multiple points of failure (e.g. numerous sewer pump stations due to the developments obstructing the use of gravitational flow down natural slopes).

### *4.4.2 Mining in environmentally sensitive areas*

Surface mining and areas of conservation importance are mutually exclusive for the simple reason that surface mining denudes large areas of vegetation and soil cover, and changes the hydrological regime of watercourses. This disrupts ecosystem processes completely, and in most cases permanently. Mining is also reliant on large amounts of water for the resource extraction and processing, and responsible for the release of waste water contaminated by sediment, heavy metals and other chemical components. The only area of convergence between the two land uses exists in the form of untransformed mining properties such as those found adjacent to the Cullinan mine. These usually represent valuable additions to the overall conservation area stock even if they are undermined.

Conservation can however not be deemed more important a land use than mining, as both have a part to play in the economic development of the region and the country, and neither can be 'moved' to more convenient locations. Unfortunately, in view of the nearly absolute incompatibility of the two land uses, either the one or the other must be allowed on any given piece of land. In the context of the Dinokeng Project, this decision should be based on which land use has the greater benefit for the project as a whole – i.e. whether or not the activities will promote or prevent the objectives of the Dinokeng Project being realised in the immediate vicinity and the region. Generally speaking, the following determinations would be applied:

- New mining activities may not fragment or interrupt designated sensitive areas or corridors
- Mining activities may not exceed the carrying capacity of local water resources
- Mining activities may not pose risks to sensitive environments such as wetlands, watercourses and pristine grassland areas larger than 5 hectares
- No mining is allowed in the DGR
- Mining activities may not detract from tourism and recreational activities in designated tourism or recreational hubs, nodes or corridors

A consistent approach towards mining activities and approvals, however, requires the cessation of all illegal mining activities in order to encourage compliance with the legal requirements for ongoing management, monitoring and rehabilitation of approved mining operations. Authorities tasked with the regulation of mining, water use and land use activities must carry out their responsibilities and act against these mines.

### *4.4.3 Environmental sensitivity in the GDACE agricultural hub*

It appears as if there is an overlap (conflict) between areas designated as part of the Nokeng/Kungwini Agricultural Hub by GDACE and the areas that are designated as ecologically sensitive. The area of concern stretches from the southern reaches of the study area, between the Magaliesberg mountain and the Rayton railway line, to the Onverwacht/Ellis Steinberg settlement and farming lands north-east of Refilwe, mostly on the eastern side of the Elands River. In this area, cultivated lands are matched to large expanses of fertile soil and the availability of water for irrigation, and are located close to agricultural support networks as well as markets.

The conflict stems from the ecological sensitivity analysis that identifies the riverine areas along the Elands River, wetlands and remnants of primary grassland in the same area. Individually, and in combination, these constitute habitat for rare and endangered fauna and flora species, and part of the larger ecological system of the region and the province.

Cultivation and preservation of untransformed biological diversity are mutually exclusive, since cultivation activities will remove the primary vegetation and change the characteristics of the soil and hydrology. Cultivated land can not be restored to primary grassland on a human timescale. At best, a lose-lose scenario where both land uses are compromised in a mixed-use landscape will result, especially where trade-offs are prevalent.

It is therefore necessary to consider the needs of each land use, in order to determine the possibilities for co-existence based on shared needs or mutual benefit. These, in conjunction with areas of specific conflict can then be used to define a fine grain spatial and operational plan for the agricultural areas.

**Table 4-3: Issues related to the co-existence of agriculture and sensitive ecology**

| Issue | Agriculture need | Ecosystem services | Ecosystem need |
|---|---|---|---|
| **Some congruence (enhance the mutual benefit)** | | | |
| **Current state** | Existing fields | | Habitat diversity for seasonal migrations (not necessarily relevant here, as the landscape is undiversified) |
| **Water and watercourses** | Water for irrigation including<br>extraction from river<br>dams and weirs<br>Boreholes<br>canals | Groundwater recharge<br>Sustainable water supply<br>Water purification | Natural corridors linking the larger units (large scale, long term as well as short term) some may be critical<br>Buffering from the chemical pollution (fertilisers, biocides)<br>Some restoration can be |

| | | | |
|---|---|---|---|
| | | | particularly important |
| **Agro-chemical use** | Pest control<br>Fertilisers | Predators<br>Balancing factors (e.g. diverse habitats to make pest competitors more resilient) | Habitat diversity for biodiversity, ecological function and resilience<br>Buffering from the chemical pollution (fertilisers, biocides)<br>responsible use of chemicals and GMOs |
| **Soil erosion** | Soil protection | | Soil protection production methods that conserves water and protects against soil erosion such as zero till, crop rotation, contour planting<br>ground cover underneath elevated crops (trees) |
| **Game** | Large game farm areas | Habitat/ grazing/ foraging | Full spectrum ecological system |
| **Conflict (Mitigation and trade-offs required)** | | | |
| **Land fragmentation & Agricultural extension** | New fields | | Large unfragmented spaces |
| **Infrastructure & access** | Access roads<br>Electrical reticulation<br>Water supply | | Permeable fencing<br>No ruts<br>No roads through wetlands<br>Limited levels of activity |
| **Intensive animal farming** | Intensive animal farming can be independent of good soils, but may need pastures, as well as fodder and grain crops | | Wastewater management<br>Control of nutrient overload |
| **Extensive animal farming** | Large areas for grazing<br>Disease free areas and game | Grazing areas | Disease free stock |

The only feasible solution is therefore to do a fine grain analysis of where there are specific sensitive ecological features (wetlands, ridges, rivers and intact sections of primary grassland larger than 5ha) and to then generate an open space system for the zone. This analysis will provide more practically useful information than the Dinokeng-wide analysis used for the Desired State & control zone analysis.

The detailed analysis will indicate where agricultural activities must be excluded from the open space area. The designated agricultural areas can then be managed according to specific environmental management controls (mitigation measures).

### *4.4.4 Agricultural activities in the DGR*

The DGR area is envisaged as a conglomerate of relatively untransformed private and state land that can be managed as a single entity in order to sustain viable populations of game species for the purposes of nature-based tourism and recreational activities. As detailed in the analysis of the conflicts between commercial agriculture and ecological function in Table 4-3 above, both cultivation and animal husbandry may represent areas of potential incompatibility with the DGR ideal. However, the level of disagreement is dependent on the intensity of the farming activity and the nature of the farming practices.

Game farming is fully compatible with the DGR concept, but will require co-operative game management that includes and involves all the affected game owners. In this regard, the activities can be managed by means of an overarching environmental management plan which is made binding on participants in the scheme. Non-participants can be accommodated through the already implemented 'island farm' concept – the exclusion fencing of individual farms within a larger conservation entity. The only two requirements would then be co-operation between land users in terms of veld management (fire regimes, water extraction) and disease control.

Extensive stock farming will be more problematic in terms of disease control, as there are serious risks of vector and pathogen transfer between livestock and game. Again, the island farm concept will need to be implemented in order to separate game and livestock. Buffer areas might be necessary to avoid the transfer of disease vectors, and the transportation of animals during risk periods must be managed in a way that minimises the risk of contact. However, strict control will be required in terms of disease control. The bulk of the responsibility will unfortunately be on the part of the livestock farmer as the measure of control over the domesticated animals is so much greater.

In terms of crop farming practices, all the potential conflicts of Table 4-3 apply. Consequently, a judgement call on the appropriateness of cultivation within the DGR needs to be made, based on whether or not crop farming would support the objectives of the DGR to the extent that the impacts of farming activities would be tolerable. This judgement call may take the form of a general principle (farming being acceptable or not), or as separate approvals for individual farms. A blanket decision might be possible, whether as part of the management plan for the reserve, or as a legislated regulation should the reserve obtain official protected area status. However, this might be shortsighted in consideration of the fact that there might be specific conditions under which cultivation may proceed, or specific requirements for cultivation of crops in support of the DGR. Specific conditions under which cultivation may be allowed should be guided by the analysis in Table 4-3.

### *4.4.5 Fragmentary linear infrastructure*

It is known that the installation and subsequent maintenance of linear infrastructure in the form of roads, pipelines and transmission lines have a range of impacts on the natural environment. The impacts can be classified as direct disturbance, edge effects and habitat fragmentation:

- Direct disturbance

The installation of linear infrastructure in natural environments necessarily requires the disturbance of long sections of natural habitat, soil and geological structure modification and even interference with stream ecology and dynamics. These impacts have the obvious effect

of killing plant and animal life in the direct path of the disturbance, but also lead to secondary impacts such as weed infestation, habitat degradation, erosion, changes in groundwater dynamics etc. Although some recovery is possible, the full restoration of grasslands (as are present in the study area) can only take place on geological time-scales. The recovery of vegetation and soil structure may be insignificant though, since subsequent maintenance, replacement or capacity increases would require that the disturbance be repeated.

- Edge effects

Any form of disturbance regime within a natural habitat will result in impacts that radiate outwards from the point of disturbance. The impacts are jointly called 'edge effects' and may include the spread of invasive species, changes in microclimate and changes in species composition due to the change in habitat and life process opportunities. Edge effects effectively extend the overall environmental impact of any infrastructure project beyond the immediate transformed servitude area, and perpetuate the impacts even after the initial disturbance has been rehabilitated.

- Habitat fragmentation

The transformation during construction, operational factors and maintenance or upgrade requirements of linear infrastructure jointly result in the servitude area becoming a fragmentary influence in the landscape. For example, most servitudes need to be maintained in a treeless state in order to prevent damage to the infrastructure elements and this differentiates the servitude from the rest of the habitat. The movement of species across this break in the habitat might subsequently be reduced. Similar effects are associated with fencing, high volume road traffic, non-mountable kerbing, etc. The more fragmented a habitat, the lower the resilience of the species found in the area, due to disruption of migration routes and isolation of genetic clusters.

The extension, operation, continued maintenance and upgrading of linear infrastructure will necessarily be required for the further development of the Dinokeng area, especially for the infill development in the south, and tourism activities further north. It is also inevitable that the services will intersect sensitive environments. Since coordinated and appropriately managed development is actively encouraged in the area, the associated infrastructural impacts need to be considered and planned for at the same time.

Many environmentally responsible development principles can be applied to ensure that infrastructure has the minimum impact on the natural environment. These would include appropriate design, siting and alignment, servitude management, and in some cases retrofit of existing infrastructure.

### *4.4.6 Sense of place in Cullinan*

The town of Cullinan represents one of the strongest tourism nodes in the Dinokeng area and the region as a whole. Tourism and recreation in Dinokeng therefore needs to optimise and harness the existing image and further potential of Cullinan as part of the foundations for the local industry.

In recent years, however, Cullinan became increasingly attractive as a dormitory town in support of Rayton and the City of Tshwane. The result is a rapid urbanisation rate, with associated non-tourism related functions and services such as shopping centres.

Transformation of the rural and historic nature of the town risks damaging the sense of place that is associated with the mine and its related tourism functions, whilst traffic congestion and general infrastructure overload detracts from the visitor experience.

It is therefore necessary to consider the future of Cullinan within the bigger context, namely its location within the broader Dinokeng tourism project, as well as imminent incorporation in the City of Tshwane municipal area. This perspective offers the opportunity to define whether preservation of the heritage and tourism function in the town has enough merit to hold its own against urbanisation of the town and if so, which development controls need to be put into place to protect this function.

From the Dinokeng Integrated Tourism Development Framework, it appears as if the Cullinan hub is envisaged as an important component of the overall "Africa in one day" concept[6]. The town has intrinsic tourism value, but requires further development of its tourism resources, especially in terms of accommodation, information access and integrated transportation planning. In the broader Dinokeng context, however, cultural and natural resources must be conserved and sustainably utilised for the greater good of the Dinokeng area. These sentiments are also echoed by the Metsweding Local Economic Development Framework which acknowledges the Roodeplaat and Cullinan hubs as particular areas where tourism development potential can be realised.

Tourism-focussed development, associated with diamond mining, Victorian history and rural living, is therefore the priority for Cullinan. Urbanisation with no contribution to local economic development therefore needs to adapt to the tourism development priority, and not the other way round.

Methods whereby the 'urban' residential function can be made more compatible with the tourism focus, are:

- Recognition of, and defining the sense of place
- Protecting the architectural character as per the Nokeng Tsa Taemane Development Guidelines
- Screening urban functions from tourists
- Defining an urban edge
- Development structuring that will facilitate tourism in designated tourism zones, visitor engagement and information access
- Strategies for the preservation of characteristic features

## 4.5 Environmental Control Zones

From the spatial analysis described in section 4.3 above, nine Control Zones are identified:

[6] GDACEL, 2001: Dinokeng Integrated Tourism Development Framework: Volume C – Land Use, Environmental Management and Infrastructure Development Framework, Tender No. GT1233PC/48, December 2001.

1. The DGR
2. Agriculture
3. Development consolidation
4. Development spines & gateways
5. Sensitive environments
6. Tourism & heritage clusters
7. Recreation
8. Mining & conservancies
9. The remainder

As can be seen, not all the zones are contiguous, especially in the case of the development spines and gateways. Development guidance and controls in the zones, however, do not necessarily need to be limited to specific spatial locations. Spatially segregated 'zones' may therefore be employed. In addition, it may be found that some of the zones overlap to some extent. In such cases, the nature of the overlap is identified and management options defined in order to steer development decision-making.

### *4.5.1 DGR*

The DGR is, arguably, the most obvious control zone. It represents nearly the entire northern parts of the Dinokeng Project Area, and has generally been accepted as the future state of (most of) the properties within its boundary. The DGR is envisaged as a public-private partnership development focussed on a nature-based tourism experience. Public funding will be used to facilitate the development, management and coordination of the project, whilst private land-owners will retain their property rights and contribute to the tourism products on offer.

Comments received during the first round of public participation for this EMF project indicate that there is support for the initiative from the landowners, whilst the development plans for both Nokeng Tsa Taemane and Metsweding municipalities acknowledge it as a key trigger for economic development. Currently, an initial phase of the DGR roll-out has been fenced off in the Ditolo/Kwalata area, but plans for the expansion areas are moving ahead. The potential full extent of the DGR will cover the area between the N1 and Mokhombo Dam, from the Moloto Road in the South to a line roughly south of the Rust-de-Winter Dam.

### *4.5.2 Cultivation*

Game farming will form part of the DGR, and stock farming will remain interspersed in the land use mixture of the Dinokeng Area, but soil dependent cultivation will necessarily be drawn to the south-eastern corner of the study area. This is where fertile soils and water for irrigation purposes, and hence also one of the provincial agricultural hubs. The Kungwini/Nokeng Hub is therefore designated as a specific control zone in Dinokeng.

Agricultural activities play an important role in both employment creation and food security, and should therefore be encouraged. It also creates a local sub-economy focussed on

providing specialised agricultural services such as farming implements or transportation services. The envisaged developments in tourism and recreation in Dinokeng offer opportunities for growth in the local agricultural sector, since tourism activities inevitably include meals as part of the hospitality offering and therefore also fresh produce.

A particular concern in the Cultivation Zone is, however, the overlap with areas of ecological sensitivity. A careful balance needs to be struck between the consolidation, expansion and operation of agricultural activities on the one hand, and the need to maintain and conserve a viable network of ecologically functional open spaces in this zone (also refer to section 4.4.3 above).

### *4.5.3 Development consolidation*

Consolidation of development should occur in existing built-up nodes, in order to maximise the utilisation of services infrastructure through intensification of land use. Applicable areas are existing settlements and towns, such as Cullinan, Rayton, Moloto, Rust-de-Winter, etc. Community services in consolidated areas have a better chance at reaching the most needy community members, and automatically also find a location with good public transportation access. Control over the rate and nature of consolidation can provide municipal (and other) planning with the necessary projection data to inform bulk services planning.

Consolidation also implies a certain amount of infill development, such as will be the case between Cullinan and Refilwe, and Cullinan and Rayton. Appropriate infill will not require undue infrastructural expansion, yet contribute to the overall spatial functioning of a built-up node.

### *4.5.4 Development spines & gateways*

In a large area such as Dinokeng, certain spatial nodes and corridors are required as structuring elements. Additionally, in order to function effectively as a tourism and recreation-driven economy, visitors to the area need to be guided by a network of gateways and spines towards tourism facilities. Often, main road intersections function as gateways, but there could also be other development clusters that define the role of a particular location.

Examples of development spines are the Tswhane-Cullinan transportation links, the Moloto corridor, and the main road between Rayton and Refilwe. Nodes, on the other hand, are evident in places such as the Roodeplaat Dam resort area, Hammanskraal off-ramp, Cullinan, and specific clusters of tourism offerings.

### *4.5.5 Sensitive environments*

A healthy, functioning ecology is critical to the future development of the Dinokeng Project area. In the northern parts, nature-based tourism will rely on the establishment of a large game reserve area, which implies the maintenance of an intact habitat for the various game species that will be found in the reserve. The slow urbanisation of the south, however, will require intact ecological systems for their role in providing ecosystem services. These services include stormwater management, water purification, groundwater recharge, pest control, micro-climatic control, pollination, etc.

It is therefore necessary to identify and maintain the sensitive environments in Dinokeng as a functional ecological system. This implies the conservation and protection of inherently sensitive habitats such as ridges, wetlands and river systems, but also large unfragmented

and untransformed grasslands, migration corridors between sensitive areas, and locations where rare or endangered species are known to be present. Where necessary, these areas will need buffers around them that can protect them from the negative influences of adjacent land uses.

### *4.5.6 Tourism & Heritage clusters*

Tourism offerings in Dinokeng will naturally gravitate towards specific nodes of heritage value or scenic appeal, and tourism activities. These nodes will benefit from shared marketing responsibilities, services and information. The overall management of the Dinokeng Project will also benefit, since clusters are simpler to integrate into management strategies than a multitude of individual facilities.

Examples of identified nodes are Roodeplaat Dam, DeWagensdrift and Cullinan, but some clustering in the DGR area is also possible.

### *4.5.7 Recreation*

Roodeplaat Dam represents the recreational hub for the Dinokeng Area. The dam area is home to watersports, game farms, resorts and all manner of outdoors activities. The large number and diversity of offerings is facilitated by a location that is very accessible from the Tshwane area, and a growing local market. Clustering mainstream recreational activities around the dam has benefits for tourism to Dinokeng such as better utilisation rates for services and integration of activity packages.

The experience at Roodeplaat dam may also inform future plans for recreational activities in the vicinities of the Rust-de-Winter and Mkhombo Dams.

### *4.5.8 Mining and Conservancies*

Mining will continue in the Dinokeng Area until it is no longer profitable, or until regulation or urban encroachment sterilises the mining land. In the Dinokeng Area, however, the mining activities exist side-by-side with several conservancies. The two activities are generally incompatible, and conflicts are present in Dinokeng, with each side arguing for their continued right to exist.

The mining and conservancy zone between Roodeplaat Dam and Cullinan therefore has unique management challenges, and is designated as a specific control zone. In this area, management intervention or control will be required to facilitate the co-existence of the two land uses.

### *4.5.9 The remainder of the study area*

The remainder of the study area constitutes areas without a particularly distinct character related to the Dinokeng scheme, or with no specific management and intervention requirements. Some settlements and farming areas fall in this category.

# 5 ENVIRONMENTAL MANAGEMENT FRAMEWORK AND STRATEGIC ENVIRONMENTAL MANAGEMENT PLAN

Based on the Status Quo Report and the Desired State information, it is possible to gain a clear understanding of the immediate development trends and environmental requirements

in Dinokeng. These are highlighted as discrete control zones that form the basis for pro-active environmental management in the study area.

The various control zones will be used as geographical management areas to determine where and how certain development activities should take place, and consequently to inform an overall environmental framework and strategic environmental management plan. The SEMP will provide the guidance necessary for land use planning and environmental decision-making, but stop shy of prescribing detailed design measures. More detailed designs will need to be informed by investigations associated with environmental or town planning authorisation processes.