ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR THE AMAJUBA DISTRICT MUNICIPALITY

EMF VOLUME I: Environmental Sensitivity Zones and Assessment Guideline

Institute of Natural Resources

ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR THE AMAJUBA DISTRICT MUNICIPALITY

EMF Vol I: Environmental Sensitivity Zones and Assessment Guidelines

Prepared for

AMAJUBA DISTRICT MUNICIPALITY

edtea
Department :
Economic Development, Tourism and Environmental Affairs
PROVINCE OF KWAZULU-NATAL

Prepared by

Institute of Natural Resources

67 St Patricks Road, Scottsville, 3209
Tel: 033 346 0796, Fax: 033 346 0895, E-Mail: dcox@inr.org.za

In partnership with

eTHEMBENI CULTURAL HERITAGE

IMA Trader 20 cc

Engeolab

MAY 2019

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

1.1 BACKGROUND

The Amajuba District Municipality (ADM) has embarked on the development of Environmental Management Framework (EMF). The ADM EMF was initiated through a concurrent agreement between the national and provincial ministers responsible for environmental affairs in terms of Chapter 5 of the National Environmental Management Act (1998). It was prepared as a joint initiative between the National Department of Environmental Affairs (DEA), the KZN Department of Economic Development, Tourism and Environmental Affairs (EDTEA) and the ADM. The need for the EMF was driven by authority concerns in the District regarding the following environmental issues:

- The decline in air quality,
- The extent of water pollution,
- Land degradation and other environmental issues that may negatively affect local people and the growing economy, as well as
- The lack of adequate information to make more informed decisions.

The Institute of Natural Resources NPC (INR) has been appointed to conduct the EMF process on behalf of and in collaboration with the ADM, EDTEA and other key roleplayers in the District.

1.2 PROJECT PURPOSE AND STRUCTURE

The specific aim of the EMF is to:
Integrate environmental sustainability into municipal planning and operations, and to inform decision making regarding specific development applications in terms of the EIA and other regulatory processes. This is in line with the aims of an EMF as defined below in the extract from the EMF regulations.

PURPOSE OF AN ENVIRONMENTAL MANAGEMENT FRAMEWORK

The EMF regulations (Section 2) list the purpose of the regulation as: *Compilation of information and maps specifying the attributes of the environment in a particular geographical area:*

a) For such information to inform environmental management, and
b) For such maps and information to be used as environmental management frameworks in the consideration of applications for environmental authorisations in or affecting the geographical areas to which those frameworks apply.

Section 2 (3) further explains that EMFs are aimed at:

a) Promoting sustainability.
b) Securing environmental protection.
c) Promoting cooperative environmental governance.

The project is structured into four phases each of which builds on the outcomes of the preceding phase in working towards the overall outcomes. The objectives and deliverables of each phase are summarised below.

This following table summarizes the aims, objectives and deliverables of the project phases. This report contributes to the EMF Phase (Phase 4).

Table 1: Project phases, their purpose and outcomes

PHASE
1: INCEPTION PHASE ***What do we want to achieve & how are we going to do it?*** ***Purpose:*** Define the aims, objectives and nature of the project deliverables & the proposed approach and methods for achieving these ***Deliverable -*** *Inception Report*
2: STATUS QUO ASSESSMENT ***Where are we now? What is the state of our natural systems & environmental quality, the drivers of the state & consequences for socio-economic systems?*** ***Purpose:*** Map, classify and document the Present State of the receiving environment (socio-economic, biophysical, etc.) as well as trends and causes of the present state and environmental issues ***Deliverable*** *- Status quo & supporting specialist reports*
3: STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) & DESIRED FUTURE STATE (DFS) ***Define where we want to get to?*** ***Purpose:*** Defines key sustainability issues and the Desired Future State (DFS) in the form of a sustainability framework that defines objectives, criteria, sustainability targets (and permissible limits of change) for the various components of the receiving environment. ***Deliverable –*** *SEA Report, Sustainability Framework and Environmental Management Zones (EMZ's).*
4: ENVIRONMENTAL MANAGEMENT FRAMEWORK ***How do we get there? Develop the tools to move from SQ to DFS*** ***Purpose***: Develop EMF outputs which include Environmental Assessment guidelines, Decision Support Tool, and Strategic Environmental Management programme. ***Deliverable*** – Final EMF Outputs

1.3 LOCATION AND EXTENT OF THE AMAJUBA DISTRICT MUNICIPALITY

The ADM comprises three local municipalities (LMs) i.e. Newcastle LM, Dannhauser LM, and Emadlangeni LM. The project area is shown in Figure 1. The Newcastle LM1 is considered the economic hub of the ADM. The key economic activities of the ADM include commercial agriculture, coal mining and industrial manufacturing. As an example, the area constitutes the largest producer of chrome chemicals in Africa. There are transport and nodal links to Johannesburg, Durban and Richards Bay ports. Newcastle is also a retail hub for this and neighbouring districts.

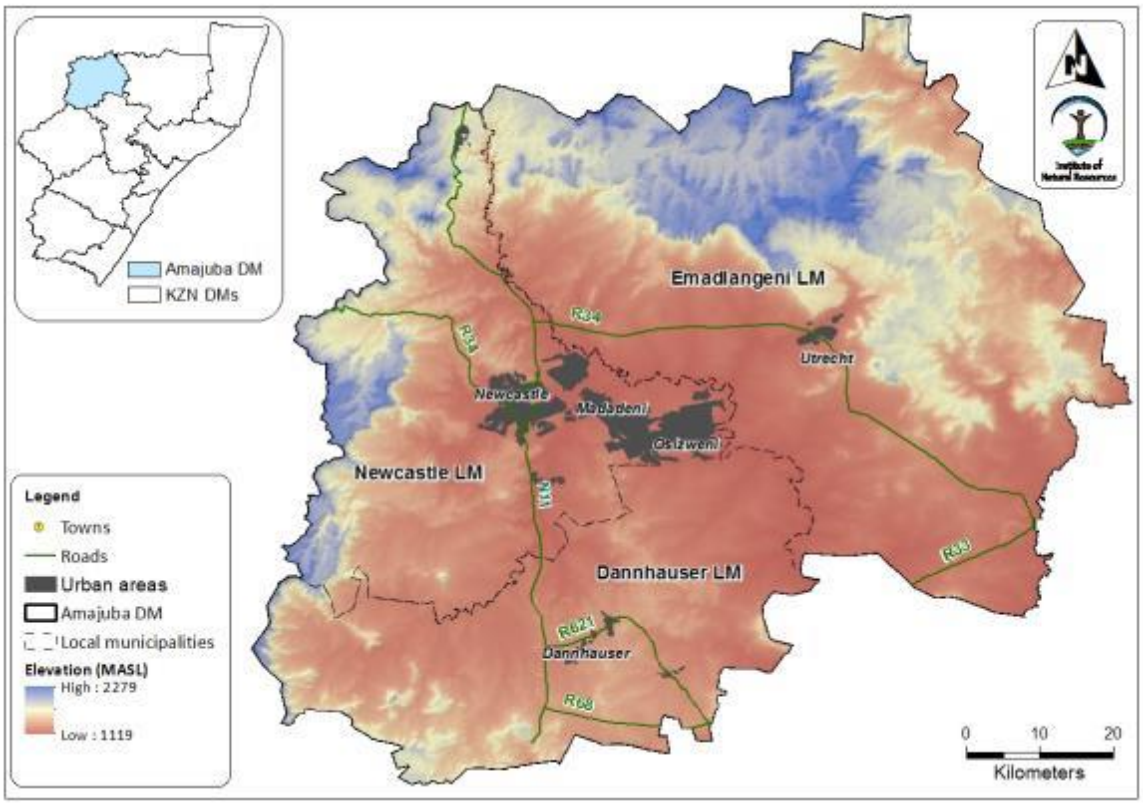


Figure 1: ADM Project area

2. STRUCTURE OF THE EMF

The broad aim of the Environmental Management Framework (EMF) is to "Inform sustainable development planning for the Amajuba District Municipality by:

- Informing development planning
- Informing the EIA process for specific development applications, and
- Providing management guidance for responding to key sustainability issues.

While the EMF regulations include more specific requirements, the four outputs summarised in the figure below constitute the EMF and the role these play in meeting the project aims and the legal requirements. ***This document is Volume II*** of the suite of outputs (Figure 2).

1 An EMF has been developed for the Newcastle EMF. The EMF has not been gazetted and the information will be integrated with the District EMF where still current and relevant.

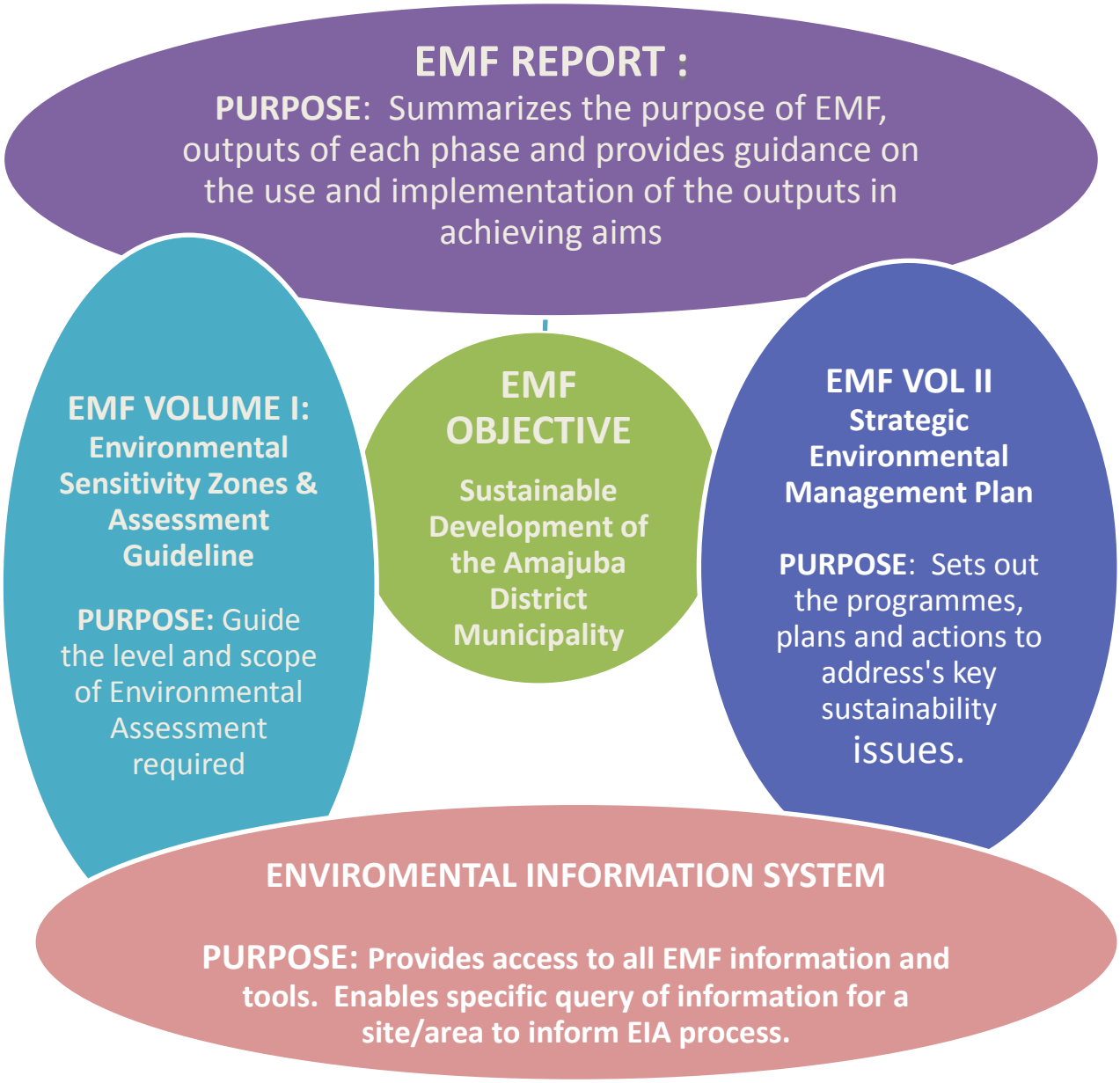


Figure 2: Structure and components of the EMF

2.1 PURPOSE OF THIS GUIDELINE

The EMF regulations define an EMF as the "***Compilation of information and maps*** specifying the ***attributes of the environment*** in a particular geographical ***area***: and for such maps and information to be used in the ***consideration of applications for environmental authorisations*** in or affecting the geographical areas to which those frameworks apply".

This guideline responds directly to this requirement – by providing guidance on the scope and level of environmental assessment considered appropriate for the different levels of sensitivity within the main environmental zones identified through the EMF process. ***This guideline can, and should be applied to all development applications – not only those that require an EIA.***

2.2 WHO SHOULD USE THIS GUIDELINE

This guideline is primarily for use by Environmental Assessment Practitioners and the associated specialist team responsible for managing and undertaking the EIA process for specific development applications. The information is also relevant to consultants responsible for managing other relevant regulatory processes that require information relating to the environmental impact of an activity, in support of the applications. Examples of other such processes include water-use licences, heritage development permits, CARA licences, and mining permits. The guideline is also valuable to the decision makers responsible for administering the relevant legislation and for making decisions on applications in terms of the various processes and Acts. It also aids the municipality to assess the sustainability of development activities, which do not trigger the EIA regulations but which will nevertheless have an impact. The guideline provides the basis for the municipality to motivate for appropriate assessments in terms of planning authorisation.

2.3 REPORTING STRUCTURE

The report is structured as follows.

- **Section 3** Explains how the different information provided in the guideline should be used in different aspects of environmental assessment and management. It also indicates which of the other information and outputs developed during the EMF should be used in combination with this guideline.

- **Section 4** This section provides a graphic overview and descriptive summary of the sensitivity of all the environmental features which have been defined according to the following broad and associated sub-components:

-

Aquatic	*Terrestrial*	*Social*
Aquatic Biodiversity	Terrestrial Biodiversity	Air Quality
Water Quality	Geotechnical Conditions	Heritage Resources
Wetlands	Agricultural Potential	Social Environment
Water production areas	Flood Zones	infrastructure
Groundwater		

- **Section 5** provides the following detail for each of the environmental components listed above.
  i. A summary of the current status of the environmental system or feature that defines the zone, and its subcomponents.
  ii. The key sustainability issues and objective [defined in the strategic assessment and sustainability framework – see SEA report].
  iii. A definition and background to the sensitivity levels used [the thresholds that have been used to define the sensitivity levels].
  iv. A map showing the spatial extent of the sensitivity levels.
  v. Recommendations for undertaking Environmental Assessment in these zones in terms of the nature and scope of specialist investigations required.

2.4 UNDERSTANDING SENSITIVITY

In considering the sensitivity zones it is important to understand that sensitivity and constraint lie on two ends of a two-way relationship between environmental features and development activities. This is described further below.

i. *Impact of development on the environment (environmental sensitivity)*
The first is where the development activity impacts the environmental feature or system. For example, urban development on grassland will permanently transform that system resulting in a reduction of habitat and ecosystem services provided by that system. In this case, the level of constraint imposed on development increases with the level of environmental sensitivity of the system.

ii. *Impact of the Environment on Development (environmental constraint)*
The second scenario is where the environmental feature constrains development activities. A prime example is the impact of steep slopes. There is a cost to building or growing anything in steep slope areas, and there is additionally a greater risk of land subsidence and erosion. The steeper the slopes are, the higher the level of constraint.

3. USING THE GUIDELINE

The EMF regulations require that the EMF must inform the EIA process. This guideline however has relevance at various stages in the development life cycle. The following points explain what other resources developed during the EMF process should be used in conjunction with this guideline to optimize the value of this resource at different points in the development life cycle.

i. ***Baseline Specialist Reports*****:** These reports provide detail that informed the definition of the sensitivity zones including the location, extent and state of the various systems as well as their conservation status. This detail should be analysed to establish relevant features at a site scale. The drivers of the status quo are also discussed in these reports. If an application is for a land use that has already been identified as contributing to the degraded state of the environmental feature in question, it has the potential to add to the cumulative loss of the system. This understanding assists in highlighting the need for an appropriate level of assessment and mitigation of the impacts common to this land-use, during the EIA phase.

ii. ***EMF Decision Support Tool (online GIS):*** This tool contains all the baseline spatial information e.g. the location and extent of environmental features. It can therefore be queried to identify all sensitive features occurring within a development site and the level of sensitivity defined for the system or features at the site in question. The higher the number of environmental features occurring on a site, the higher the cumulative impact. By providing an understanding of the range of features occurring on a site, the DST assists in providing a quick and high level understanding of the potential specific (particular features) and cumulative impact.

iii. ***Sustainability Framework:*** The sustainability framework has value at various points in the development life cycle as described below:

a. Project Planning

Development proposals must show how they contribute to the achievement of the sustainability objectives relevant to their project through layout, design, choice of technology and on-going management i.e. the sustainability objectives should inform project planning.

b. Environmental Assessment

The acceptability of the project should be assessed against the sustainability framework and specifically the sustainability objective during the EIA. This is important as it has been informed by an assessment of cumulative impact within the SEA undertaken for

the EMF. The assessment accounts for the relationship between natural, economic and social systems because it was founded on an ecosystem services approach. This framework therefore holds much greater value than developing a project specific assessment framework that provides scores for impacts.

c. Environmental Management Programme

The criteria, indicators and targets in the framework can also be integrated into the Environmental Management Programme (EMP) that must be submitted with the Impact Assessment Report.

iv. Stakeholder Database:

The stakeholder lists generated in the EMF process, provides a starting point for developing an I&AP database as part of the public participation process required in the EIA for specific projects.

v. Legal & Institutional Framework:

The legal and institutional framework described in the state of environment phase is a useful tool for ensuring that all regulatory processes relevant to a particular application are identified. This needs to be done at an early stage in the process in order that a developer is able to plan accordingly in terms of time and budgets. It also assists the EAP to develop a project plan for the EIA that accounts for the information requirements of the other processes, and provides for alignment in terms of consultation i.e. it facilitates co-operative governance and co-ordinated decision making – one of the other key objectives of the EMF.

3.1 CONFIDENCE IN SENSITIVITY LAYERS

It should be noted that the accuracy of the information, notably the spatial definition of location and extent provided for the various systems (such as wetlands) and environmental aspects (water production) varies considerably. This is due to differences in the resolution or scale of the information used in the mapping and the process undertaken (modelling versus direct mapping of systems). While the assumptions and limitations are detailed in the attached specialist reports, the confidence in the spatial outputs that define the boundaries of the various sensitivity zones is summarized below in table for each feature (Table 2). The confidence rating is a general indication that considers the information presented for each sensitivity layer in relation to the others (Table 2).

As a guiding context, the scale at which mapping should be undertaken relates to the scale of decision making. In the case of the EMF there are various relevant scales:

- **District Scale** – for informing broad development planning such as the spatial development Framework (SDF).
- **Local and site scale** – for informing localised planning at the scale of a LUMS or local area plan.
- **Site/property scale** – at which a developer makes application for a specific development activity.

The scale at which the majority of the features are mapped is consistent with requirements for the District Scale and certain aspects also for the Local Scale. The focus of this guideline is however the EIA process which takes place at the site/property scale. The assessment of confidence is therefore made with this in mind.

Error! Reference source not found.: Descriptions of confidence rating boundaries

CONFIDENCE RATING	DESCRIPTION
VERY HIGH	The feature definitely occurs at this location and the position of the feature boundary is considered accurate. An infield assessment may be required to confirm that an EIA is required if the feature represents the trigger.
HIGH	The feature very likely occurs at this location and the position of the feature boundary is considered relatively accurate but requires in field investigation to confirm the extent and nature of further investigations
MODERATE	The feature likely occurs at this location but the accuracy of the boundary or level of associated constraint is low. Requires in field review and specialist assessment.
LOW	The feature may occur at the location, and the definition of boundary and nature of the system is poor. In field assessment and specialist investigations definitely required.

Table 2: Confidence ratings assigned to environmental features

ENVIRONMENTAL FEATURE	SOURCE/NATURE OF MAPPING	LIMITATIONS & IMPLICATIONS	CONFIDENCE RATING
Agricultural Resources	The provincial agricultural land potential categories are used together with the provincial field cropping boundaries.	The layer is modelled and developed at a provincial scale. Furthermore, a key input in assessing land capability is soils, for which detailed understanding can only be achieved through detailed investigations. As a consequence agricultural sensitivity is a high level indicator – except where it has been identified as existing agricultural land.	Low to Moderate
Air Quality	In the absence of a full dispersion model, the USEPA's AQ Screen model was used to identify distances associated with the dispersion of emissions. Input data consisted of actual emission data from registered emitters in the District. KZN EDTEA AQ monitoring data was used to validate model outputs	A full dispersion model is not available for the District. The USEPA's Screen model does not take topography or climate variables into account and thus is very much a screening model. Results however compare favourably with the EDTEA's monitoring data.	Low
Aquatic Biodiversity	National Freshwater Ecosystem Priority Area data is used together with the National PES-EIS data to identify the present state and importance of	Both the NFEPA and the PES-EIS data are desktop level products. No ground truthing has been carried out and no recent river health data is available for the District	Low to Moderate

	freshwater ecosystems of the District.		
Heritage Resources	SAHRIS and KZN Museum database were consulted and data extracted for this work. This has been supplemented by battlefield data available from Amafa aKwaZulu-Natali.	The data used is known to be accurate but incomplete. No area–wide systematic surveys have been undertaken of important buildings or stone or iron age archaeological features for the District.	Moderate to High
Terrestrial Biodiversity	Protected area boundaries surveyed accurately. Provincial scale mapping of the CBAs supplemented by more detailed analysis and mapping for the Agri-Ecological zones which was informed by digitizing off images and consultation.	Provincial level CBA mapping is undertaken using a number of input layers including a provincial scale land cover map. This has inaccuracies, particularly in identifying partially transformed land. It is not uncommon to find a CBA that consists of transformed land.	Moderate to High
Water production	Data draw from the CSIR's Strategic Water Source Area delineation project was used to map runoff across the District. This was aggregated to micro-catchment level to assess landscapes production potential	Given that this is a modelled output undertaken at a fairly coarse catchment scale, there is a moderate level of confidence relative to the EIA scale.	Moderate to High
Water Quality	A synthesis of measured water quality monitoring data was supplemented by a modelled assessment of water quality risk based on land cover.	In catchments where monitoring data is available, confidence regarding water quality is high. In catchments where only modelled data is available, confidence is moderate and an assessment should be undertaken to confirm the modelled hypothesis.	Low to Moderate
Wetlands	A combination of modelled data (Heistermann and Rivers Moore) and the existing provincial Wetlands layer (which varies in accuracy depending on the source data)	The uncertainties of the location of wetlands in highly disturbed areas, and lack of digitising reduces the confidence. Infield verification is required. The model also predicts the location of certain wetland types better than others.	Moderate to High
Floodable areas	The layer is derived from a provincial scale model that utilised a range of Digital Elevation Model data. This was supplemented by a river line buffer approach segmented by altitude and slope.	Ananlysis of modelling outputs show that in flatter areas the output is far more accurate than in steeper areas where the flood risk area is not aligned with the river. This is accommodated through the inclusion of buffered river lines. In areas where engineering has modified the course of a river and altered the topography, the channel is often poorly represented. Detailed screening and assessments are required.	Low to Moderate

Geotechnical features	Input data consists of data from the 30m SRTM digital elevation model, 1:250 000 geological maps, SOTER database District geotechnical and geohydrological studies, Mintek's Assessment of KZN Coal Reserves (2007). Geohydrological data includes the National Groundwater Data Base (NGDB) and the 1:500,000 hydrogeological map series	Some elements of the data have more confidence than others. The DEM is high confidence, while the mining data (extent uncertain) and the geological maps (scale) carry less confidence. The completeness of the NGDB data is also uncertain and parameters are not measured consistently across all boreholes.	Moderate
Infrastructure assessment	The approach integrates census information indicating level of infrastructure available in small place areas and spatial data regarding the location of the infrastructure It also incorporates some information on the condition of infrastructure.	The confidence varies considerably because the layer integrates such a variety of infrastructure types and combines location and condition/capacity.	Moderate

4. ENVIRONMENTAL SENSITIVITY PATTERNS

Table 3 presents the spatial extent of the sensitivity levels for each of the environmental features. These patterns translate into varying levels of sensitivity and constraints based on the number of features at a particular site and the sensitivity levels allocated to those features. As a summary, the following points are evident regarding the overall sensitivity patterns shown.

i. Cumulative sensitivity

A cumulative sensitivity analysis shows a band of high cumulative sensitivity extending around the District, but dominating the south eastern, and north western areas of the District. This is consistent with the high levels of ecosystem services generated in these areas.

ii. Large Scale/High Level Sensitivity

The following zones all present high levels of sensitivity across large areas of the District.

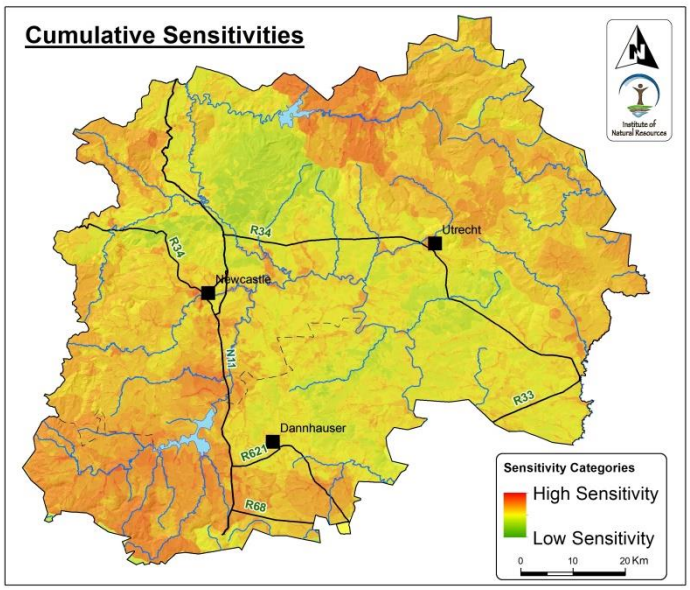
- *Water Production Areas* – Large regions of the District comprise strategic water source areas which are areas which produce the bulk of the water for use in the District. These are critical given the constrained supply of water in the District and the growing demand for water.
- *Important Terrestrial Biodiversity Areas* – Large areas of high sensitivity are found in the higher lying areas of the District, particularly in the north eastern areas. These areas are characterised by irreplaceable critical biodiversity areas. Grassland areas in the Buffalo River basin are seen to contain fragments of highly sensitive biodiversity and a swath of low to moderate sensitivity representing vulnerable vegetation types. Much of this area is transformed which has resulted in the fragmented appearance of the remaining highly sensitive features.
- *Agricultural land* – Land that is presently cultivated is shown as the highest level of sensitivity and this is predominantly located in the central and south western regions. All other land in KZN Land Potential classes A to C is shown as Moderate to High sensitivity. In many cases this reflects potential based on grazing and as such much of the higher lying steeper sloped areas are included in this category.
- *Water Quality Zones* – Water pollution by mining and industrial activities and by urban impacts (including waste water), is a significant issue across the study area. Sensitivity is indicated using both the influence an area has on critical supply infrastructure, as well as its present state. Highest sensitivity is thus indicated in the upper Ngagane Catchment, down through to the Buffalo River above Tayside Weir. The upper Dorpspruit catchment above Utrecht is also identified as highly sensitive.

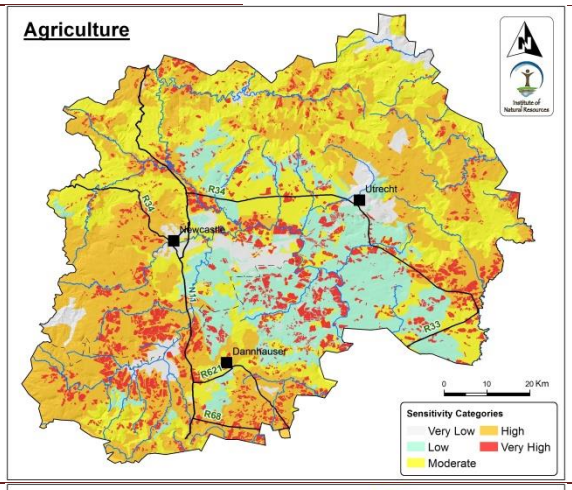
iii. Central areas with Low Sensitivity Levels

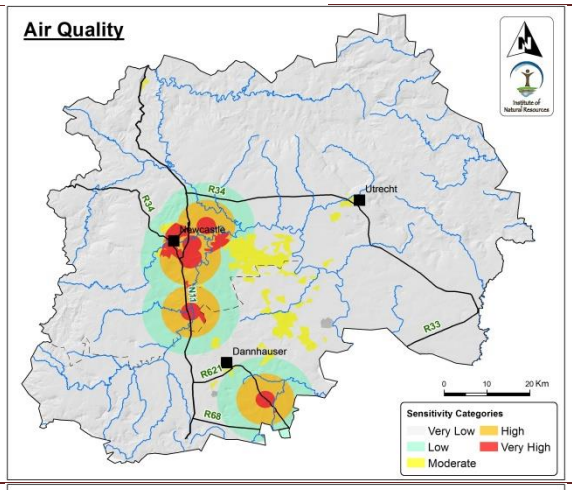
The central areas of the District in the lower lying areas of the Buffalo River Basin are characterised by generally lower sensitivity levels. This does not mean there are not areas of high sensitivity for different features, (e.g. wetlands and some grassland vegetation types), however land users in this area are likely to encounter fewer sensitive environmental features which opens this area up to a wider range of potential suitable land uses.

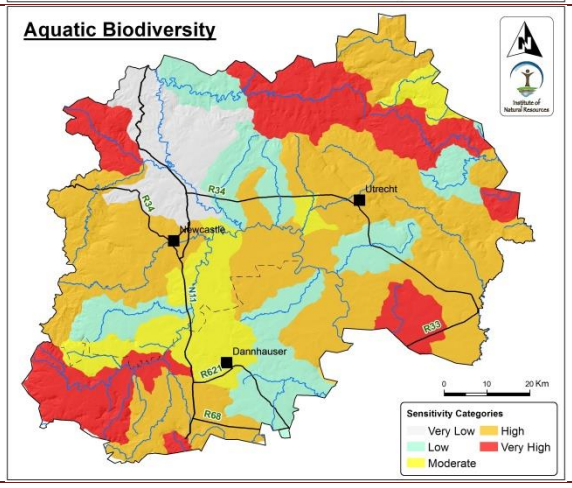
Table 3: Spatial overview of all environmental sensitivity and constraint areas

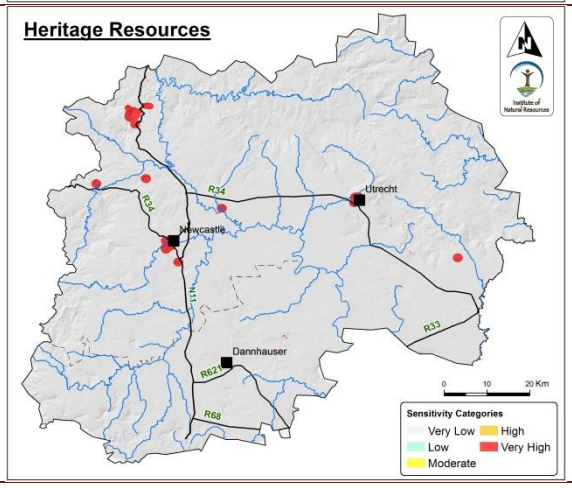
Environmental Sensitivity Features

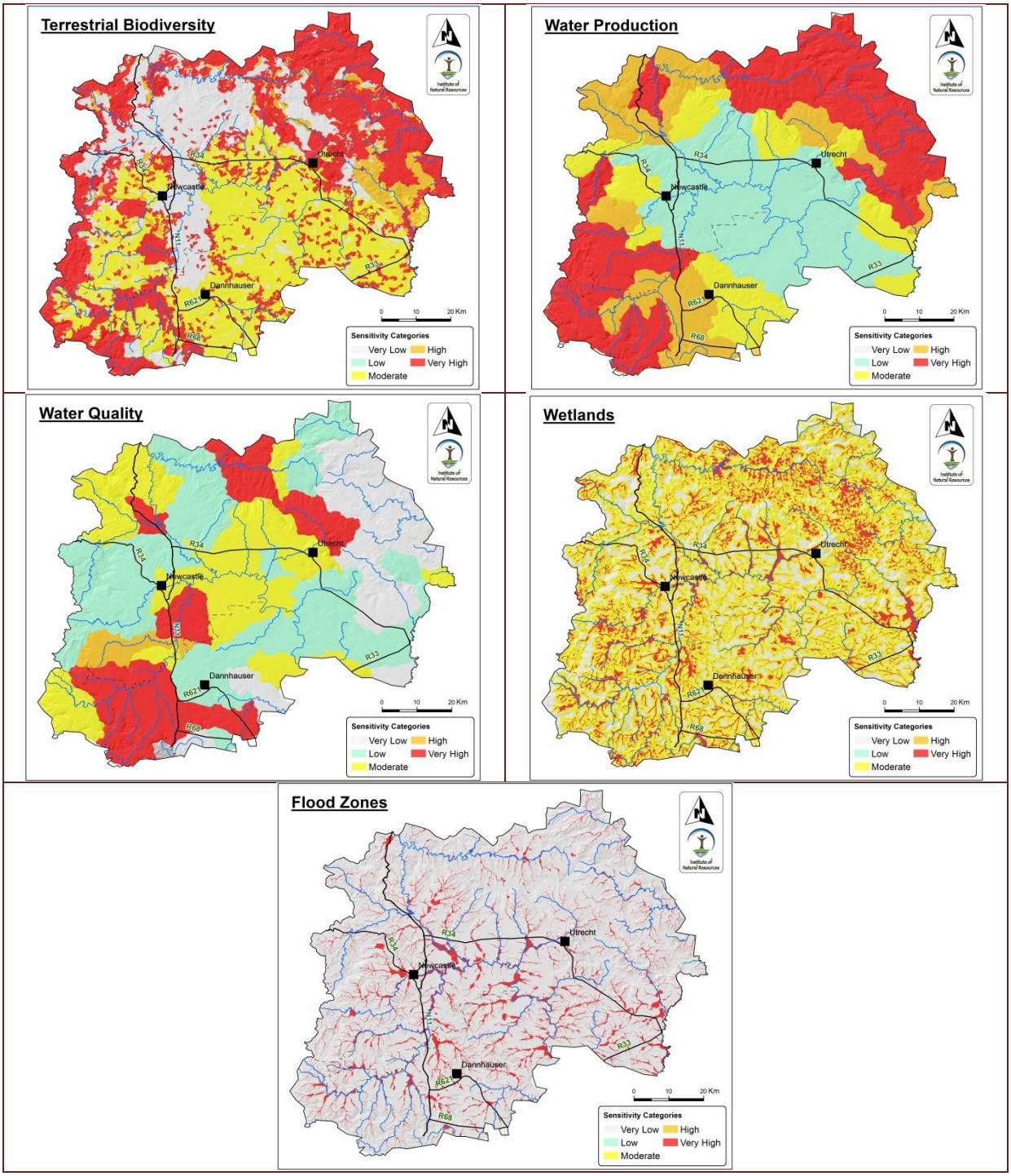




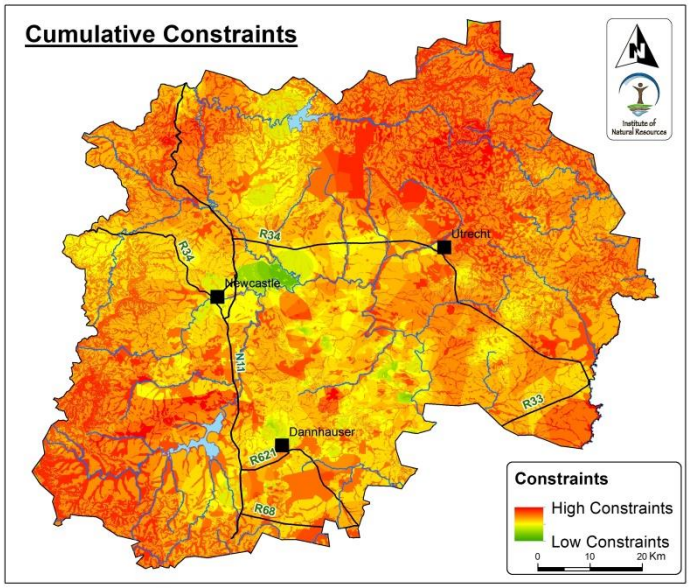


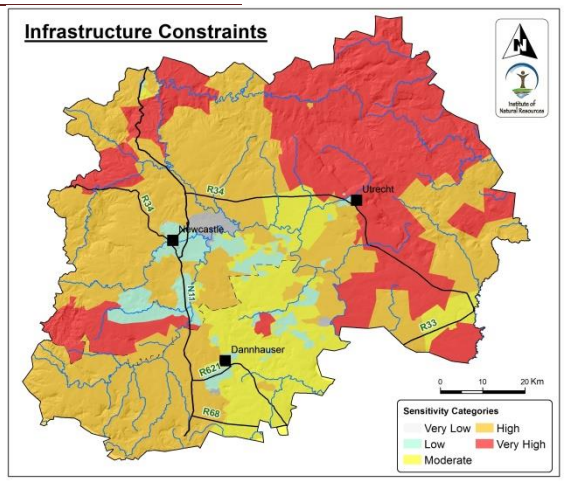


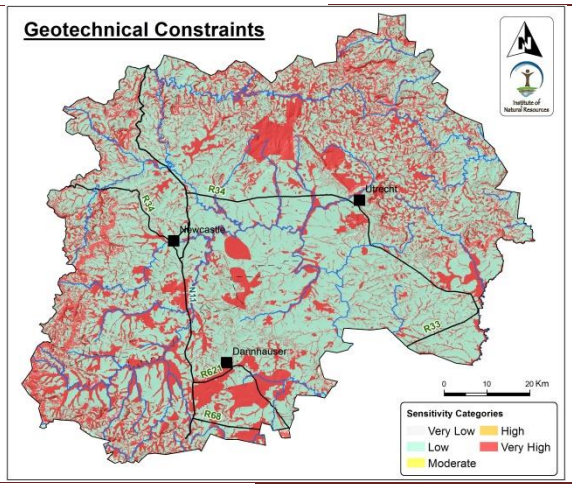


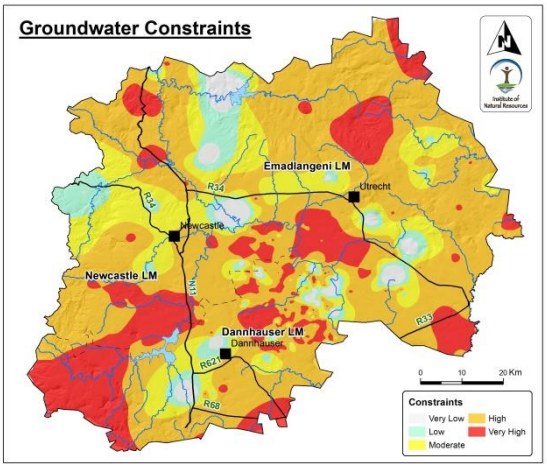

Terrestrial Biodiversity
Water Production
Water Quality
Wetlands
Flood Zones
Utrecht
Newcastle
Dannhauser
R34
R33
R621
R68
N11
0 10 20 Km
Sensitivity Categories
Very Low
High
Low
Very High
Moderate

Environmental Constraint Features









5. AGRICULTURAL RESOURCES

5.1 STATUS QUO

Summary Statement: The District has significant agricultural potential and is highlighted as being a key economic development potential area, but this potential is not being fully realised and the sector is in decline. The commercial cultivation sector is limited by a lack of water available for irrigation development, while governance issues surrounding land restitution have reduced the extent to which farmers (original land owners and beneficiaries) are prepared to invest in agricultural infrastructure.

The status quo is summarised as follows:

i. **Optimization of high and good potential arable soils for primary production:** The majority of productive areas (category A and B) are presently used for primary production of key crops,
ii. **Current use of land:** Presently, agriculture within the district is represented by 1) commercially cultivated land including irrigated and dryland activities, particularly maize, soya, dry beans and vegetables (10.1% of District area), 2) Commercial timber plantations (3.3%), 3) small scale and subsistence cultivation predominantly in areas of communal tenure (2.8%), and 4) vast areas of livestock focused grazing areas (74.2%).
iii. **Land potential:** High value land in the ADM includes both areas with high potential for cultivation as well as for rangeland areas (KZN DAARD). The land with the greatest agricultural potential is predominately situated in the vicinity of Ntshingwayo Dam and along the Buffalo River. Steep slopes in much of the District restrict cultivation potential. Most of the very high potential (A and B categories) cultivatable land is already developed.
iv. **Threats:** Agricultural land is under threat by the loss of land with good potential to other land uses and degradation of agricultural land. Slow progress with land restitution projects threatens agricultural productivity.
i. **Economic status:** From an economic perspective, the sector is contributing a very small portion of the District's GVA and is reportedly in decline.

5.2 SUSTAINABILITY OBJECTIVE

Secure the Existing and Potential value of the Agricultural Sector to the economy and food security.

5.3 SENSITIVITY ZONES

The thresholds defining the sensitivity zones for agricultural resources are defined according to the following hierarchy and summarised in Table 4. It is important to note that land in lower Land Potential Categories may be so categorised due to low rainfall and may still be very productive if irrigation is available and developed.

i. **Existing cultivated areas:** The highest sensitivity class is reserved for existing cultivation activities as cultivatable land is a particularly scarce resource and it is considered most critical to protect existing agricultural investment.

ii. **Uncultivated land with high potential:** Uncultivated land inland Potential Category A or Category B is reflected as being of high sensitivity. Given that the majority of high potential cultivatable land is already under production, the majority of the land in this category is therefore being assessed as high potential from a grazing perspective.
iii. **Uncultivated land with moderate potential:** Uncultivated land in Land Potential Category C is reflected as being of moderate sensitivity.
iv. **Uncultivated land with low potential:** Uncultivated land in Land Potential Category D and Category E is reflected as being of low sensitivity.
v. **Unavailable Areas:** Areas that are unavailable for agriculture including transformed land (urban areas, roads etc), water bodies and protected areas are considered to contribute almost nothing to the agricultural resource base and are therefore considered very low sensitivity.

Table 4: Sensitivity catogories applied to Agricultural Resources

Sensitivity feature	Sensitivity Level	Sensitivity Score
Horticulture	Very High Sensitivity	5
Pivot Irrigation	Very High Sensitivity	5
Rainfed Annual Crop Cultivation / Planted Pastures	Very High Sensitivity	5
Subsistence Farming	Very High Sensitivity	5
Small Holdings	Very High Sensitivity	5
Uncultivated High Potential Land CATEGORY A	High Sensitivity	4
Uncultivated High Potential Land CATEGORY B	High Sensitivity	4
Uncultivated High Potential Land CATEGORY C	Moderate Sensitivity	3
Uncultivated High Potential Land CATEGORY D	Low Sensitivity	2
Uncultivated High Potential Land CATEGORY E	Low Sensitivity	2
Old Fields	Low Sensitivity	2
Transformed land	Very Low Sensitivity	1
Water bodies	Very Low Sensitivity	1
Protected areas	Very Low Sensitivity	1

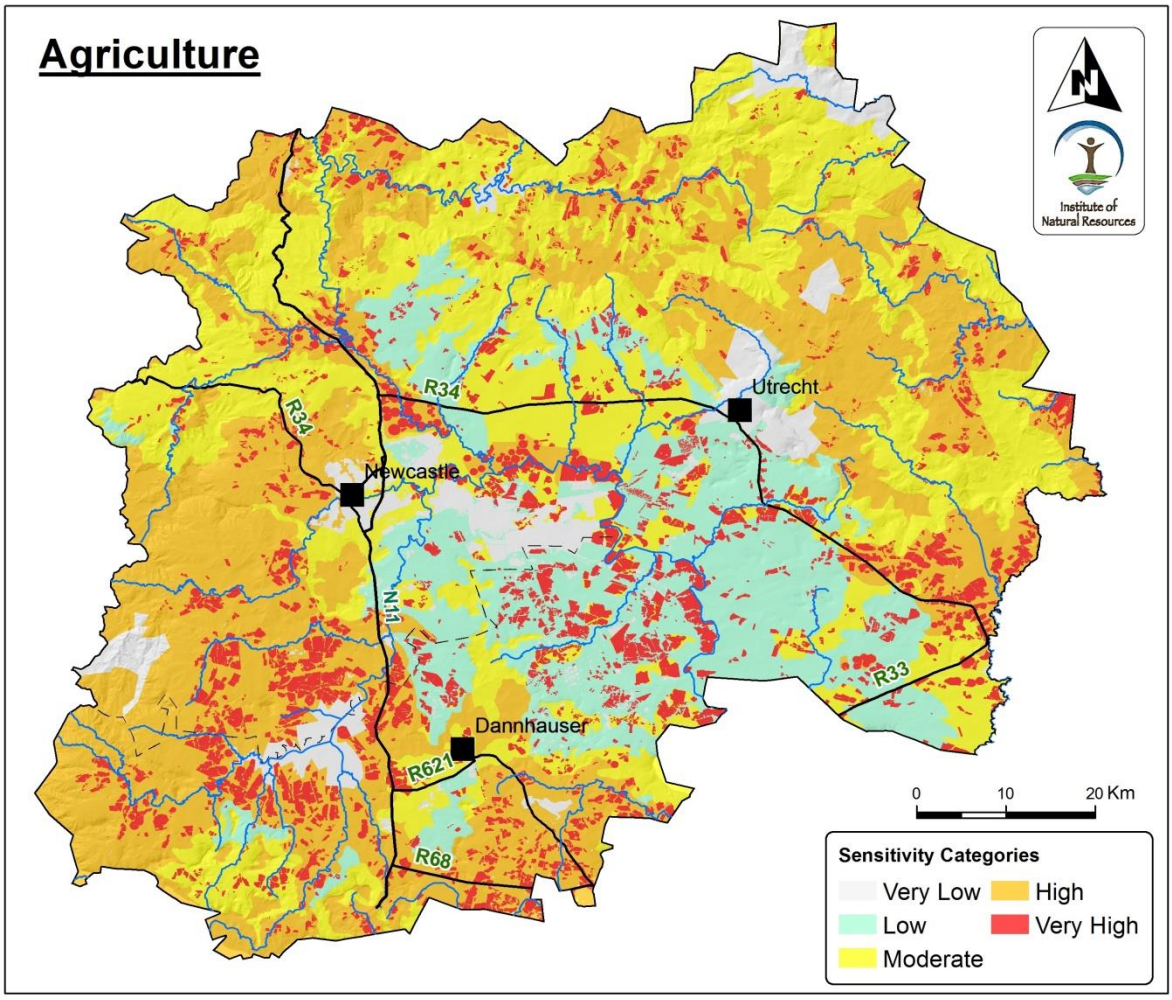


Figure 3: Agricultural resources sensitivity zones.

5.4 GUIDELINES

SENSITIVITY LEVEL	DEVELOPMENT OBJECTIVES	EIA GUIDELINES
		Specialist Investigations
Very High Sensitivity	▪ Cultivated land that should be retained exclusively for agricultural purposes. ▪ These areas represent high capital investment in agriculture with supporting infrastructure such as irrigation ▪ They also represent areas with high value for vulnerable livelihoods in the form of subsistence agricultural areas.	The conversion of cultivated land to other land uses should only be considered under certain exceptional circumstances. In areas outside of town planning schemes, an Agricultural Screening Assessment (as described in below) should be undertaken by a SACNASP registered scientist in the relevant field of expertise. If the Agricultural Screening Assessment recommends it, or if requested by the Competent Authority or the Provincial or National Department responsible for Agriculture, a Detailed Agricultural Assessment (as described below) must be undertaken by SACNASP registered scientist in the relevant field of expertise.

High Sensitivity	These areas offer unique opportunities for cultivation and food security. These areas are considered non-renewable natural resources which should be reserved for agricultural production and food security. Areas of high agricultural potential are identified as areas with inherent potential for cultivation based on the inherent soil properties and climate of the area. It is recommended that areas deemed to have high agricultural potential, do not lose viability for sustainable agricultural production on site. Ultimately these sites should not be developed for purposes other than agriculture, and should retain the opportunity for future agricultural production. Activities that will result in the loss of agricultural potential such as the subdivision of land into nonviable portions or extensive non-agricultural development should not be undertaken in this zone. Within this zone it is also important that the viability of a land parcel for agricultural production be considered together with its agricultural potential. Areas that are too small or lack the appropriate resources to become viable agricultural areas could be considered for alternative land use, as long as they do not impinge on the right to farm, nor should they negatively impact adjacent agricultural enterprises.	In areas outside of town planning schemes, an Agricultural Screening Assessment (as described below) should be undertaken by a SACNASP registered scientist in the relevant field of expertise. If the Agricultural Screening Assessment recommends it, or if requested by the Competent Authority or the Provincial or National Department responsible for Agriculture, a Detailed Agricultural Assessment (as described below) must be undertaken by SACNASP registered scientist in the relevant field of expertise.
Moderate Sensitivity	While these areas may have agricultural value this can only be determined through more detailed site specific slope, vegetation and soil analysis; consideration of the viability of land parcel size; and, availability of appropriate infrastructure. Agricultural potential of these areas is moderate yet provides opportunity for production, or the land could be providing extensive grazing or serving as buffer areas to high potential agricultural land, further investigation of these sites is recommended. If any site is deemed to have high agricultural potential then the management priorities and land use guidelines for the high agricultural potential constraint should be applied.	In areas outside of town planning schemes, an Agricultural Screening Assessment (as describe below) should be undertaken by a SACNASP registered scientist in the relevant field of expertise. If the Agricultural Screening Assessment recommends it, or if requested by the Competent Authority or the Provincial or National Department responsible for Agriculture, a Detailed Agricultural Assessment (as described below) must be undertaken by SACNASP registered scientist in the relevant field of expertise.

Low Sensitivity	Areas within this zone have been identified as having limited value for agricultural production. This may be as a result of unsuitable soils, terrain or climatic conditions. Extensive agriculture such as grazing or subsistence farming may however be undertaken in this zone. It is critical however that stocking rates be carefully considered to ensure that land degradation does not occur. In some areas, this category of land may be the only land available for production and thus the impact of its loss on agriculture in the area should be carefully considered before rezoning.	Agricultural Screening Assessment (as described below) undertaken by SACNASP registered scientist in the relevant field of expertise if requested by the Competent Authority or the Provincial Department responsible for Agriculture
Very Low Sensitivity	Not appropriate for agriculture	No assessment required.

Agricultural Screening Assessment

As a minimum the Initial Agricultural Assessment must include the following information and must be undertaken by a SACPNASP registered scientist registered in the appropriate field.

1. DESCRIPTION OF ACTIVITY:
   a. Describe the nature of the proposal including a site plan and the location of the proposal in the context of the surrounding area; and,
   b. describe any activities or processes associated with the proposal that may cause adverse impacts on agriculture

2. PHYSICAL RESOURCE:
   a. Provide a general description of the agricultural resources capability of the property and the surrounding area for agriculture, including a description of soils and climate, with special consideration of the contribution of the surrounding area to the regional agricultural sector;
   b. A general description of slope and topographic features including contour mapping of the site and surrounding area; and,
   c. Analysis of property size and availability of water for irrigation.

3. SURROUNDING LAND USE:
   a. Zonation of property and surrounding properties in terms of the Municipal Land Use Scheme; and
   b. Include a description of the type and intensity of surrounding agricultural and non-agricultural land uses and proposed land use changes up to a distance of 1 km from the property boundary of the site.

4. STATEMENT ON THE IMPACTS ON AGRICULTURE:
   a. Indicate the potential effects of the proposal on existing and potential agricultural use of the property;
   b. Indicate the potential effects of the proposal on existing and potential agricultural use on surrounding lands;
   c. Identify potential impact on the viability of neighbouring agricultural operations resulting from conflicting uses that may occur as a result of the proposed development;
   d. Consider the proposal's impact on the agricultural character of the general surrounding landscape, including implications on land use, tenure or fragmentation patterns; and,
   e. Consider the potential cumulative impacts of this proposed development in the context of other existing and future non-agricultural developments.

5. CONCLUDING STATEMENT:

The report must include a professional opinions as to the extent to which the development could impact on or effect agricultural use and provide recommendations as to whether a Detailed Agricultural Assessment is required.

Detailed Agricultural Assessment

1. DESCRIPTION OF ACTIVITY:
   a. Describe the nature of the proposal including a site plan and the location of the proposal in the context of the surrounding area; and,
   b. Describe any activities or processes associated with the proposal that may cause adverse impacts on agriculture.

2. PHYSICAL RESOURCE:
   a. Agricultural Capability: Provide a detailed description of the agricultural resources capability of the site and surrounding area for agriculture, including: A detailed description of soils, including mapping and capability ratings based on a site–specific assessment; a description of climate features.
   b. A general description of slope and topographic features including contour mapping of the site and surrounding area;
   c. Analysis of property size and availability of water for irrigation; and,
   d. Consideration of the contribution of the surrounding area to the regional agricultural sector.

3. SURROUNDING LAND USE:
   a. Zonation of property and surrounding properties in terms of the Municipal Land Use Scheme; and
   b. Provide a map and a description of the type and intensity of surrounding agricultural and non-agricultural land uses and proposed land use changes up to a distance of 1 km from the property boundary of the site.

4. ASSESSMENT OF THE IMPACTS ON AGRICULTURE:
   a. Past Agricultural Practices: Outline the history of the type and extent of agricultural operations on the site, including any recent changes;
   b. Describe Existing Agricultural Production: Include current cultivation patterns, livestock operations, and other land use;
   c. Existing Farm Management: Describe land tenure and management ; size of the total operation of which property is part, including the relationship of the site to current operations and the potential to find other similarly capable replacement lands;
   d. Agricultural Viability: Provide an assessment of the viability of the property as an agricultural operation on its own and in consolidation with a larger existing operation; consider the suitability of the site for different types or alternative agricultural uses.
   e. Describe and assess of the degree of investment in land improvements, irrigation systems, facilities, buildings, machinery, etc.;
   f. Local and Regional Context: Describe current land use and the contribution of the property to the local and regional agricultural sector;
   g. Employment: Detail the current employment and job opportunities associated with the property;
   h. Assess the potential effects of the proposal on existing and potential agricultural use of the property including a description of the quantity and quality of land lost from agricultural production, and effects on existing or potential operations on the site;
   i. Assess the potential effects of the proposal on existing and potential agricultural use on surrounding lands including impacts on the viability and sustainability of neighbouring agricultural operations resulting from potential restrictions that may occur as a result of the proposed development;
   j. Assess potential impact on the viability of neighbouring agricultural operations resulting from conflicting uses that may occur as a result of the proposed development;
   k. Assess constraints on agricultural production that may result as a consequence of the proposed development on agricultural uses in the area;
   l. Assess the proposal's impact on the agricultural character of the general surrounding landscape, including implications on land use, tenure or fragmentation patterns; and,
   m. Assess the potential cumulative impacts of this proposed development in the context of other existing and future non-agricultural developments.

5. CONCLUDING STATEMENT:

The report must include a professional opinions as to the extent to which the development could impact on or effect agricultural use and provide recommendations in this regard.

SUPPORTING INFORMATION

The study should be supported with the following background information:

a) literature cited;
b) all background data sources;
c) a list of people contacted during the study;
d) a description of the methodologies and survey techniques employed in the study, including method of viability impact assessment;
e) source of physical resource inventory data (e.g., soil descriptions, climate and slope measurements); and
f) Resumes of study team members.

6. AIR QUALITY

6.1 STATUS QUO

Summary Statement: There are numerous registered emitters located in the District, particularly in the Newcastle area. In addition to these registered industrial emissions, impacts are reportedly from vehicular emissions, mining activities, biomass burning and impacts imported from higher lying neighbouring regions.

There is a perception amongst stakeholders that air quality is bad within the district particularly due to industrial activity. Monitoring data for the ADM is however very limited. That which is available indicates that air quality in the Newcastle area is compromised, however not to the extent of exceeding national standards as this data indicates that NAAQS standards are generally not exceeded. Air quality has the potential to be a key constrain to development as continued deterioration of air quality may eventually surpass safe limits

The status quo is due to the following factors:

- The air quality impacts within the district are attributed to a number of different sources including industrial emissions, biomass burning, domestic burning and transportation. Mining and mine waste additionally contributes to particulate matter pollution.
- EDTEA monitoring data indicates that the gaseous ratio of SO2 to NO2 is biased towards NO2. This suggests that vehicle emissions play a leading role in AQ impacts.
- The 'bowl like' topography of the District means that dispersion of pollutants is relatively poor. In addition, this means that impacts from activities in higher lying neighbouring areas also impact the District.
- Currently there is no monitoring being undertaken by the District to provide a better understanding of air quality impacts. Air quality monitoring is limited to that carried out by EDTEA passive sampling projects.

6.2 SUSTAINABILITY OBJECTIVE

Maintain or improve present air quality and improve the knowledge base on air quality by implementing an Air Quality Monitoring Programme

6.3 SENSITIVITY ZONES

Air quality sensitivity zones have been delineated using available emissions data supplied by registered emitters. This has been combined with road density data to accommodate the finding that vehicular emissions are a significant contributor to air quality problems. The road density data are used since there is no vehicular count or emissions data available. The following sensitivity areas have been defined:

i. **High industrial impact areas and high road density:** These areas are considered to be the most highly impacted areas and thus are the most sensitive from the perspective of evaluating applications for additional development. They are categorised as having very high

sensitivity, though they should be more realistically viewed as imposing a very high level of constraint.

ii. **High industrial impact and low road density:** These areas are considered to be the most highly industrially impacted areas and thus are also considered very high sensitivity

iii. **Moderate industrial impact and high road density:** The evidence provided by EDTEA monitoring data shows vehicular emissions are highly significant in air quality concerns in the District. For this reason, areas with high road density coupled with moderate industrial impacts are also considered very high sensitivity.

iv. **Low industrial impact and high road density:** The evidence provided by EDTEA monitoring data shows vehicular emissions are highly significant in air quality concerns in the District. For this reason, areas with high road density coupled with low industrial impacts are still considered moderately sensitive.

v. **Moderate industrial impact and low road density:** Industrial impacts in such areas are likely to have dispersed to a moderate level of impact.

vi. **High road density:** Areas beyond the industrial impact zone are likely to only be significantly impacted by vehicular emissions. High road densities are therefore likely to result in a moderate level of sensitivity.

vii. **Low Impact industrial and low road density:** Air quality impacts in these areas are likely to be of low significance and thus are considered of low sensitivity.

viii. **Low road density:** Areas outside of the industrial impact area and additionally with low road densities are the least impacted areas in the District and are considered to be of low sensitivity.

Table 5: Air quality sensitivity zones

Sensitivity feature	Sensitivity Level	Sensitivity Score
High impact industrial and high road density	Very High Sensitivity	5
Moderate impact industrial and high road density	Very High Sensitivity	5
High impact industrial and low road density	Very High Sensitivity	5
Low Impact industrial and high road density	Moderate Sensitivity	3
Moderate impact industrial and low road density	Moderate Sensitivity	3
High road density	Moderate Sensitivity	3
Low Impact industrial and low road density	Low Sensitivity	2
Low road density	Very Low Sensitivity	1

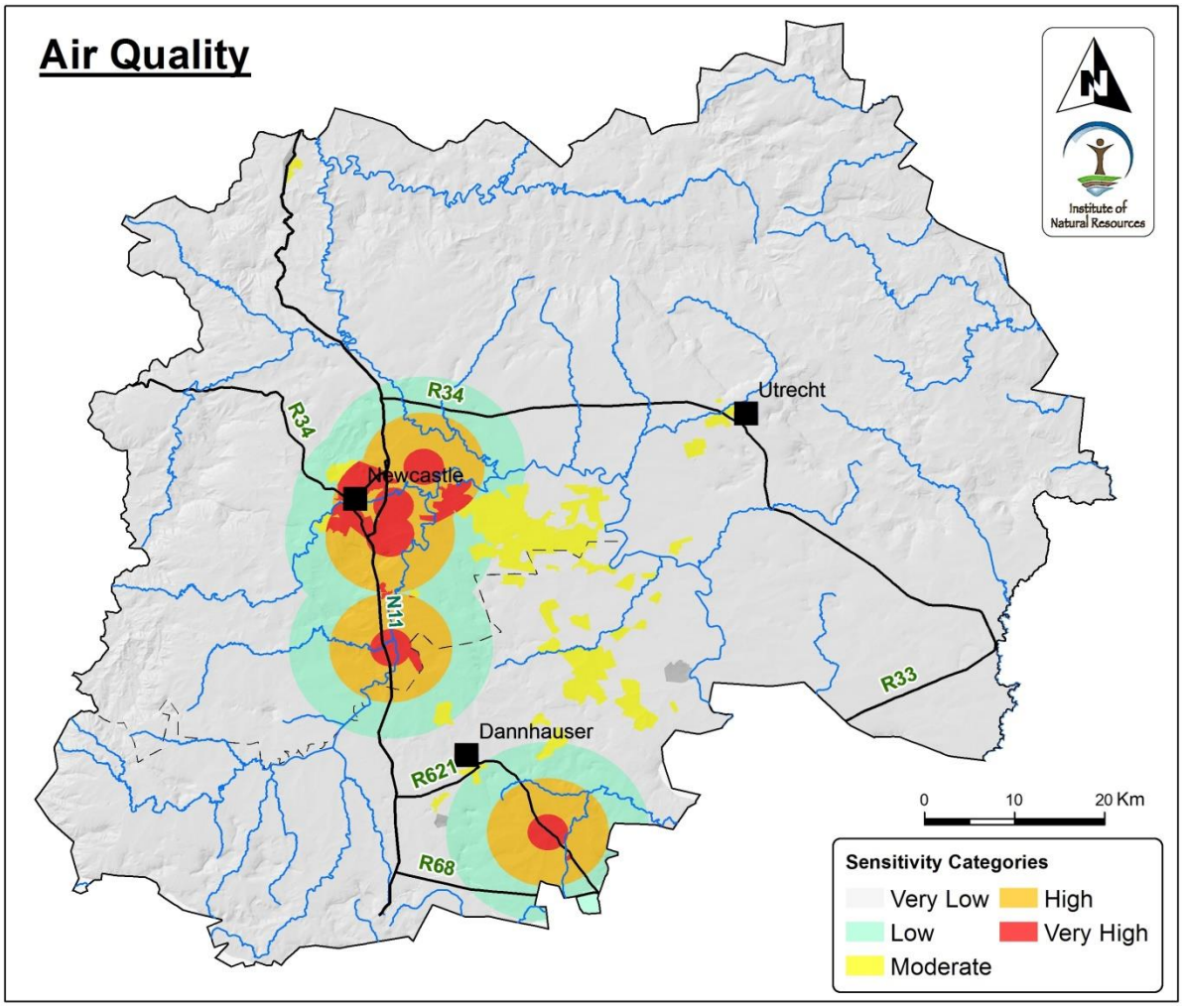


Figure 4: Air quality sensitivity zones

6.4 GUIDELINES

SENSITIVITY LEVEL	DEVELOPMENT OBJECTIVE	EIA GUIDELINES
		Specialist Investigations
High Sensitivity	Since the present situation with respect to AQ is unclear, the development objective at this point should be to, at the very least, retain current air quality by: - Either excluding activities that negatively impact current levels of air quality, and/ or - implementing mitigation measures that secure current levels.	▪ Given the perception that air quality in the District is poor, and given the bowl like topography of the District which hinders dispersal of pollutants, an air quality specialist study is mandatory for any development which is likely to compromise air quality further and should focus on understanding the: - Nature of the pollutants (noise, dust, gas, odour). - The concentrations, intensity and frequency of pollution events. - The location, extent and scale of the impact – how far the pollution will be experienced and at what concentrations under different climatic conditions. - The cumulative impact on pollution levels in the District. ▪ Given the current lack of baseline data, this would need to be established to inform the assessment of cumulative impact.
Medium Sensitivity		
Low Sensitivity		Specialist study required to assess: - The direct impact on neighbouring sensitive land-uses/activities. - The cumulative impact on high and medium sensitivity zones due to the combined influence of climatic and topographical factors.
Very Low Sensitivity		Non applicable.

7. AQUATIC ECOLOGICAL HEALTH

7.1 STATUS QUO

Summary Statement: The majority of aquatic ecosystems in the upper catchments of the ADM are considered priority ecological conservation areas from a national perspective. Those in the lower reaches are largely considered important ecological support areas. The Present Ecological State (PES) of the riverine ecosystems of the District have been classified at a desk top level through the DWS's PES / EIS study. This information reflects that the rivers range from a B – "Good: Near Natural" category in higher lying mountainous reaches to a D – "Poor: Largely Modified" in the Ncandu and Horn Rivers and the Dorpspruit through Utrecht. The remaining areas are given as a C – "Fair: Moderately Modified". The majority of the Buffalo River below the confluence with the Ngagane River is given as a B. This is in contradiction with various ecological reports of the river as being highly polluted and in a poor condition.

The current situation is due to the following factors:

Water Quality: The key driver of reductions in biological health in the ADM is poor water quality. Other flow related impacts are present, particularly on the Ngagane River below Ntshingwayo dam and Ngagane abstraction points, but are of less significance.

Habitat: Riparian habitat in particular is heavily impacted along the mid to lower reaches of the Buffalo River. Here expansion of settlements and associated sand mining has degraded riparian habitats. Heavy grazing pressure has also impacted this stretch of river. Alien plants have established dense stands in some upper lying riparian areas. These have excluded indigenous riparian species and contribute to bank collapse and sedimentation of water courses.

Monitoring: There is a lack of bio-monitoring data available to provide input to this study. The PES-EIS study provides a desktop level of information, but no ground-truthed data is available.

7.2 SUSTAINABILITY OBJECTIVE

Secure the quality, quantity and timing of ecologically important flows in the rivers of the ADM and implement management measures to protect their ecological integrity.

7.3 SENSITIVITY ZONES

The catchments of the District have been classed into sensitivity categories based on their conservation priority and on their present ecological state.

Table 6: Sensitivity catergories applied to aquatic ecological health

Sensitivity feature	Sensitivity Level	Sensitivity Score
River NFEPA Good condition (A/B)	Very High Sensitivity	5
River NFEPA Moderate condition (C/D)	High Sensitivity	4
Fish Support Area Good condition (A/B)	High Sensitivity	4
Fish Support Area Moderate condition (C/D)	Moderate Sensitivity	3
Phase 2 FEPA	Moderate Sensitivity	3
Upstream MA	Low Sensitivity	2
All else	Very Low Sensitivity	1

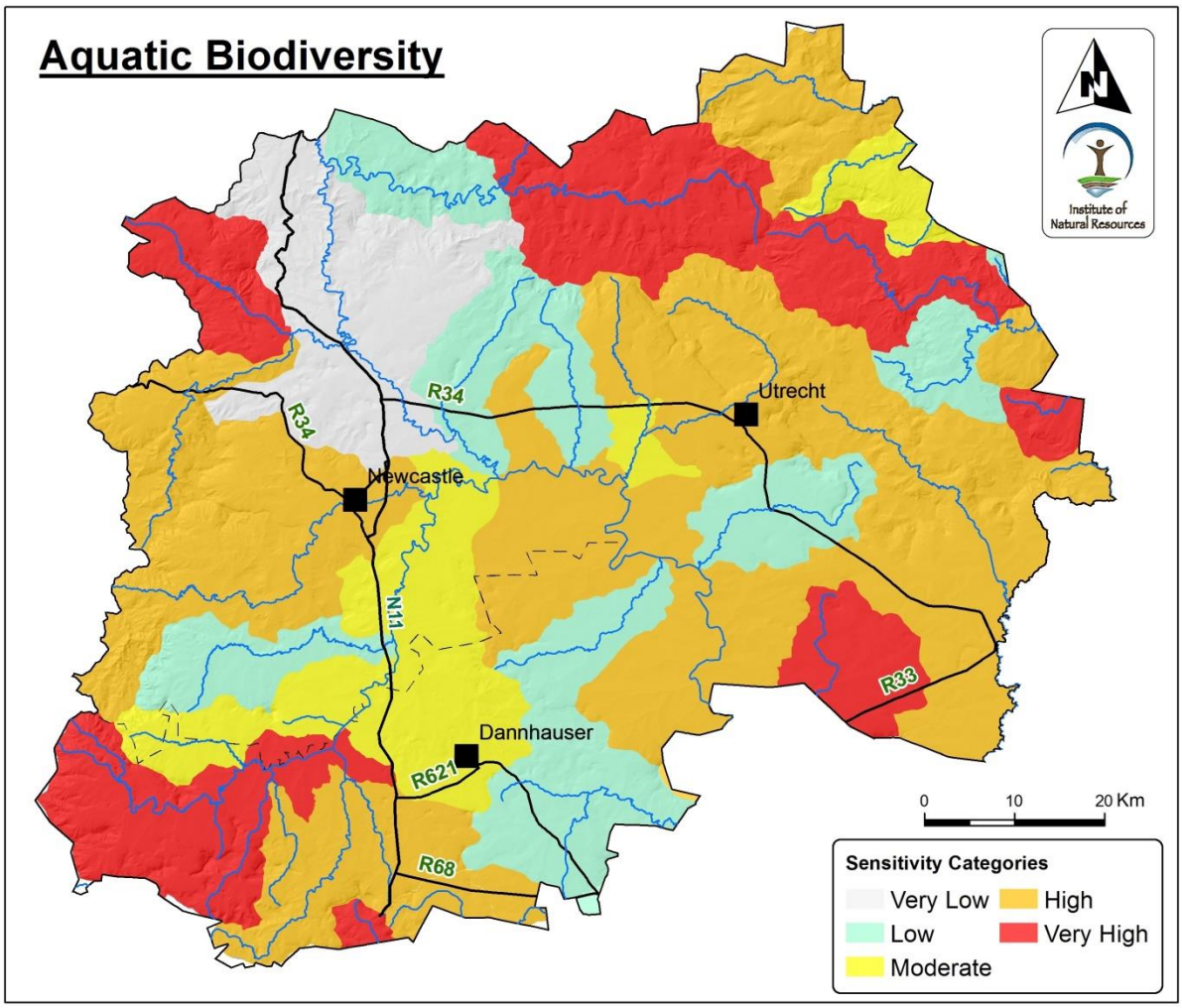


Figure 5: Aquatic Ecology sensitivity zones

7.4 GUIDELINES

SENSITIVITY LEVEL	DEVELOPMENT OBJECTIVES	EIA GUIDELINES
		Specialist Investigations
High Sensitivity	Development must protect the ecological integrity of the riverine systems both on site and downstream of the development. This includes: 1. Implementing appropriate buffers around all water courses 2. Managing sediment on site and avoiding sedimentation of water courses 3. Where abstraction of water is considered, developments must ensure the ecological reserve is maintained. Contribute to the improved condition of the aquatic ecosystem through rehabilitation of riverine features.	Where developments are likely to impact a water course, EIA specialists should undertake the following: ▪ Delineation of the riparian zone and assessment of condition of the riparian vegetation. ▪ Delineation of an appropriate buffer to protect the riparian zone. ▪ Baseline ecological assessment of aquatic ecosystem. ▪ Assessment of impacts of any proposed direct inputs to system e.g. storm-water run-off, and effluent disposal and ▪ the potential impact of the development itself on receiving aspects of the aquatic system i.e. stream bank stability, riparian vegetation, flows, in-stream habitat.

Medium Sensitivity	Maintain the condition of the aquatic ecology.	
Low Sensitivity		
Very Low Sensitivity	▪ NA	▪ NA

8. HERITAGE RESOURCES

8.1 STATUS QUO

Summary Statement: The ADM has a rich heritage resource base, including significant battlefields and associated sites, archaeological sites, significant architecture and sites associated with the anti-apartheid struggle. Heritage resources are seen as an economic opportunity for the district due to their tourism potential however there is currently little emphasis on the identification, conservation and maintenance of heritage resources and no marketing of these as tourist attractions.

The majority of identified and formally recognised heritage sites (listed on SAHRIS) in the District are related to colonial history. These are predominantly related to the Anglo-Zulu and Anglo-Boer wars and Voortrekker sites. There is the potential for more recent sites of significance from the anti-apartheid era to be captured and protected.

Heritage tourism has a very limited input to the District economically. In the majority of local economic development strategies and plans, tourism related to heritage sites is seen as an important potential driver of economic growth. There is currently however no formalised body responsible for the maintenance and promotion of heritage tourism in the District. There are also no formal agreements with land owners or tourism associations and no heritage tourism operators are based in the District.

The status quo is a factor of the following issues:

i. **Marketing and management of sites**: Most of the heritage sites in the District with Tourism potential relate to colonial history and battlefields in particular. These areas are not effectively marketed, signposted or maintained. The District competes with other such tourist attractions in neighbouring Districts.

ii. **Location:** Many tour operators are located outside of the District and may therefore not focus on tourism opportunities within the district.

iii. **Responsibility:** There is currently no assigned responsibility for heritage resources in the District government structure. A heritage champion is required to drive heritage conservation in the District.

iv. **Local level protection:** There are currently no local level heritage sites recognised in the District.

v. **Over expectation:** There is tourism potential in the district but the impact of tourism on the economy is much less than is perceived.
vi. **Maintenance and investment:** Areas with potential for tourism are not well maintained and conserved and the potential is not reached.

8.2 SUSTAINABILITY OBJECTIVE

To adequately identify, protect and benefit from the District's heritage resources and to ensure their long term management and marketability.

8.3 SENSITIVITY ZONES

Heritage Sensitivity Zones have been defined according to the variety of specific heritage features encountered in the District. The battlefields located in the District are a key element of the District's history and represent a major economic development opportunity. They are therefore regarded as very highly sensitive. Although other SARIS listed National and Provincial Grades I and II Heritage Sites, are not as potentially marketable, they are important on a national level and thus also considered very highly sensitive.

Sites of National Heritage value that are known of but that are not registered on SARIS are considered as one step lower i.e. highly sensitive, only because they do not carry the same level of protections as those sites listed on the national database. These sites are nonetheless of great heritage value.

There are sites that have been proposed by this EMF as being of value, particularly those associated with the anti-colonial / anti-apartheid movements. Recognition of these sites would restore a level of balance in the representation of various events of history as presently, the colonial war related sites dominate the Districts collection. These sites are at this stage have no legislated status and are regarded as moderately sensitive.

Table 7: Sensitivity features associated with heritage resources

Sensitivity feature	Sensitivity Level	Sensitivity Score
Battlefield and 500m buffer	Very High Sensitivity	5
SARIS Site	Very High Sensitivity	5
Non-SARIS Site	High Sensitivity	4
Proposed sites	Moderate Sensitivity	3

** All buffers include a 25m allowance for the feature itself*

From a spatial perspective, unfortunately heritage features and their buffers are often too small to be seen on a map of the District. A map of the District's heritage features (Figure 6) therefore appears to only consist of battlefield features. The smaller features are however represented and can be identified and queried in the EMF's spatial GIS data.

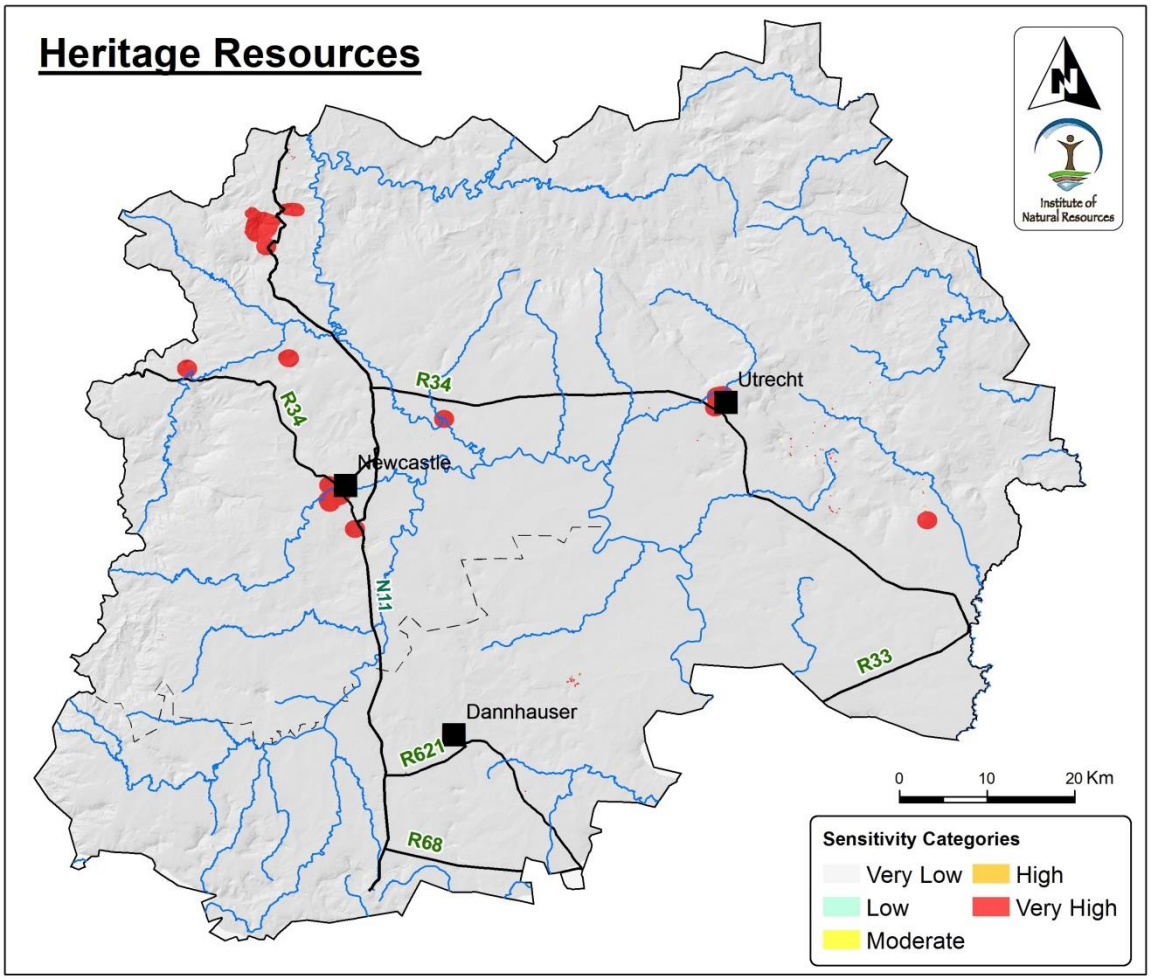


Figure 6: Heritage Resources sensitivity zones

8.4 GUIDELINES

SENSITIVITY LEVEL	DEVELOPMENT OBJECTIVE	EIA GUIDELINES Specialist Investigations
Very High Sensitivity **High Sensitivity** **Moderate Sensitivity**	The development objective for sites in this category is to retain the site and it's buffer in a largely unchanged state, in relation to the site's heritage significance, in order to retain its value.	▪ A specialist heritage impact assessment is required that should focus on o The heritage value of the feature o The nature of the development and its likely impacts on the heritage value of the feature. This should include and assessment of the impact on the feature's sense of place and the relevance of the landscape character to the feature (battlefields particularly).
Low Sensitivity	To identify and evaluate the significance of sites or artefacts encountered in these areas.	All development sites should be screened for potential sites or artefacts of heritage significance. This is particularly relevant in the region's fossil rich Karoo Supergroup deposits. In these areas, palaeontological Impact Assessment should always be compiled, even if only at the desktop level, before development proceeds on site.
Very Low Sensitivity		All development sites should be screened for potential sites or artefacts of heritage significance.

9. TERRESTRIAL BIODIVERSITY

9.1 STATUS QUO

Summary Statement: There is very limited protection of important terrestrial biodiversity within the district. In the lower lying areas, most high biodiversity value areas are fragmented and under threat from urban settlement expansion, agriculture and mining. In higher lying areas, important biodiversity areas coincide spatially with areas of importance for water production and livestock grazing presenting opportunities for synergistic protection and tourism.

The overall situation is due to the following key issues:

i. ***Fragmentation:*** Areas with high biodiversity conservation value in the low lying areas are highly fragmented and little opportunity for maintaining connectivity exists. This limits the efficacy of ecological processes. This fragmentation is primarily as a result of the expansion of urban and sparse settlement and associated small scale agriculture.

ii. ***Alien plants:*** Rapid expansion of alien plants (wattle trees in particular) has resulted in large areas of grassland being lost in a short space of time (40 000 Ha in 20 years)

iii. ***Transformation of habitat***

   a. ***Mining:*** There are conflicts between mining and terrestrial biodiversity within the district. Mining areas have been developed and are proposed to be developed in areas of high terrestrial biodiversity value.

   b. ***Urbanisation:*** There has been an accelerated conversion of grassland to urban areas. Sparse urban areas themselves have progressively become more dense and open space on the peripheries of Osizweni and Madadeni has been developed. Much of this expansion happens outside of the environmental regulatory and municipal planning framework.

   c. ***Agriculture:*** Cultivation of natural areas transforms habitat and results in biodiversity loss. Over utilisation of grazing areas can result in diminished species diversity and diminished ecological functioning

iv. ***Synergies:*** In some instances, there is overlap between CBAs and high quality agricultural land where cultivation is not possible. In these cases, agrobiodiversity zones have been defined which describe the protection needs of both biodiversity and agriculture. These areas also correlate well spatially with strategic water source areas.

9.2 SUSTAINABILITY OBJECTIVE

Secure formal or stewardship agreement level protection of critical biodiversity areas required to meet provincial targets and ensure appropriate management of these and ecological support areas.

9.3 SENSITIVITY ZONES

The sensitivity zones for terrestrial biodiversity are derived from varying levels of biodiversity importance/sensitivity according to the following levels of hierarchy:

i. **Formally protected areas and stewardship sites**: Protected areas include all areas as referred under Section 9 of the National Environmental Management: Protected Areas Act (Act 57 of 2003), which are protected by law for the purpose of managing and conserving biodiversity. These include Nature Reserves and Protected Environments with management assigned to the competent authority of the Province, namely the KwaZulu-Natal Nature Conservation Board, trading under the name of Ezemvelo KZN Wildlife (EKZNW).
Stewardship sites also include all areas under biodiversity related agreements.

ii. **Critical Biodiversity Areas (CBAs) and Agro-Biodiversity Zones**: CBAs include all areas that are critical for meeting biodiversity targets and thresholds in the Province, and which are required to ensure the persistence of viable populations of species, as well as the functionality of ecosystems. CBAs are split into two levels, namely Irreplaceable CBAs and Optimal CBAs. CBAs are derived using provincial–scale conservation planning processes (i.e. the irreplaceable and optimal categories from the 2010 Minset). Other datasets included in the conservation planning process included Critically Endangered and Endangered ecosystems, and critical linkages from the landscape corridor dataset. At a similar level of importance, areas that are important for both sustainable agriculture and biodiversity conservation due to presence of land of moderate to high agricultural potential and high biodiversity value are referred to as Agro-Biodiversity Zones.

iii. **Threatened Ecosystems as defined by NEMBA**: The Biodiversity Act (Act 10 of 2004) provides for listing of threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to preserve witness sites of exceptionally high conservation value (SANBI Biodiversity Advisor).

iv. **Ecological Support Areas (CBAs) and Environmental Management Zones**: ESAs include areas that support and sustain the ecological functioning of CBAs to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the CBAs, as well as allowing for the maintenance of Ecological Infrastructure (EI). ESAs include ecological corridors, species-specific areas, and protected area buffers such as the Trail Zone that has been specifically defined for the uKhahlamba Drakensberg Park World Heritage Site. At a similar level of importance to the ESAs, environmental corridors and ecological links that also promote sustainable land management for the ecosystem goods and services that are provided and the biodiversity that is supported are referred to as Environmental Management Zones.

v. **Other Natural Areas (ONAs) – Threatened Vegetation Types**: Despite not being identified as critical for meeting biodiversity targets, these areas are still important from a biodiversity conservation perspective and should be avoided if possible in development planning. They are capable of providing a number of services and should be managed carefully with close reference to the other elements of the EMF such as water production areas. in terms of maintaining and/or enhancing ecological infrastructure.

vi. **Other Natural Areas (ONAs) – Non-Threatened Vegetation Types**: At the lowest level of importance/sensitivity are untransformed natural areas that have not been identified as a priority for biodiversity conservation based on the categories listed above. Nevertheless,

these areas retain their natural ability to perform a range of biodiversity and ecological infrastructural functions. They should be managed in accordance with other components of the UMDM EMF (e.g. water yield and water quality) in terms of maintaining and/or enhancing ecological infrastructure.

The table below summarises the categorisation of sensitivity zones covering terrestrial biodiversity that is based on the aforementioned rationale (Table 8). Figure 7 illustrates the spatial distribution and extent of the terrestrial biodiversity sensitivity zones as they are located within the district.

Table 8: Sensitivity scores for terrestrial biodiversity

Sensitivity feature	Sensitivity Level	Sensitivity Score
Protected Areas	Very High Sensitivity	5
CBA Irreplaceable	Very High Sensitivity	5
CBA Optimal	Very High Sensitivity	5
Agro-biodiversity Zone	Very High Sensitivity	5
Threatened Ecosystem	Very High Sensitivity	5
Proposed Protected Area	High Sensitivity	4
Ecosystem Support Areas	High Sensitivity	4
Environmental Management Zone	High Sensitivity	4
ONA – Threatened Vegetation Type	Moderate Sensitivity	3
ONA – Non-Threatened	Low Sensitivity	2
Transformed Areas	Very Low Sensitivity	1

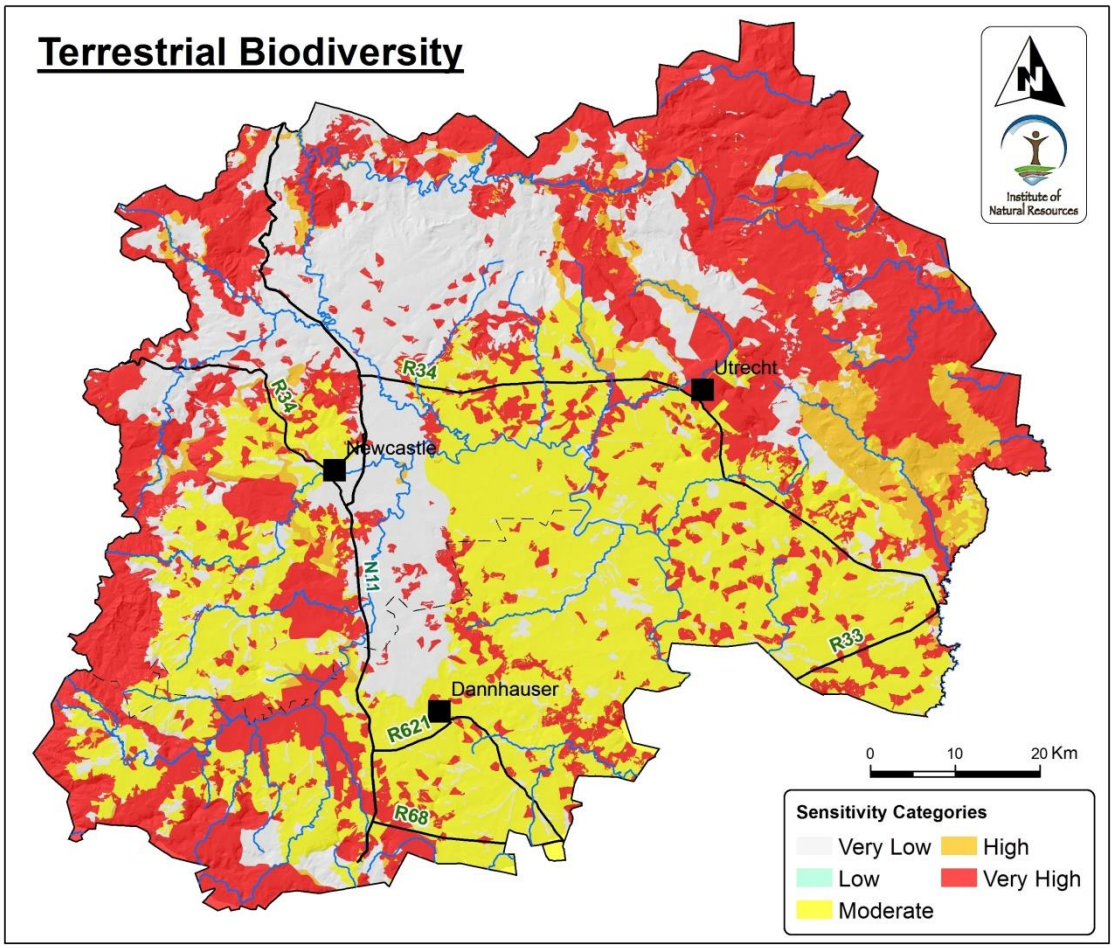


Figure 7: Terrestrial biodiversity sensitivity zones.

9.4 GUIDELINES

SENSITIVITY LEVEL	DEVELOPMENT OBJECTIVES	EIA GUIDELINES Specialist Investigations
Very High Sensitivity	**Protected Areas:** Development in accordance with Protected Area Management Plan approved by the KwaZulu-Natal Nature Conservation Board **Critical Biodiversity Areas (CBAs), NEMBA Threatened Ecosystems and Agro-Biodiversity Zones:** These areas have very high development constraints and care should be taken to ensure that large scale transformation does not occur and that the ecological functioning of these sites is not lost. Activities that would result in transformation or the nett loss of critical biodiversity elements should not be undertaken in this zone. Activities that are compatible with biodiversity management objectives and that would result in a nett increase in biodiversity should be supported. In cases where biodiversity impacts cannot altogether be avoided or acceptably mitigated on-site, and where there is substantial socio-economic justification to support the development, the establishment of suitable off-site biodiversity offsets that would result in positive impacts for biodiversity in the region must be considered.	A terrestrial biodiversity specialist study is required for areas of very high sensitivity. This study has to be undertaken by a suitably qualified professional whose qualifications are publically recognised and verifiable. - The report should clearly define the methodology used to undertake the assessment. - The outcomes of the report needs to clearly state the sensitivity of the study area and indicate whether potential impacts can be avoided or mitigated - The report should also include recommendations and management for important biodiversity features.

	Development should consider the following principles: Loss of natural land supporting biodiversity and functioning ecosystems should be avoided. Development should utilise already transformed and/or heavily degraded land as far as possible. Development must be planned and designed according to principles of conserving biodiversity by maintaining and/or enhancing biodiversity features on-site. Development should ensure a "no nett loss" of biodiversity, with management measures and mechanisms put in place to conserve and/or enhance the biodiversity value of the land. Where these high biodiversity areas correspond with areas of high agricultural values, then areas are to be maintained and managed as agricultural landscapes that encourage biodiversity through linkages and corridors that connect protected areas. The agricultural component should rely on uncultivated land by avoiding ploughing of virgin land.	
High Sensitivity	**Ecosystem Support Areas and Environmental Management Zones:** These areas are critical to the maintenance of biodiversity in the landscape and supporting the areas in category 1 (Very High sensitivity). They should be retained and managed in a natural state. Biodiversity resources on-site should be identified and the impact of the proposed development on these resources must be assessed. Development should only proceed in a manner that would limit potential impacts on important biodiversity elements occurring on the site and the surrounding landscape. Activities that will result in extensive transformation or the nett loss of critical biodiversity elements should not be undertaken in this zone. Activities that will support biodiversity objectives should be encouraged. This would include development that includes components of rehabilitation and conservation as part of the layout and design. Development should consider the following principles: • Development must not impact negatively on the functioning of ecological corridors and natural land that provide an important role of supporting biodiversity at the landscape level. • Habitat fragmentation and edge effects should be limited and developments should be clustered together. • Development should first target existing transformed land, and then heavily degraded land, before considering more natural land. • Corridors comprising natural land should be maintained in a natural/near-natural state.	A terrestrial biodiversity specialist study is required for areas of high sensitivity. This study has to be undertaken by a suitably qualified professional whose qualifications are publically recognised and verifiable. - The report should clearly define the methodology used to undertake the assessment. - The outcomes of the report needs to clearly state the sensitivity of the study area and indicate whether potential impacts can be avoided or mitigated - The report should also include recommendations and management for important biodiversity features.
Moderate Sensitivity	**Other Natural Areas (ONAs) – Threatened Vegetation Types:** Untransformed land that was not identified as a priority for biodiversity conservation based on the aforementioned categories are referred to as other natural areas (ONAs). Where these consist of threatened vegetation types, they are considered of moderate sensitivity as these areas are still able to contribute to the broader biodiversity conservation agenda. They are also able to perform a range of biodiversity processes and ecological functions and contribute important ecosystem services.	The Competent Authority or Department of Environmental affairs or equivalent parks authority such as Ezemvelo KZN Wildlife may request that a terrestrial biodiversity impact study must be undertaken, to determine the present state with respect to vegetation types present and the condition of the terrestrial biodiversity. The proposed development's impact on the terrestrial biodiversity of the District should also be assessed. This should assess the impacts broadly, but specifically take into account:

		- The impact and cumulative impact of the proposed development on terrestrial biodiversity.
Low Sensitivity	**Other Natural Areas:** Untransformed land that was not identified as a priority for biodiversity conservation based on the aforementioned categories are referred to as other natural areas (ONAs). Although they have a lower level of importance/sensitivity, they continue to perform a range of biodiversity processes and ecological functions. They should be maintained as far as possible especially when in a natural/near-natural condition.	Competent Authority or Department of Environmental affairs or equivalent parks authority such as Ezemvelo KZN Wildlife may request that a terrestrial biodiversity impact be undertaken, to determine the present and the proposed development's impact on the terrestrial biodiversity of the District.

References:

Ezemvelo KZN Wildlife. 2013a. Guidelines for Biodiversity Impact Assessments in KwaZulu-Natal, version 2. Report prepared by IEM, Ezemvelo KZN Wildlife. February, 2013. Available from: http://www.kznwildlife.com.

Ezemvelo KZN Wildlife. 2013b. Biodiversity offsets in KwaZulu-Natal: Concise guideline, version: 4Final. Report prepared by IEM, Ezemvelo KZN Wildlife. February, 2013. Available from: http://www.kznwildlife.com.

10. WATER PRODUCTION

10.1 STATUS QUO

Summary Statement: Water production is a critical ecosystem service for the District given that all the water used in the District is produced in the District and water supply in the area is under extreme pressure with the current level of water demand equalling the available supply. The District's catchments additionally make important contributions of water to other regions and nationally important users including downstream municipalities, Gauteng Province and Eskom for power generation. Climate change is also likely to increase rainfall uncertainty and increase drought and flood frequency. Regions of the ADM are therefore recognised as nationally important strategic water source areas (SWSAs). High water yielding areas are located in the high lying areas of the district and correlate spatially with CBAs and high value agricultural areas.

The current situation is due to the following factors:

i. **Topographic situation:** The District is situated at the top of the Buffalo River catchment with important tributaries of this river supplying water to key abstraction points like Ntshingwayo Dam. Because of this topographic situation, there are no contributions to these abstraction points made from any catchments outside the District.

ii. **Protection level:** There is presently very little protection of high water yielding areas resulting in numerous threats to these areas.

iii. **Alien plants:** A key factor impacting on the ADM's SWSAs is alien plants (wattle in particular). They degrade the ability of a landscape to regulate water production and reduce the yield of the catchment through increased evapotranspiration.

iv. **Agriculture - Livestock:** Over-utilisation of grasslands by livestock farmers results in reduced health of grasslands which encourages alien plant invasion and reduces the hydrological functioning of the landscape. Areas with reduced vegetation cover are also susceptible to erosion which reduces water quality and increases the rate at which dams fill with sediment.

v. **Mining:** Mining activities in the District have declined over the last decade, however also not occurring in abundance in SWSA within the district. There is however conflict between mining and water provision especially in the Dannhauser area.

10.2 SUSTAINABILITY OBJECTIVE

Improve water production security through appropriate protection and water resource management measures to ensure best possible hydrological health of catchments and long term sustained output of water.

10.3 SENSITIVITY ZONES

Water yield has been characterised using mean annual runoff (MAR) estimations for sub-quaternary scale catchments. These have been categorised as follows:

i. **Highest MAR (catchments in the top 25%):** Catchments reflecting the top 25% in terms of MAR are the most valuable water producing areas in the District and therefore considered critical catchments and allocated a very high sensitivity ranking.

ii. **Moderate to high MAR (50% - 75%) and located above critical supply points:** Moderate to high yielding catchments located above critical supply points are also considered critical catchments and also allocated a very high sensitivity ranking.

iii. **Moderate to high MAR (50% - 75%):** Catchments in the 50% – 75% rank are considered to be highly important ecological infrastructure and are categorised as highly sensitivity.

iv. **Low to moderate MAR (25% - 50%) and located above critical supply points:** These catchments make a modest but important contribution to critical supply points and are considered high sensitivity.

v. **Low to moderate MAR (25% - 50%):** These catchments make a moderate contribution to downstream users and are therefore considered to be moderately sensitive.

vi. **Low MAR (1% – 25%):** These catchments make a limited contribution to basin water supply and are considered to be of low sensitivity.

Table 9: Sensitivity catogories applied to water production areas

Sensitivity feature	Sensitivity Level	Sensitivity Score
Highest 25% of ADM MAR catchments	Very High Sensitivity	5
Moderate to High MAR (50% - 75%) and above critical infrastructure	Very High Sensitivity	5
Moderate to High MAR (50% - 75%) catchments	High Sensitivity	4
Low to Moderate ADM MAR and above critical infrastructure	High Sensitivity	4
Low to Moderate ADM MAR catchments	Moderate Sensitivity	3
Lowest 25% of ADM MAR catchments	Low Sensitivity	2

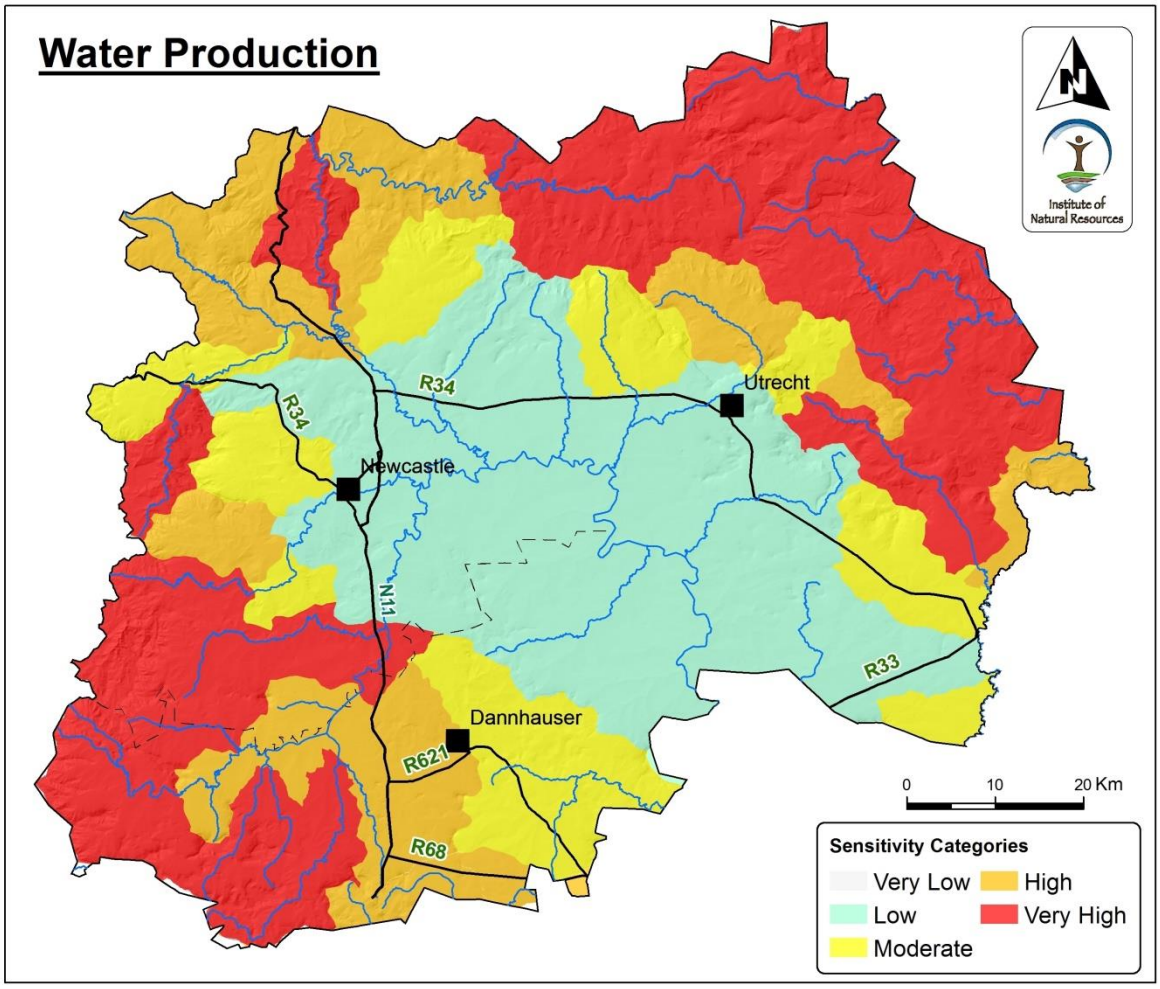


Figure 8: Water production sensitivity zones

10.4 GUIDELINES

SENSITIVITY LEVEL	DEVELOPMENT OBJECTIVES	EIA GUIDELINES
		Specialist Investigations
Very High Sensitivity	Developments that would result in the large scale transformation of ecological Infrastructure should be avoided (particularly grasslands and wetlands). Where impacts on critical ecological infrastructure will result in the loss of ecological infrastructure and these impacts are not avoidable, and, where substantive socio-economic benefit justifies the development, the establishment of suitable off-site offsets for these ecological water yield services in the region must be considered. Ensure that the ecological Reserve is maintained such that aquatic	If required, undertake an environmental impact assessment (EIA) and water use licence application (WULA). These should preferably be undertaken concurrently to improve the overall authorisation/licencing process, as well as to avoid delays in obtaining authorisation from the competent authorities. The process should be initiated with a pre-application meeting with the Department of Water and Sanitation (DWS) to establish the WULA requirements; and, a pre-application process with the Competent Authority in terms of the EA process. Conduct the necessary specialist studies to assess the impact of the development on the water resource. Specialist studies should include, but not be limited to; wetland delineation and functional and/or a river ecosystem assessments; and, a hydrological impact assessment.

High Sensitivity	ecosystems will continue to supply goods and services to society. Ensure the development is flood neutral and does not result in significant hydrological alteration. Ensure the development is flood neutral and does not result in significant hydrological alteration. The developments of additional dams and streamflow reduction activities (e.g. plantation forestry) should be avoided Maintain and/or enhance ecological infrastructure (wetlands, riparian areas, grasslands, etc.) to improve water supply to downstream users and safeguard ecological requirements. Ensure that adequately-sized buffers for aquatic ecosystems are maintained and/or reinstated, and managed in an optimum, natural/near-natural condition (i.e. good vegetation cover free of alien vegetation).	Through existing and/or new studies, establish the flow requirements for the human and ecological Reserve. The ecological Reserve needs to be determined at an appropriate level (i.e. Rapid, Rapid level III, Intermediate or Comprehensive Reserve determination) according to the nature of the proposed development, as well as other relevant factors such as the present ecological status of the water resource. The Department of Water and Sanitations' (DWS) methods for Eco Classification and Eco Status Determination in rivers should guide the Reserve determination process. If required water use license (i.e. WULA) must be obtained before commencement of the development, in accordance with the various water use types listed under Section 21 of the National Water Act (Act no. 36 of 1998). The WULA process should integrate findings from specialist studies and the ecological Reserve determination, and should include a risk assessment using the DWS Risk Assessment Matrix. Appropriate measures need to be established based on the outcomes of the risk assessment, and incorporated into an environmental management plan report (EMPr). The EMPr should also include, but not be limited to, a stormwater management plan; rehabilitation plan covering both terrestrial and aquatic environments; and, procedures for ongoing monitoring and maintenance.
Moderate Sensitivity	Ensure that the ecological Reserve is maintained such that aquatic ecosystems will continue to supply goods and services to society. Avoid aquatic ecosystems, and where possible, incorporate appropriate aquatic buffers during the developing planning process. Maintain, and as far as possible enhance aquatic ecosystems (e.g. wetlands and riparian) and associated buffers. Ensure that adequately-sized buffers for aquatic ecosystems are maintained and/or reinstated, and managed in an optimum, natural/near-natural condition (i.e. good vegetation cover free of alien vegetation).	
Low Sensitivity	Ensure that the ecological Reserve is maintained such that aquatic ecosystems will continue to supply goods and services to society. Avoid aquatic ecosystems, and where possible, incorporate aquatic buffers during the developing planning process. Maintain, and as far as possible enhance aquatic ecosystems (e.g. wetlands and riparian) and associated buffers.	If required, undertake environmental assessments (EA) and water use licence applications (WULA) in accordance with listed activities under the NEMA and the NWA, and conduct the necessary specialist studies to assess the impact of the development on the water resource. If required, a water use license (i.e. WULA) must be obtained before commencement of the development, in accordance with the various water use types listed under Section 21 of the National Water Act (Act no. 36 of 1998).
Very Low Sensitivity		

11. WATER QUALITY

11.1 STATUS QUO

Summary Statement: Water quality in the District ranges from very good in the high lying areas to highly impacted in the lower reaches of the Ncandu, Horn and Ngagane rivers and other smaller tributaries. This is an important consideration given the importance of these rivers to regional water supply security. The key impacts originate from mining activities (both active and abandoned mines), urban waste water, industrial activities and agriculture. Importantly, monitoring data is limited with respect to the spatial distribution of sites and the determinands included in programmes meaning the characterisation of water quality and the identification of water quality concerns across the District is difficult. Available data indicates acid mine drainage (indicators of pH and sulphate concentrations) and waste water (indicators of bacteria and nutrient enrichment) to be the key water quality issues facing the District.

The current situation is due to the following factors.

i. ***Impacts of Acid Mine Drainage (AMD):*** *The long history of mining in the District has meant there are many sources of Acid Mine Drainage including both numerous abandoned mines and active mining operations. Key impacts of AMD are increased pH, increased concentrations of sulphates and other salts and increased concentrations of metals such as iron. These changes reduce the ecological integrity of the rivers downstream of decant points, reduce the utility value of the water (e.g. this water becomes unusable for irrigation) and increase treatment costs. AMD impacts groundwater similarly.*
ii. ***Waste Water Treatment Infrastructure:*** *The largest treatment works in the District (Madadeni, Newcastle and Osizweni) are presently at capacity and storm water ingress results in frequent discharges of largely untreated effluent to the environment.*
iii. ***Inadequate Waste Water Treatment:*** *The IRIS Green Drop reporting system, together with works' effluent monitoring data show that numerous treatment works within the Amajuba District are failing to meet effluent quality standards.*
iv. ***Industrial water quality impacts:*** *The high concentration of industrial activities in the Newcastle area results in numerous discharges of treated effluent as well as contamination of surface runoff and groundwater through waste stockpiles.*
v. ***Agricultural activities:*** *Agricultural activities generate widespread diffuse inputs of nutrients and other pollutants in the form of fertilisers and pesticides. DWS monitoring data is presently unable to demonstrate such impacts given the limited number of determinands monitored and the course detection limits of the laboratory methods implemented.*

11.2 SUSTAINABILITY OBJECTIVE

Understand District water quality problems better through improved monitoring and improve water quality to levels which sustain human and economic users/uses and ecological functioning .

11.3 SENSITIVITY ZONES

There are many determinands that influence water quality, from salts (such as sulphate, calcium, sodium and magnesium) and metals to bacterial contamination each of which impact different users in different ways. The specialist investigation revealed that the components that are at the core of the quality issue are salts, pH, excessive bacteria and nutrient loading.

A catchment's WQ sensitivity is graded according to:

1. the location of a catchment relative to critical water supply infrastructure – either:
    a. Critical (the catchment in which the supply infrastructure is located),
    b. Proximal (catchments either immediately above or two catchments above critical catchments),
    c. Distal (catchments more than 2 above critical catchments) or
    d. Non influential catchments (not relevant for supply features), and
2. the level to which the catchment's water quality is compromised. This is established using either:
    a. Measured WQ monitoring data, or
    b. through a modelling process based on land use.

The highest sensitivity is located around the key water supply features on the Ngagane and Buffalo Rivers. Not only are these critically important resources, but they are also stressed from a water quality perspective. All catchments are established to be sensitive from an ecological perspective.

Table 10: Sensitivity catogories applied to water quality areas.

Sensitivity feature	Sensitivity Level	Sensitivity Score
Catchments directly influencing critical water supply features	Very High Sensitivity	5
Proximal catchments - high measured	High Sensitivity	4
Proximal catchments - high modelled	High Sensitivity	4
Proximal catchments - low	Moderate Sensitivity	3
Distal catchments - high measured	Moderate Sensitivity	3
Distal catchments - high modelled	Moderate Sensitivity	3
Distal catchments - low	Low Sensitivity	2
Catchments not influencing - high measured	Low Sensitivity	2
Catchments not influencing - high modelled	Low Sensitivity	2
Catchments not influencing - low	Very Low Sensitivity	1

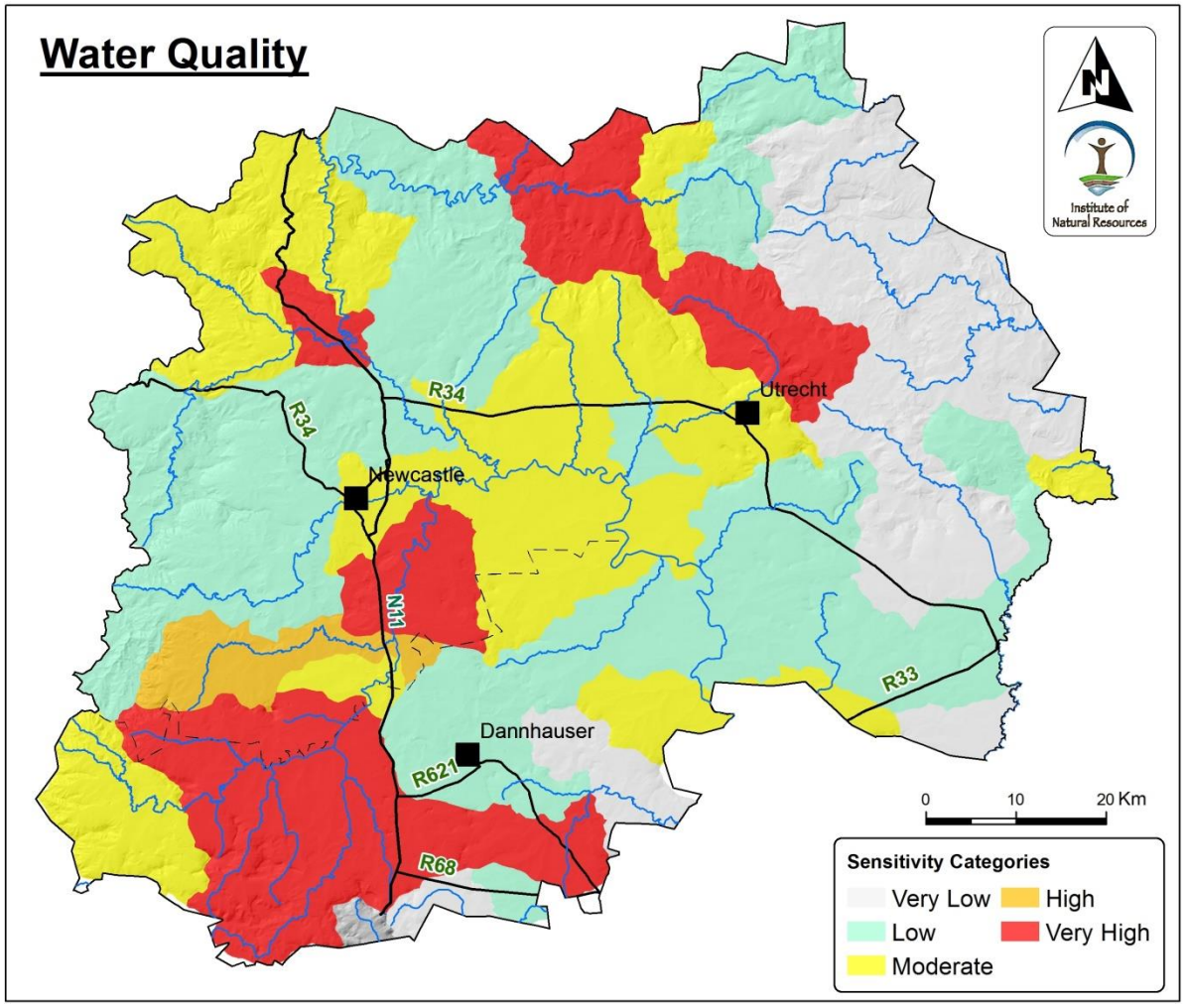


Figure 9: Water quality sensitivity zones

11.4 GUIDELINES

SENSITIVITY LEVEL	DEVELOPMENT OBJECTIVES	EIA GUIDELINES
		Specialist Investigations
Very High Sensitivity	There should be no increase in loading of pollutants, particularly salts, metals, nutrients, sediments and microbiological contaminants in these catchments. These catchments have, or are predicted to have, limited or no capacity to absorb further contamination and are in close proximity to key water storage infrastructure, thereby posing a risk to quality of supply. Activities undertaken here should be limited to those which can prove that they will have a negligible impact on water quality. Where discharge of waste is unavoidable, effluent should be environmentally neutral (concentrations of contaminants should be the same as or lower than the receiving environment concentration).	A water quality impact study must be undertaken to determine the proposed development's impact on the key water resources in this catchment and, immediately downstream of it. This should assess the impacts broadly, but specifically take into account: 1. The volume of waste generated by the development and its proposed disposal; 2. Cumulative impacts of existing activities located in the critical and proximal catchments particularly with respect to nutrient loading and bacteria contamination; 3. The potential contribution of the proposed development to the eutrophication of the water resource; and, 4. The potential sedimentation impacts associated with construction projects. The study must also assess the impact of the proposed

	Only activities which will result in no discernible change from present nutrient and microbiological concentrations via diffuse sources should be permissible. Activities must ensure limited soil disturbance and any potential for sediment movement into drainage channels must be controlled. Water quality monitoring requirements for all authorised activities must include high frequency sampling and analysis of relevant indictors to an appropriate level of detection. Activities that could result in any deterioration of the current water quality standard should not be supported.	activity on the sensitive aquatic ecology of the catchment. Any development activity must adhere to the requirements of any water use licence issued in respect of the activity.
High Sensitivity	Existing and predicted high pollutant loads indicate that the ability of the natural environment to ameliorate these impacts and assimilate the pollution loads is already heavily utilised. Developments in these areas should exclude activities with the requirement to discharge large quantities of liquid waste to the environment (i.e. point source discharges) or activities with a high potential for spills and stormwater contamination. Activities undertaken in these areas should be limited to those with a low impact on water quality. All approved activities that could have a negative impact on water quality must include appropriate water quality monitoring. Activities that could result in a substantive deterioration of the current water quality standard should not be supported.	A water quality impact study must be undertaken, to determine the proposed development's impact on the sensitive aquatic ecology of the catchment and on the water resources located downstream of this catchment. This should assess the impacts broadly, but specifically take into account: 1. The impact of waste generated in and by the development and its proposed disposal 2. Cumulative impacts of the proposed development together with existing activities located in the downstream catchments particularly with respect to nutrient loading Any development activity must adhere to the requirements of any water use licence issued in respect of the activity.
Moderate Sensitivity	In proximal catchments included in this category, existing and predicted pollutant loads are considered to be moderate to low. All catchments however are considered important and sensitive given the limitation that water supply imposes on the District and from an ecological perspective. This means that catchments with lower pollutant loads are still important from a water quality perspective as they provide dilution capacity to compromised catchments downstream and support important and sensitive ecosystems. Activities in these catchments should	The Competent Authority or the Department of Water and Sanitation may request that a water quality impact study must be undertaken, to determine the present state with respect to water quality in the catchment concerned and the proposed development's impact on the water resources of the District. This should assess the impacts broadly, but specifically take into account: 1. The impact of waste generated by the development and its proposed disposal 2. Cumulative impacts of the proposed development together with existing activities located in the downstream catchments Any proposed activity must abide by the requirements of

	ensure any dischargeable waste generated is treated to standards that do not further compromise the WQ in downstream critical catchments. Distal catchments included in this category are considered to be compromised from quality perspective. Given their location above critical supply points, any further degradation will impact on the District's already constrained water supply. Any development in such catchments should ensure no Activities that could result in a substantive deterioration of the current water quality standard should not be supported.	any water use licence issued in respect of the activity.
Low Sensitivity	All catchments in the study area are considered important and sensitive from a water quality perspective. Any activities or development (present and future) within catchments in this category must take localised users of water into account and manage impacts on water quality accordingly. Localised areas with high pollutant loads should be treated carefully due to water uses not associated with key infrastructure. Activities in these catchments should ensure waste is managed responsibly and effluent treated effectively.	The Competent Authority or the Department of Water and Sanitation may request that a water quality impact study must be undertaken, to determine the present state with respect to water quality in the catchment concerned and the proposed development's impact on the water resources of the District. All requirements of any water use licence issued must be abided by.
Very Low Sensitivity	These areas have a greater absorption capacity for pollution loads however all catchments in the study area are considered important and sensitive from a water quality perspective. Any activities or development (present and future) within catchments in this category must take localised users of water into account and manage impacts on water quality accordingly.	The Competent Authority or the Department of Water and Sanitation may request that a water quality impact study must be undertaken, to determine the present state with respect to water quality in the catchment concerned and the proposed development's impact on the water resources of the District. All requirements of any water use licence issued must be abided by.

12. WETLANDS

12.1 STATUS QUO

Summary Statement: High levels of loss and degradation have reduced the capacity of wetlands to ameliorate the serious water quality issues in the catchment and sustain species with high conservation value. Most of the District's wetlands are in the upper catchment areas surrounding the district, but, with the exception of Groenvlei, the larger systems are located in the lower basin areas.

12.2 SUSTAINABILITY OBJECTIVE

Secure the long term functioning of wetland systems through accurate mapping, condition assessment (and rehabilitation where necessary), application of wetland buffer areas and implementation of regulatory instruments.

12.3 SENSITIVITY ZONES

The sensitivity zones relate to the extent of the wetland and its zone of influence. The actual body of the wetland is the most sensitive, given that direct impacts result in the loss of the habitat and ecological functioning. The 32 metre buffer zone represents a zone of lesser, but still significant sensitivity as activities in this area are likely to impact the wetland directly. The 500 metre buffer aims to represent the immediate catchment of a wetland and activities in this area can indirectly alter the condition of a system. This threat relates particularly to activities that alter the hydrology (volume, frequency and amplitude of run-off) in the wetland's catchment as these flows represent the life blood of the system.

Table 11: Wetland sensitivity categories

Sensitivity feature	Sensitivity Level	Sensitivity Score
Wetland body	Very High Sensitivity	5
32m Buffer zone	High Sensitivity	4
500m Buffer zone	Moderate Sensitivity	3

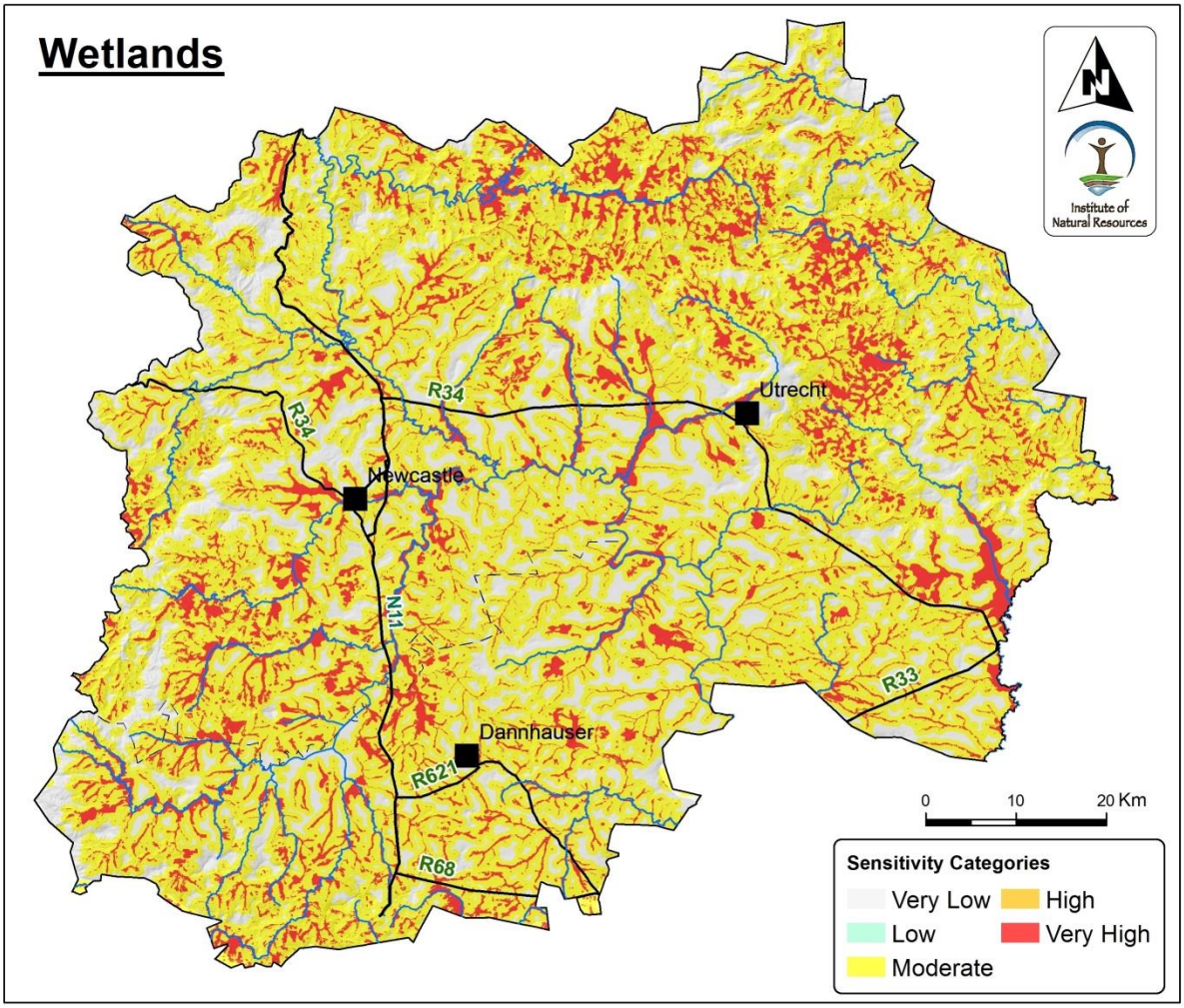


Figure 10: Wetland sensitivity zones.

12.4 GUIDELINES

SENSITIVITY LEVEL	DEVELOPMENT OBJECTIVES	EIA GUIDELINES
		Specialist Investigations
High Sensitivity	Net gain of wetland health and function through rehabilitation of existing systems on development sites to optimum levels of functioning and defined management plan to maintain this state.	▪ *Wetland Delineation.* The mapping undertaken for the EMF was at a broad level. Where it is suspected that a wetland occurs on site a specialist should be required to confirm this. If wetland/s occur then they need to be delineated according to DWA delineation guidelines. ▪ *Wetland Health Assessment* A wetland health and functional assessment using the WET-Health and WET-Eco services tools. ▪ *Wetland Rehabilitation and Management* The EMP should include a wetland management component that details how existing systems in good condition will be protected and managed, and how degraded systems will be restored and managed to achieve the sustainability objective. This management should include the delineation of a buffer zone that is appropriate to the nature of the land-use and associated impacts. The most recent/accepted guidelines for determining wetland buffers should be applied. In this regard the WRC has
Medium Sensitivity		

		commissioned a project to establish procedures for delineating wetland buffers (WRC project: K5/2200 – in prep).
Low Sensitivity	NA	NA
Very Low Sensitivity		

References and Resources

- Macfarlane, D.M., Kotze, D.C., Ellery, W.N., Walters, D., Koopman, V., Goodman, P. & Goge, C. (2006*). Wet-Health: A technique for rapidly assessing wetland health*. Version 1.
- Kotze, D.C., Marnerwick G.C., Batchelor A.L., Lindley D.S. and Collins N.B., (2007). WET-Management Series. *WET-Ecoservices: A technique for rapidly assessing ecosystem services supplied by wetlands*.
- Department of Water affairs and Forestry (2005). *A practical field procedure for identification and delineation of wetland and riparian areas*. Edition 1, September 2005. DWAF, Pretoria.
- Department of Water affairs and Forestry (2006). *Delineation of Wetland and Riparian Areas*. DWAF, Pretoria.
- SANBI (2009). *Further Development of a Proposed National Wetland Classification System for South Africa. Primary Project Report*. Prepared by the Freshwater Consulting Group (FCG) for the South African National Biodiversity Institute (SANBI).
- WRC project K5/2200: *Development Of A Methodology To Determine The Appropriate Buffer Zone Width And Type For Developments Associated With Wetlands, Watercourses And Estuaries (in prep).*

13. FLOOD ZONES

13.1 STATUS QUO

Summary Statement:

Floodable areas are generally small in the higher lying areas of the District. As rivers descend in altitude and reduce in gradient down towards the Buffalo River Basin, floodable areas increase in size. Flood plain areas play an important role in dissipating flood energy and absorbing sediment. They also host important ecosystems like wetlands.

Floodplain areas within the district have been subject to a range of development activities meaning infrastructure and lives are placed at risk and riparian, wetland and aquatic ecosystems are degraded. Activities associated with this development such as sand mining and brick making also reduce the ecological integrity of these areas.

Increased hardened surfaces and loss of infiltration in these areas increases flood volumes and intensity downstream. Climate change is also expected to result in increased flooding frequency and intensity.

The situation summarised above is due to the following factors and drivers:

i. Urbanisation: Over time, urban and peri-urban settlement expansion has occurred in flat, unoccupied areas which are generally floodable areas and large areas of flood zones have been transformed to urban and peri-urban landscapes.

ii. Urbanisation and governance: More recently, the majority of urban settlement expansion is unplanned and informal. This is occurring outside of regulatory and planning frameworks. This places homes, services infrastructure and lives at risk.

iii. This has a two way impact especially to the people that live on these flood plain areas and the potential negative impact to their infrastructure and lives should there be a flooding event.

iv. Sand mining: The flood plain of the lower Ngagane and Buffalo River is affected by sand mining where large areas of flood plain have been stripped of vegetation and the soil below exposed to flood erosion. Sand mining in flood zones of the Buffalo River basin is presently unregulated.

v. A significant area of flood zone in the District has also been cultivated due to the highly fertile alluvial soils and suitably flat land.

13.2 SUSTAINABILITY OBJECTIVE

To protect people and infrastructure from flood hazards and secure the ecosystem service value of floodplains (flood regulation, water quality regulation and habitat provision).

13.3 SENSITIVITY ZONES

Flood zones have been demarcated and areas within these zones are categorised as being very highly sensitive. All other areas are considered to be of very low sensitivity.

Table 12: Sensitivity catergories applied to flood zones

Sensitivity feature	Sensitivity Level	Sensitivity Score
All areas within demarcated flood zones	Very High Sensitivity	5
All other areas	Very Low Sensitivity	1

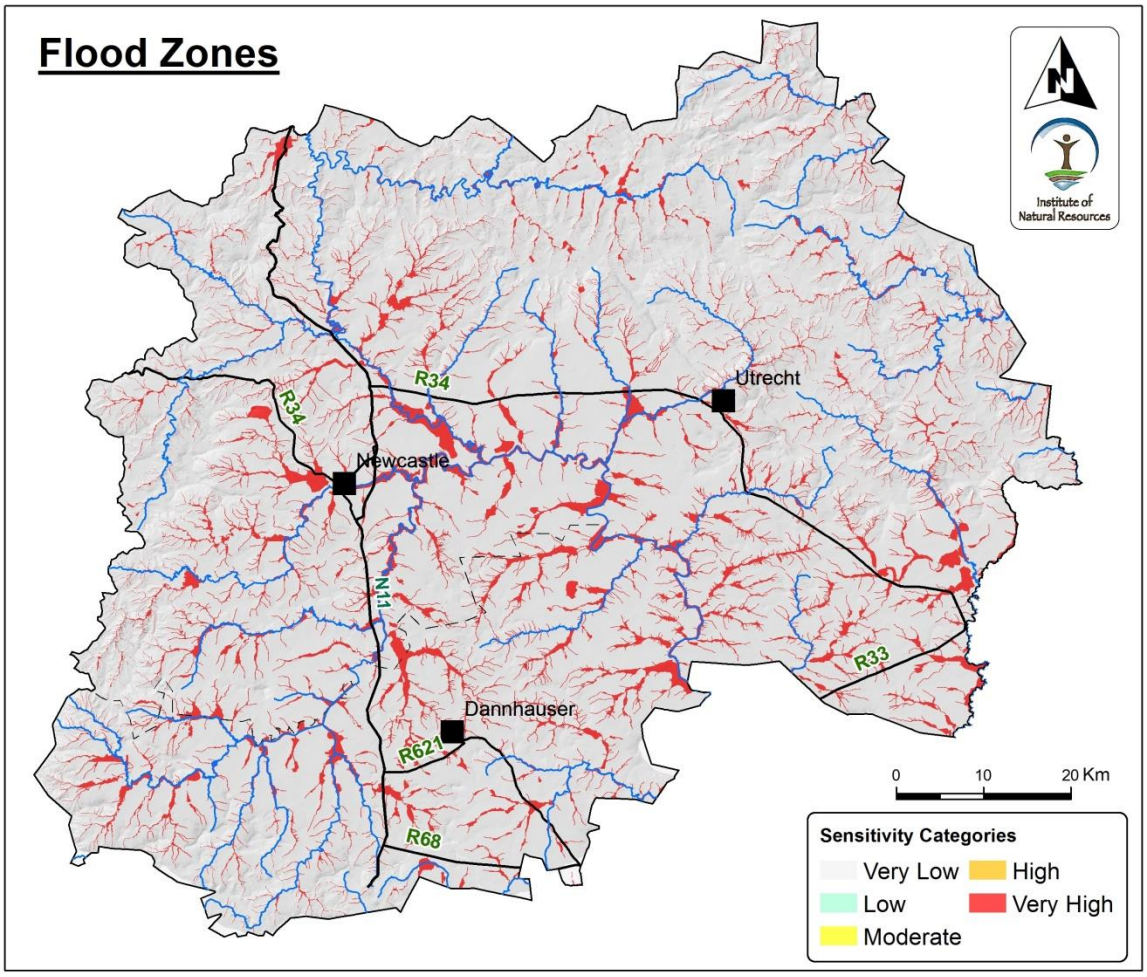


Figure 11: Flood zone sensitivity zones.

13.4 GUIDELINES

SENSITIVITY LEVEL	DEVELOPMENT OBJECTIVES	EIA GUIDELINES
		Specialist Investigations
Very High Sensitivity	Any development situated within the flood risk zone is in danger of being affected by a river or stream in flood and may place people and infrastructure on-site, and upstream or downstream of the site, in danger. Developments within flood risk areas may also negatively impact upon riverine ecology and hydrology. Should development be proposed below the established flood lines (see EIA guidelines), precautions must be taken to ensure the protection of the infrastructure and people associated with that development; and, the protection of infrastructure and people both up and down- stream of the site. Buildings and residential structures should not be permitted below the 1:50 year flood line. Activities that will result in unacceptable flood risk; or, that would negatively impact on the ecological and hydrological functioning of the floodplain are not supported in the flood risk area. Flood zone areas can contain ecological features that help mitigate flooding potential and provide ecosystem services. If development cannot be avoided within a predicted flood risk area, care must be taken to ensure that the functioning of the flood zone area is not compromised. Where residual impacts remain after mitigation, the establishment of suitable off-site offsets for these residual impacts must be considered and implemented.	A flood line assessment should be undertaken for any application for development in these areas to accurately delineate the 1:20, 1:50 and 1:100 year flood lines. A flood risk assessment should be conducted for those proposed developments that may be impacted on by flood events, or may impact or influence flood events. A riparian and aquatic ecology impact assessment should also be undertaken for any development activities proposed to be located within the 1:100 year flood risk area. This assessment should include an assessment of the impact of any development on the riparian area, aquatic ecology of the stream, and flood attenuation service provided to downstream areas by the riparian vegetation that exists within these zones.

Very Low Sensitivity	The area is not expected to experience flooding. However development anywhere in the catchment may alter the flow of water into a catchment system. It is therefore important that no development occurs that will significantly affect the flood regime of the catchment. Smaller catchments are more sensitive to flood regime changes. Activities that will result in increased hardened surfaces should be subject to storm water management. Storm water management plans should allow for the management of stormwater entering the natural drainage system, ensuring that there are no cumulative effects on the catchment flow pattern. All developments within this zone should be flood neutral.	Should a drainage line or small stream occur in the vicinity of any proposed development, a flood risk assessment should be undertaken.

14. CONSTRAINT FEATURES - GEOTECHNICAL CONDITIONS

Unlike the other environmental features where the development activity impacts the environmental feature, in this case the environmental features place a constraint on development. Given the nature of the relationship, the terminology differs from the other environmental features and there is no need to set a sustainability objective. The focus therefore lies in understanding the constraint categories, and how to consider these in the EIA process.

14.1 CONSTRAINT ZONES

The geotechnical specialist study delineated seven categories of constraint zone based on geotechnical conditions based on a combined analysis of Geology, Slope and Land Type. These zones have been categorized into the constraint levels detailed in Table 13. The constraints imposed by geotechnical consideration relate directly to the cost of constructing in these zones and the risk of damage. For example, it is more costly to construct on steep slopes and unstable geology.

Table 13 Development Constraints

Constraint feature	Constraint Level	Constraint Score
Semi/Unconsolidated Sediments	Very High Constraint	5
Steep Slopes	Very High Constraint	5
Mining	Very High Constraint	5
Intrusive Rocks	Low Constraint	2
Mixed Sediments	Low Constraint	2
Tillite	Low Constraint	2
Granitoids	Low Constraint	2

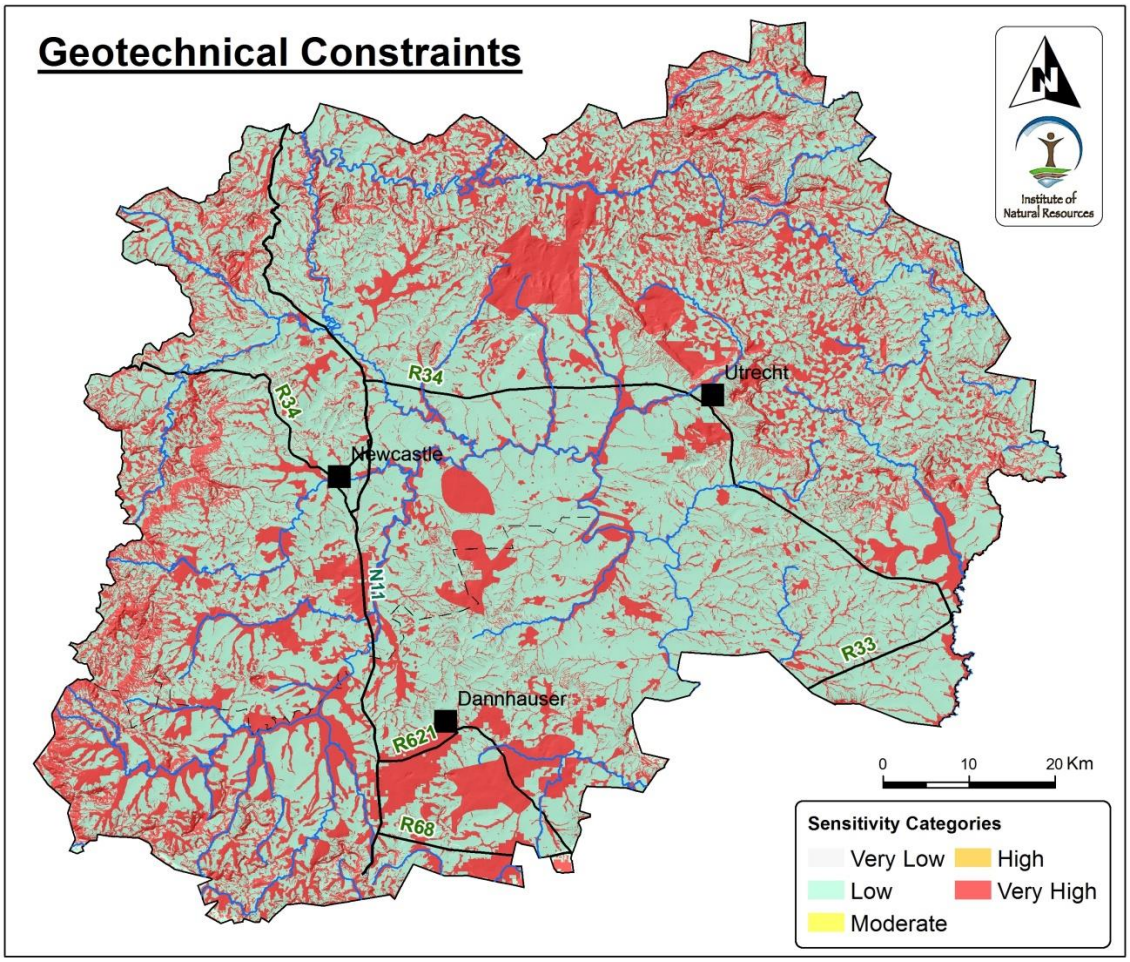


Figure 12: Geotechnical based constraint zones

14.2 GUIDELINES

SENSITIVITY LEVEL	EIA GUIDELINES
	Specialist Investigations
Very High Constraint	A specialist geotechnical study is mandatory. The scope of the investigation should be informed by reviewing the GIS and specialist geotechnical information to understand the basis for the constraint level i.e whether it is slope, geology or mining related risk.
High Constraint	
Moderate Constraint	
Low Constraint	No assessment required.
Very Low COnstraint	

15. CONSTRAINT FEATURES - GROUNDWATER CONDITIONS

Unlike the other environmental features where the development activity impacts the environmental feature, in this case the environmental features place a constraint on development. Given the nature of the relationship, the terminology differs from the other environmental features and there is no need to set a sustainability objective. The focus therefore lies in understanding the constraint categories, and how to consider these in the EIA process.

15.1 CONSTRAINT ZONES

The groundwater study delineated zones of depth to the static water table based on borehole data. These values have been used to categorise the level of constraint imposed by groundwater to development. Importantly it also implies constraints regarding sanitation facilities as pit latrines and soak-away pits are likely to impact shallow groundwater resources.

Table 14 Development Constraints

Constraint feature	Sensitivity Level	Sensitivity Score
Depth to Static Water Level < 10m	Very High Constraint	5
Depth to Static Water Level >10 and < 20m	High Constraint	4
Depth to Static Water Level >20 and < 30m	Moderate Constraint	3
Depth to Static Water Level >30 and < 40m	Low Constraint	2
Depth to Static Water Level >40	Very Low Constraint	1

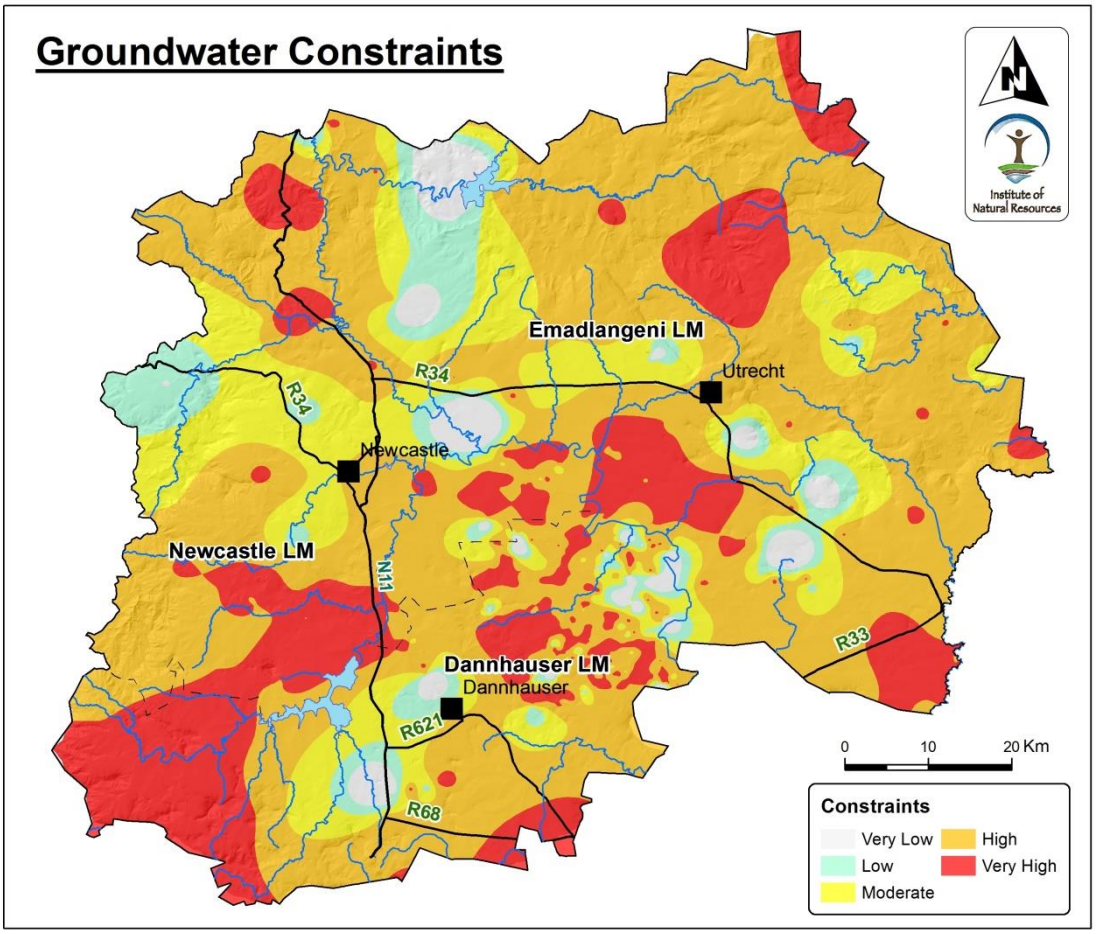


Figure 13: Groundwater based constraint zones

15.2 GUIDELINES

CONSTRAINT LEVEL	EIA GUIDELINES
	Specialist Investigations
Very High Constraint	Depth to groundwater must be confirmed. If indeed a shallow table exists, a specialist assessment is recommended to ascertain the threat of the development to the groundwater resource and the threat posed by the groundwater to the development (see DEADP guidelines[2]). Appropriate mitigation must be put in place if necessary. Where developments are could potentially threaten the quality of groundwater resources, monitoring boreholes must be installed.
High Constraint	
Moderate Constraint	No assessment required.
Low Constraint	
Very Low COnstraint	

16. CONSTRAINT FEATURES - INFRASTRUCTURE

Unlike the other environmental features where the development activity impacts the environmental feature, in this case infrastructural features potentially place a constraint on development, through the lack of their being present in a specific area or through their being in poor condition.

Importantly, a high infrastructural constraint score means that infrastructure or services required to support development in a specific area are unlikely to be present and as such any development will require significantly greater investment to establish the required infrastructure and will likely impact the environment to a greater degree through this process.

16.1 CONSTRAINT ZONES

Infrastructure constraints have been categorised as shown in Table 14 below. These scores have been combined to provide an overall infrastructure index which is used to represent infrastructure constraints across the District.

Table 15: Catergorisation of infastructure constraints

Infrastructure Constraint Feature	Constraint Feature Score
Electricity – Low supply means little infrastructure and constrained in this area means this needs to be built.	
Low supply percentage but Highly constrained	5
High supply percentage and not constrained	1
Moderate to high supply percentage and not constrained	1
High supply and slightly constrained	2
Moderate supply and slightly constrained	3
Moderate to low supply and slightly constrained	4
Moderate to low supply and constrained	5
Low supply and not constrained	4

[2] Saayman I., 2005, Guideline for involving hydrogeologists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 D. Republic of South Africa, Provincial Governement of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town.

Infrastructure Constraint Feature	Constraint Feature Score
Moderate to low supply and not constrained	3
Moderate supply and not constrained	2
Moderate to high supply and constrained	3
Moderate supply and constrained	4
Moderate to high supply and constrained	5
Waste – possible waste management issues if no collection	
People with waste collection >=75% - Good	2
People with waste collection >=50%<75 - Moderate	3
People with waste collection >=10%<50% - Poor	4
People with waste collection >=0%<10% - None	5
Water piped	
People with piped water >=75% - Good	2
People with piped water >=50%<75 - Moderate	3
People with piped water >=10%<50% - Poor	4
People with piped water >=0%<10% - None	5
Road density	
Very Low Road Density <= 12.5	5
Moderate to Low Road Density < 12.5<=50	4
Moderate to High Road Density <50<=100	3
High Road Density >100	2
Sanitation infrastructure demand	
Low demand < 5% without	2
Low to moderate demand >= 5% < 20% without	3
Moderate to high demand >= 20% < 40% without	4
High demand >= 40% without	5
Total Infrastructure	**Mapped Constraint Score**
Low infrastructure constraint - Total score 5 - 13	2
Moderate infrastructure constraint - Total score 14 - 17	3
High infrastructure constraint - Total score 18 - 20	4
Very high infrastructure constraint - Total score 21 - 24	5

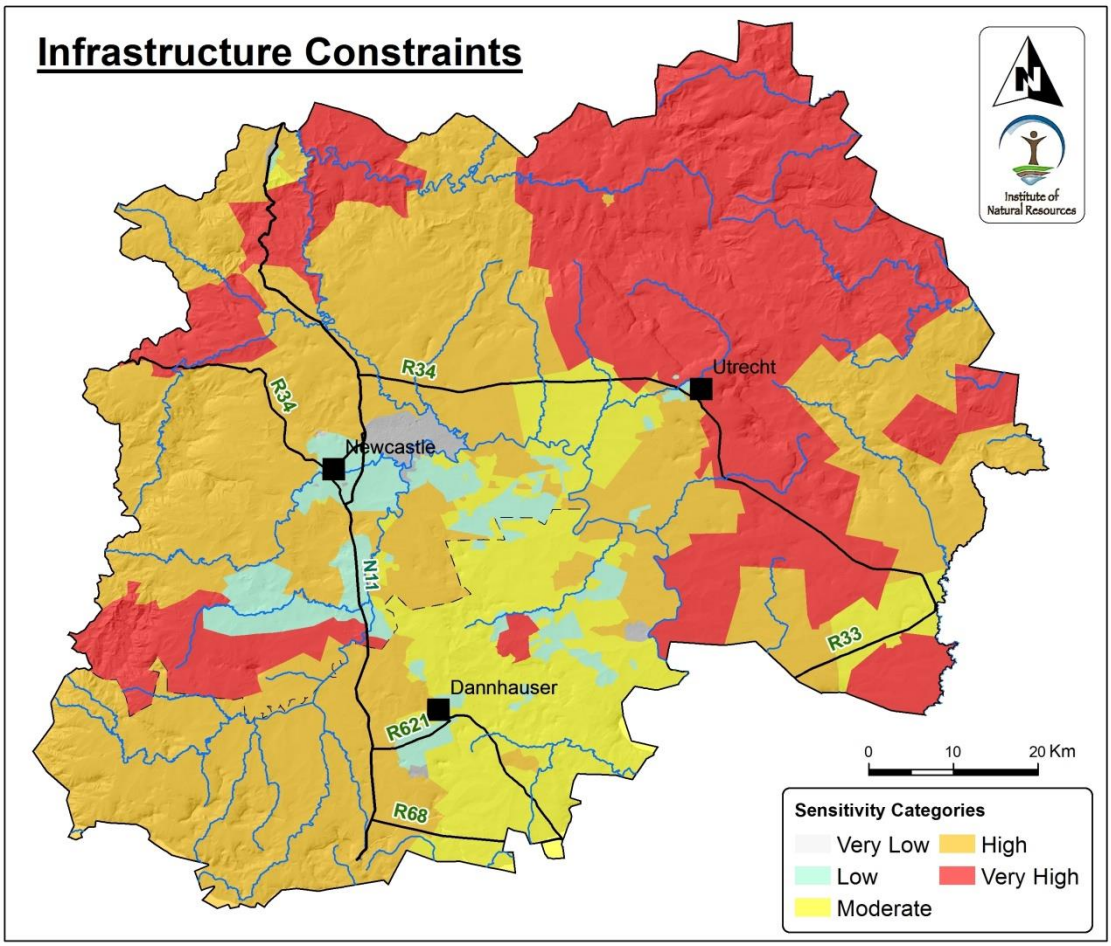


Figure 14: Infrastucture based constraint zones

16.2 GUIDELINES

SENSITIVITY LEVEL	EIA GUIDELINES
	Specialist Investigations
High Sensitivity	Assessment of available infrastructure as well as infrastructure required in order for development to occur is mandatory before the development begins as it is important for budgetary processes as well as feasibility of the proposed development.
Medium Sensitivity	
Low Sensitivity	
Very Low Sensitivity	