ASSESSMENT OF COASTAL LANDHOLDINGS: TUGELA AND TINLEY MANOR

A PROJECT OF TONGAAT HULETT

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Tongaat Hulett

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1. INTRODUCTION

The Coastal Unit of SSI Engineers and Environmental Consultants, in association with Eco-Futures, the Oceanographic Research Institute (ORI), Andrew Mather, Petrie Swart and John Phipson were appointed by Tongaat Hulett to undertake an assessment of their landholdings from the south bank of the Tugela River to their southern boundary near Sheffield Beach from their respective specialist perspectives. This assessment contextualises these landholdings (hereafter the Tugela and Tinley Manor landholdings) in terms of *inter alia* their historical and current land use and condition, as well as their observed development trajectories in order to evaluate the environmental opportunities and constraints of the landholdings from a coastal perspective. This data has been collected and collated from national, provincial and local policy, reports and specialist comments, in combination with data and information derived from ground-truthing and GIS data. This process paints a picture that describes their position, linkages and status within a local, regional and provincial context.

Broadly speaking, the aim of this study is to provide information on the environmental status quo of the Tugela and Tinley Manor landholdings in order to allow for informed decision-making which is cognisant of the coastal specific environmental opportunities and constraints inherent to the landholdings in question. It is noted that the information presented herein is largely assessment-driven and has limited applicability in conceptual terms. By outlining the environmental opportunities and constraints (i.e. the 'no-go' zones and preferred developable zones) the information presented here does however have potential as a starting point from an environmental perspective for the inception of development concepts.

This assessment commences with an overview of environmental and development planning considerations, towards developing a succinct concept of the status quo of the landholdings. This section is summarised in section 4, including the anticipated implications and requirements of the environmental and development planning considerations of the municipal policies and plans for the landholdings.

2. MUNICIPAL CONTEXT - ENVIRONMENT

The Coastal Policy Green Paper (Coastal Management Policy Programme, 1998) describes the area which stretches from the Tongaat River to the Tugela River as the Lower Tugela or Dolphin Coast. Tongaat Hulett's Tugela and Tinley Manor landholdings are located within this 70 km portion of KwaZulu-Natal's North Coast. The Dolphin Coast is characterised by coarse sandy beaches which are enclosed by rocky outcrops (Coastal Management Policy Programme, 1998). The offshore environment is typified by warm coastal waters which support a variety of marine life in conjunction with the transitional environments of several significant estuaries which are found along this portion of coastline, including the largest river and only primary catchment in the region, the Tugela (Coastal Management Policy Programme, 1998). Remnant patches of riparian vegetation and coastal forest exist, along with limited examples of coastal grassland (SiVEST Selatile Moloi Team, 2007). The Tugela and Tinley Manor landholdings covered by this assessment are located predominantly within KwaDukuza Municipality, whose Integrated Development Plan (IDP) is briefly detailed below, one of four local municipalities which constitute the iLembe District Municipality. A number of sectoral reports and policies have been developed at the municipal scale for these areas, including two strategic environmental assessments (SEAs), namely the KwaDukuza SEA and the Addington Farm SEA. Existing relevant information from these and other documents has been incorporated into this report in order to provide the contexts for the Tugela and Tinley Manor landholdings on a municipal and local level.

2.1. KwaDukuza IDP

Integrated Development Planning is a central process that has become the driving means to ensure that the residents of a municipal area are ultimately the recipients of basic services that are provided by a municipality. The Integrated Development Plan (IDP) is further seen as the consolidated process that provides the framework for planning of future development in a municipality (KwaDukuza Municipality, 2007). In this regard, all other municipal plans must be aligned to the IDP and they must ultimately become annexures to the IDP. It is the task of the KwaDukuza Council to develop a developmental vision and give direction for the next five years. In KwaDukuza, this was achieved through Community IDP Izimbizos whose objectives were to identify integrated community needs in all 20 KwaDukuza wards. The product of the Community IDP Izimbizos was the KwaDukuza 2007/8 – 2011/12 Integrated Development Plan. The KwaDukuza IDP is a five-year strategic plan which is aimed at providing the community of KwaDukuza with access to basic services, health care, education, food and social security, housing, road infrastructure and safety and security amongst other things. The IDP vision for KwaDukuza reads as follows:

"*By 2015 KwaDukuza will through unity and good governance, be an economic powerhouse, delivering services in an affordable and sustainable manner within a safe and healthy environment."*

Though broad and indicative, the IDP and its vision form the overarching and unitary framework for all plans, policies and projects which are developed within the municipal jurisdiction of KwaDukuza. It is therefore imperative that subordinate visions, policies and management frameworks developed within KwaDukuza do not conflict with the IDP vision, but rather give effect to it. The KwaDukuza IDP contains a number of environmental considerations, derived predominantly from the KwaDukuza SEA, a document which is summarised in the following section.

2.2. KwaDukuza Strategic Environmental Assessment

According to the KwaDukuza SEA (SiVEST Selatile Moloi Team, 2007), and in reference to the coastal area, the beaches of KwaDukuza are generally considered to be eroding (retrograding) with the possible exception of the coastline north of the Umvoti River Mouth, which is thought to be prograding (growing) due to the presence of vegetated 'relict' dunes. Recreational harvesting of inshore resources in KwaDukuza is extensive due to the area's proximity to Durban and the accessibility of beaches, however there is little subsistence use of such resources. Much of the KwaDukuza coastal area has been significantly modified due to land clearing / transformation for sugar-cane and timber cultivation, and because of the increased demand for housing along the coast (SiVEST Selatile Moloi Team, 2007). As a result, very little natural vegetation remains, and what does remain is often situated on privately owned land (as is the case with the Tugela and Tinley Manor landholdings). The beaches are considered to be the primary tourist attraction for the region. The Coastal Policy White Paper (Coastal Management Policy Programme, 2000) noted that the region was reputed to have the fastest growing real-estate industry along the South African coast, with linear development of holiday homes and tourism infrastructure. This has serious implications for the biodiversity status of the coast, the ecological processes and the free goods and services that the coast provides (SiVEST Selatile Moloi Team, 2007). Expansion of residential and other development including the demand for beach facilities from tourists, contribute to the current degradation of the KwaDukuza coastline and loss of sense of place. Areas such as Salt Rock and Ballito are already highly developed and strong conservation initiatives are required in order to counter this trend. In spite of the transformed nature of the coast, it is likely to continue to attract large numbers of holidaymakers. The KwaDukuza SEA furthermore considers the development of the new King Shaka

International Airport a further catalyst for an increase in the number of visitors to the KwaDukuza coast and a pro-active management approach to the coastline and its beaches has therefore been recommended (SiVEST Selatile Moloi Team, 2007).

The KwaDukuza SEA highlights the following key issues of relevance to this assessment:

- The sandy beaches are subject to degradation caused by both natural and human activities. Natural sea and wind patterns result in the removal of substantial volumes of sand from the beaches. Such removal has negative impacts on the tourism industry, exposing sharp rocks and ledges, etc.
- Concern is raised regarding the biodiversity status of the coast, especially in light of the linear development ('ribbon development') of residential estates and tourism infrastructure. This growth in the residential / tourism sectors during the last decade contributes to the demand for beach recreation, which in turn has the potential to further degrade the KwaDukuza coastline. The growth trend is expected to continue as coastal space is limited.
- Five bathing beaches (Clark Bay, Willard's Bay, Thompson's Bay, Blythedale Beach and Zinkwazi Beach) are identified that have been afforded protection and management from the Municipality and where lifesaving facilities are available. A number of these beaches are fast reaching capacity with evident crowding (e.g. Willard's Beach) and accompanying impacts related to parking, ablutions, and general ecological impacts.
- The climate of KwaDukuza is best described as subtropical, exhibiting mild winters and warm to hot summers. Rainfall in the region is approximately 1220 mm per annum, while mean annual temperatures range from 21°C to 29°C.

2.3. KwaDukuza Coastal Management Programme

In light of the enactment of the Integrated Coastal Management Act 2008 (ICM Act, see section 7 of this report for a detailed description of the legislative context of the landholdings), the KwaDukuza Municipality appointed SSI Engineers and Environmental Consultants to undertake the development of a Coastal Management Programme (CMP) for the coastal area under its municipal jurisdiction, as Chapter 6 of the ICM Act mandates all three spheres of Government to do. At a municipal level such programmes must be prepared and adopted within 4 years of commencement of the Act, be reviewed every 5 years and include a public participation process both prior to as well as after adoption of the Programme (Celliers et al., 2009).

The Inaugural KwaDukuza Coastal Management Programme (CMP), in concert with the recent enactment and subsequent enforcement of the ICM Act, represents the formal starting point for a cycle of integrated coastal management in KwaDukuza. The KwaDukuza CMP has been designed with a cyclical review process firmly in mind, a process which allows for amongst others, a reassessment of local conditions and priorities in respect to implementation steps, and the identification of further issues if so required. A synopsis of the process undertaken to develop the KwaDukuza CMP is provided by Figure 1.

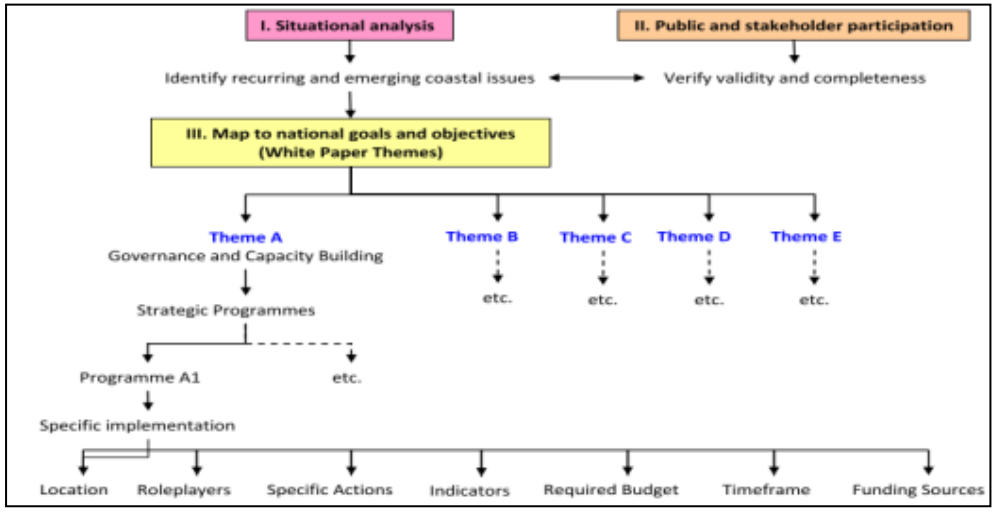


Figure 1. Process adopted in the development of the KwaDukuza CMP (Breetzke et al., 2010).

A key component arising out of a synthesis between the public participation and situational analysis phases of the KwaDukuza CMP was the development of a vision for the KwaDukuza coast. This vision represents the desired state of the KwaDukuza coast, and was based on the national and provincial coastal visions as provided for by the White Paper for Sustainable Coastal Development (Coastal Management Policy Programme, 2000), the Draft KwaZulu-Natal Coastal Management Programme, the municipal vision of the KwaDukuza IDP as well as input from the public. These components of the KwaDukuza CMP are of relevance to the Tugela and Tinley Manor landholdings as they provide the overarching framework for coastal management in the municipal area of which the landholdings form part. It follows then that the vision developed for the landholdings should not conflict with the vision for the larger KwaDukuza coast.

2.3.1. Vision for the KwaDukuza Coast

To sustainably manage the KwaDukuza coast, in so doing ensuring a safe home for residents and a regionally prominent and world-class destination for visitors where the free benefits and services that the coast provides are equally accessible to all. This will be achieved through sharing the responsibility of management of all coastal activities including recreation and development, thereby uniting all stakeholders in a spirit of stewardship. Furthermore, the philosophy which informs coastal management in KwaDukuza must promote a balance between conservation and the sustainable use of coastal resources, as well as acknowledge the dynamic an interconnected nature of the KwaDukuza coast and its hinterland while fostering a growing awareness and understanding of the important relationship that we have with our coast.

2.3.2. Summary of Coastal Management Issues in KwaDukuza

A further aspect of the KwaDukuza CMP which is of relevance to the Tugela and Tinley Manor landholdings is a summary of the issues which pertain to KwaDukuza Municipality from a coastal management perspective, a document which is attached as Appendix A. These issues are summarized in Figure 2 overleaf. Figure 2 also provides an example of the KwaDukuza CMP's strategic programme's implementation priorities, their objectives, and specific activities or projects, under each theme as provided for by the White Paper for Sustainable Coastal Development (Coastal Management Policy Programme, 2000). These proposed activities, although yet to be implemented, are of relevance to the Tugela and Tinley Manor landholdings as they present an ideal opportunity to coalesce and support sustainable coastal development initiatives in KwaDukuza to the mutual benefit of all stakeholders and role-players.

Issues	Source	Governance & Capacity Building	Our Coastal Assets	Coastal Planning	Natural Resource Management	Pollution Control & Waste Management
1. Ecological Degradation						
1.1. Biodiversity Loss	1;2;8;12		x	x	x	x
1.2. Dune Degradation	2		x	x	x	x
1.3. Shoreline Degradation	3;2		x	x	x	x
2. Inappropriate Development						
2.1. Poor Coastal Settlement Design	4;11;12		x	x		x
2.2. Lack of Development Controls	4;12	x		x		
2.3. Loss of Undeveloped Land	5		x	x	x	
2.4. Overdevelopment of Urban Areas	2;5;8;12		x	x		
2.5. Rapid Coastal Development	6;2;12		x	x	x	
2.6. Ribbon Development	3;2		x	x	x	
2.7. Coastal Squeeze	3		x	x	x	
3. Dynamic Coastal Processes						
3.1. Climate Change	1;3		x	x		
3.2. Sea-level Rise	1;3		x	x		x
3.3. Coastal Erosion	1;3		x	x	x	
3.4. Sand Replenishment Malfunction	7		x	x	x	
4. Coastal Pollution						
4.1. Upstream Industrial Pollution	1;6;8		x			x
4.2. Localised Pollution	1;6;8;12		x		x	x
5. Coastal Access						
5.1. Inadequate Parking Facilities	8			x		
5.2. Private Landholding Issues	8;12	x	x			
6. Inadequate Infrastructure						
6.1. Basic Services Backlog	9			x	x	x
6.2. Inadequate Electrical Infrastructure	6					
6.3. Limited Water Supply Capacity	10;12					
6.4. Inadequate Sanitation Infrastructure	8;10;12					
7. Human Resources						
7.1. Lack of Institutional Capacity	8;12	x				
7.2. Poor Integration of Activities/Sector Plans	8	x				

THEME B: OUR COASTAL ASSETS	PRIORITY	OBJECTIVES
1. Coastal infrastructure		To promote sustainable use of the KwaDukuza coast.
1.1. Apply for Blue Flag status	3	
1.2. Identify and develop additional beach recreational nodes	1	To conduct coastal planning and management activities in a manner that promotes learning through continuous research, monitoring, review and adaptation.
1.3. Identify and develop additional parking facilities	1	
1.4. Identification of potential tidal pools	1	
1.5. Long-term collection of coastal tourism and recreational statistics	3	
2. Coastal access (physical and equitable)		To ensure that the people of KwaDukuza and visitors to its coastline have the right of physical access to the sea, and along the KwaDukuza shoreline on a managed basis.
2.1. Assessment of physical access	1	
2.2. Management and facilitation of public access servitudes (ICM Act)	1	
2.3. Maintain Ballito promenade	1	To ensure that the people of KwaDukuza and visitors to its shores enjoy, on a managed basis, the benefits of equitable access to the opportunities of the coast.
2.4. Resolve conflicting and/or historically granted rights	3	
2.5. Reinstatement and protection of coastal public property	3	
2.6. Capitalise on historical and cultural resources	2	
3. Coastal safety and security		Improvement of safety and security in the KwaDukuza coastal area while simultaneously creating job opportunities for previously disadvantaged coastally located individuals.
3.1. Public Private Partnerships for security	1	
3.2. Maintenance of access points	1	

Figure 2. Summary of environmental and socioeconomic issues in KwaDukuza and excerpt from the KwaDukuza CMP (Breetzke et al., 2010).

3. MUNICIPAL CONTEXT – DEVELOPMENT PLANNING

This section of the coastal assessment provides an overview of the policies which inform development planning at a municipal level in KwaDukuza. While the versions of both policies considered were in draft form, it is not anticipated that the final documents did or will deviate significantly from the draft versions. In terms of the Tugela and Tinley Manor landholdings, the broader municipal development planning controls and guidelines will need to be adhered to, particularly in respect to coastal development opportunities.

3.1. KwaDukuza SDF and draft LUMS

The draft versions of the KwaDukuza Spatial Development Framework (SDF) and Land Use Management System (LUMS) are presented for the purposes of this assessment in the absence of the final versions. The SDF has since been adopted by the KwaDukuza Municipality but would not appear to have been amended. The SDF performs the function of providing strategic guidance for the future physical and spatial development of the municipality and in so doing it reflects the social, economic and environmental development issues identified *inter alia* in the IDP (Rothaug, 2008). As a consequence the framework is broad and indicative, not reflecting precise boundaries and extents, but rather establishing a broad structural organisation based on higher order land uses, amenities and infrastructure elements. The LUMS takes the guidance of the SDF further in terms of detail by establishing a control and management tool for land use and development of the municipality (Rothaug, 2008).

3.1.1. Development Implications in KwaDukuza

The following implications, which are a product of past and present development, were identified by the KwaDukuza SDF and draft LUMS (Rothaug, 2008):

- There are significant development pressures in the south of the municipality as well as on the coastal strip, this is likely to increase as the King Shaka Airport develops;
- Pressures for a wide range of development types needs to be appropriately managed;
- As in most municipalities, there exists a great need for additional appropriate accommodation and economic development, thus future residential development needs to be more structured and relate to both the creation of employment opportunities and ensuring the maintenance of a functional and attractive natural environment and the availability of support services;
- The coastal and riverine environments require a greater level of sensitive approach and protection, both for the retention of a good human environment, a functional agricultural sector as well as an increased tourism and recreation development;
- While the present agricultural development represents the most significant contributor to the economic development of the municipality, pressures for other development are likely to reduce its significance in the future. Pressure on land at present used for agricultural activities, mostly in the form of sugar cane farming, may therefore require in future a more efficient land utilisation as well as a greater diversification;
- A significant number of land claims in a central band of the municipality may have a delaying effect on development in this region; and

- In overall terms, KwaDukuza has great development opportunities through its location and contents, in particular if it is possible to manage development pressures and balance development better throughout the area, and if the municipality develops an appropriate capacity level for the management and promotion of appropriate development.

3.1.2. Development Potential in KwaDukuza

Development impetus emanates predominantly from the location of KwaDukuza along the provincial development corridor abutting the eThekwini Municipality in the south (Rothaug, 2008). The location of the new airport in close proximity to KwaDukuza is also likely to generate significant economic development potential, particularly in the southern part of the area. Such development requires guidance in terms of contents and extent, particularly along the coast. The R102 development corridor links all inland towns and developments to each other, providing opportunities for the development of economic and social nodal development (Rothaug, 2008). The location of the North Coast Rail in the vicinity of the R102 provides additional development opportunities in particular if the existing infrastructure is appropriately upgraded. The present significance of the agricultural sector in the economic development of KwaDukuza is well documented, and it has been suggested that major opportunities exist for diversification, beneficiation and better integration of local and surrounding communities in the benefits of agricultural development. It is also widely agreed that the natural and cultural assets of KwaDukuza, linked to present and future improved accessibility, can and need to be developed further (Rothaug, 2008).

3.1.3. Constraints to Development in KwaDukuza

The location and condition of the KwaDukuza Municipality suggests that physical development constraints are limited, including:

- The environmentally sensitive coastal strip which, although under substantial pressure for recreational usage and accommodation, needs to be better protected and managed;
- Better protection and management of the river, lagoon and wetland systems to maintain and improve appropriate environmental functionality;
- Relatively unstructured housing development in terms of location and integration into necessary social and economic support systems;
- Limitations in terms of carrying capacity of identified river catchment areas;
- The existence of numerous land claims in the central portions of the municipality, although it is agreed that this may primarily be an issue of development phasing;
- The existence of poorer and less developed communities in the municipalities to the west and north; and
- Present limitations in the provision of appropriate physical and social support services to peripheral communities.

3.1.4. Development Vision for KwaDukuza

The following development vision is suggested by the KwaDukuza SDF and draft LUMS document (Rothaug, 2008):

"*The spatial development framework will contribute to the balanced physical development of the municipality by establishing a spatial development structure guiding the management of future development, accommodating development pressures and additional investment, maintaining and further developing the economic potential of the municipality, while protecting and integrating the natural environment of the area*."

This vision will be considered in the formulation of the societal vision for the Tugela and Tinley Manor landholdings.

3.1.5. Environmental Structuring Approaches

The following environmental factors are intimately related to the way in which development proceeds in KwaDukuza. According to the SDF and draft LUMS, these consist of natural features which on the one hand contribute to breaking down urban development into smaller recognisable components, while on the other hand have been identified as requiring particular protection and management measures to ensure the maintenance and further development of healthy living environments (Rothaug, 2008). These elements include:

- The coast: a major component of the municipal environment. The coast of KwaDukuza is currently experiencing severe pressure for additional development, thus a balance needs to be established between such pressures, ensuring equitable access and the need for appropriately protecting and managing sensitive and unique coastal ecology.
- River mouths, estuaries, and lagoons: unique and important environments requiring appropriate protection and management while offering unique opportunities for recreational development and other ecosystem services.
- Major river systems and valleys: representing a major natural structuring element in the form of natural barriers which create breaks in the built development, while requiring appropriate protection and management in order to be positively integrated into development.
- Local tributaries: local rivers and streams providing opportunities for linking the natural environment of the major river system, providing local level relief from the built environment, while appropriately protected and managed to be positively integrated into development.
- Other environmental resource areas: including significant hills, escarpments, landscapes – these need to be appropriately integrated and utilised sensitively for appropriate tourism and recreation activities, while being adequately protected and managed.

3.1.6. Coastal Development

The KwaDukuza SDF and draft LUMS highlight the coastal strip as a particularly important element in shaping development in KwaDukuza. Some additional development is also likely to take place in the coastal strip, whereby it is expected that such development is of low intensity, retaining a largely green coastal environment and providing/retaining appropriate access for all to the coast. Coastal development needs to adhere to more stringent environmental considerations and the SDF promotes the creation of individual and unique clustered development, rather than development along the entire coastal strip (Rothaug, 2008). It should also be ensured that public access is retained to the coast, and that river mouths and lagoons and any environmentally sensitive areas are appropriately protected. The expansion of residential development is also likely to be influenced by issues of access to increased physical services and existing land claims.

3.1.7. Recreation and Tourism

KwaDukuza is favourably positioned for tourism as it contains approximately 50km of coastline in close proximity to eThekwini; is easily accessible from the N2 and is furthermore located adjacent to the new King Shaka International Airport (Rothaug, 2008). The SDF identifies particular existing and potential future tourism nodes along the coast. It is furthermore suggested that the more stringent environmental protection measures which have recently been introduced be a key consideration in any new development, towards the protection of the sensitive coastal environment, while simultaneously protecting coastal development from natural disasters. The SDF suggests that instead of continuing the development of a solid coastal urban band (i.e. 'ribbon development'), coastal

development takes the form of appropriately sized clusters in the vicinity of the coast. The location and size of these clusters would be determined by specific local environmental conditions, the desire to create manageable and unique development entities and to maintain public access to the beach front. Amenities along the beach need to be upgraded appropriately.

3.1.8. Draft Development Planning Tool for KwaDukuza

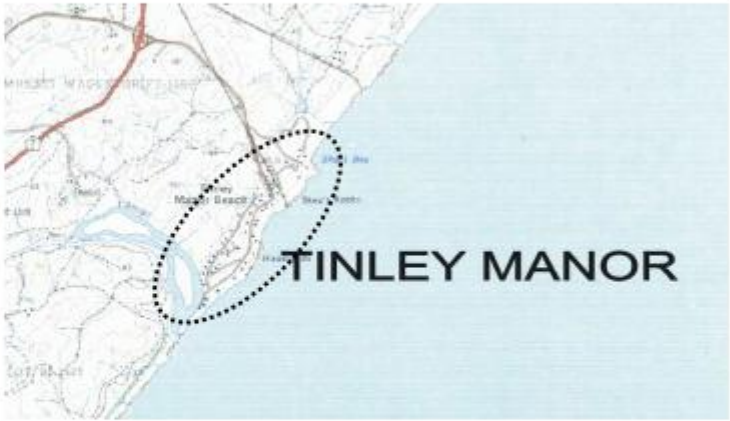
A stand-alone development planning tool (DPT) was developed in parallel with the KwaDukuza CMP. This draft product was developed in order to assist with development and planning decisions in the KwaDukuza coastal zone, and is proposed to be compatible with formal municipal planning structures such as the draft Land Use Management System (LUMS) and the Spatial Development Framework (SDF). This is as a result of the dynamic and unique nature of the coastal environment, which requires specialised management and planning. As stated, the DPT is currently in draft form but will eventually form an additional 'layer' on top of the LUMS and will allow for additional requirements in terms of decision-making in the coastal zone. The DPT also lists, *inter alia,* proposed prohibited and recommended activities in 10 identified precincts along KwaDukuza's coast, of which the Tugela and Tinley Manor landholdings form part. The precincts and their associated draft recommendations which are of relevance to this assessment are summarised in Table 1 below (Jacobs, 2010).

Table 1. Development Planning Tool Precincts (Jacobs, 2010).

<table>
<tr><th colspan="5">PRECINCT ZONE # 5
SHEFFIELD NORTH</th></tr>
<tr><th>DESCRIPTION:</th><th>CLASSIFICATION:</th><th>L.O. COORDINATES:</th><th>PLANNING SCHEME STATUS:</th><th>PLANNING SCHEME CONTROLS:</th></tr>
<tr><td rowspan="3">4km stretch of coastline, stretching from Sheffield Beach in the South to Umhlali River in the north.</td><td>Non-Urban with some Urban</td><td>2931 AD</td><td>Not applicable</td><td>Land still zoned and used for Agriculture</td></tr>
<tr><td colspan="2">LOCALITY:</td><td colspan="2">MAIN CHARACTERISTICS:</td></tr>
<tr><td colspan="2"> 
</td><td>PHYSICAL:
Undulating topography cover by sugar cane fields.

CIVIC & SOCIAL:
None present</td><td>TECHNICAL & DEVELOPMENTAL:
Land still under agricultural use

ENVIRONMENTAL:
Due to the undeveloped nature and inaccessibility of the area, coastal dune and forested areas quite well preserved and in relatively pristine state</td></tr>
<tr><th>SPECIAL FEATURES:</th><th colspan="2">DEVELOPMENT TRENDS & ISSUES IDENTIFICATION:</th><th>LAND OWNERSHIP:</th><th>SERVICES & INFRASTRUCTURE:</th></tr>
<tr><td>Remote and inaccessible
Still used for agricultural purposes
Umhlali River forms northern boundary to the area</td><td colspan="2">Main swimming beaches
Holiday Flats on the Beach
Chaka’s Rock and coal mine / archaeological sites
Access to the beach
Lack of beach facilities</td><td>Tongaat Hulett Developments</td><td>None available.</td></tr>
<tr><th colspan="3">BEACH RECREATIONAL PLAN STATUS / CMP FRAMEWORK / POLICY STATUS – [COASTAL USE VISION]:</th><th colspan="2">RISK IDENTIFICATION:</th></tr>
<tr><td colspan="3">SDP did not identify the area for nodal recreational / tourism purposes. The long term plan shows future residential developments into the area between the ocean and the N2 Freeway</td><td colspan="2">Inappropriate development and land invasion due to undeveloped status of the land</td></tr>
</table>

<table>
<tr><th colspan="5">PRECINCT ZONE # 6
TINLEY MANOR</th></tr>
<tr><th>DESCRIPTION:</th><th>CLASSIFICATION:</th><th>L.O. COORDINATES:</th><th>PLANNING SCHEME STATUS:</th><th>PLANNING SCHEME CONTROLS:</th></tr>
<tr><td rowspan="3">4km stretch of coastline, stretching from Umhlali River in the South to Tinley Manor Ski-boat launch site in the north.</td><td>Urban with some Non-Urban</td><td>2931 AD</td><td>Tinley Manor Town Planning Scheme in course of preparation</td><td>Density – Low @ 1000m^2
Coverage – Low @<40%
Special zones – N/A</td></tr>
<tr><td colspan="2">LOCALITY:</td><td colspan="2">MAIN CHARACTERISTICS:</td></tr>
<tr><td colspan="2"> 
</td><td>PHYSICAL:
Rocky beaches towards the north, and more sandy beaches towards the south at Long Beach.
Limited parking facilities available and the beach / facilities are mainly used by the local population.</td><td>TECHNICAL & DEVELOPMENTAL:
Over the last 3 years re-development/upgrading of existing dwellings commenced.
Limited shopping facilities available.
Fully developed residential urban formal settlement</td></tr>
<tr><td></td><td></td><td>CIVIC & SOCIAL:
Tinley Manor is almost exclusive used as coastal village and almost no civic and social facilities are provided. One school site is still vacant.</td><td>ENVIRONMENTAL:
Fully developed urban area, with highly disturbed frontal dune system.
Umhlali River estuary has important estuarine habitat</td></tr>
<tr><th colspan="2">SPECIAL FEATURES:</th><th>DEVELOPMENT TRENDS & ISSUES IDENTIFICATION:</th><th>LAND OWNERSHIP:</th><th>SERVICES & INFRASTRUCTURE:</th></tr>
<tr><td colspan="2">Tinley Manor Tidal Pool
On site sanitation in Tinley Manor restricts infill and densification projects.
No shark nets at main beach
WWTW is upstream of the River</td><td>Main swimming occurs in tidal pool
Used more by local community, less popular tourist beach
Lack of beach facilities
Tinley Manor will become the main beach recreational area for Palm Lakes Estate once fully developed.</td><td>Various private individual owners.
KwaDukuza Municipality owns very little land in Tinley Manor</td><td>No waterborne sewer available.
On site sewer system may cause environmental challenges</td></tr>
</table>

<table>
<tr><th colspan="5">PRECINCT ZONE # 10
ZINKWAZI</th></tr>
<tr><td>DESCRIPTION:</td><td>CLASSIFICATION:</td><td>L.O. COORDINATES:</td><td>PLANNING SCHEME STATUS:</td><td>PLANNING SCHEME CONTROLS:</td></tr>
<tr><td rowspan="3">8km stretch of coastline, stretching from Nonoti River in the South to Zinkwazi River in the north.

Mandeni Municipality to the north of the area, and Tugela River forms the southern boundary to the Siyaya Coastal Zone Protected Area which stretches from Tugela River in the south to Ezikhaweni (uMhlatuze) in the north.</td><td>Urban and Non-Urban and Agriculture</td><td>2931 AD</td><td>Nkwazi Town Planning Scheme in course of preparation</td><td>Density – Low 1000m^2
Coverage – Low <40%
Special zones – Hotel on Beachfront – OceanView</td></tr>
<tr><td colspan="2">LOCALITY:</td><td colspan="2">MAIN CHARACTERISTICS:</td></tr>
<tr><td colspan="2"> 
</td><td>PHYSICAL:
Zinkwazi Beach Village forms an isolated coastal village amidst agricultural activities at present</td><td>TECHNICAL & DEVELOPMENTAL:
Because of water shortage and lack of waterborne sewer, densification along the beach should be discouraged</td></tr>
<tr><td></td><td colspan="2"></td><td>CIVIC & SOCIAL:
No major facilities within CZ at present</td><td>ENVIRONMENTAL:
Sensitive Lagoon Area and Coastal Forests / Dune vegetation pristine</td></tr>
<tr><td>SPECIAL FEATURES:</td><td colspan="2">DEVELOPMENT TRENDS & ISSUES IDENTIFICATION:</td><td>LAND OWNERSHIP:</td><td>SERVICES & INFRASTRUCTURE:</td></tr>
<tr><td>Launch Site
Lagoon and floodplain
Popular tourism destination</td><td colspan="2">Main swimming beaches
Holiday Flats on the Beach
Tugela River
Access to the beach – Black Rock
Lagoon</td><td>Tongaat Hulett Developments
Few individuals on Agricultural Landholdings
Private Home Owners in Zinkwazi Beach</td><td>Septic tanks to be moved to higher locations – system is breached at moment.</td></tr>
<tr><td colspan="3">BEACH RECREATIONAL PLAN STATUS / CMP FRAMEWORK / POLICY STATUS – [COASTAL USE VISION]:</td><td colspan="2">RISK IDENTIFICATION:</td></tr>
<tr><td colspan="3">Beach Recreation Plan (2003) proposed Commercialisation of Beach in Zinkwazi. Policy approach to Coastal Development (2008) identified Zinkwazi as High Priority Recreational Area. SDP identifies Zinkwazi as Residential township with recreational / tourism node.</td><td colspan="2">Lack of waterborne sewer.
Relocate structures within floodplain and beach bar.
Storm damage prone beach.</td></tr>
</table>

3.1.9. Development Guidelines

It is anticipated that the following controls or development guidelines will prevail for the KwaDukuza coast (Jacobs, 2010). The precincts which are of relevance to the Tugela and Tinley Manor landholdings have been extracted and are summarized by Table 2 below.

Table 2. KwaDukuza CMP Development Planning Tool Precinct Proposed Controls (taken from Jacobs, 2010).

Precinct	Development Vision	Character	Land uses Prohibited	Land uses Permitted	Development Application Procedure	Recommended Density	Development Setback Recommended
5 – Sheffield North	Future property development along Coastal Resort Theme with Branding	Non-Urban	• Industrial • High Impact Residential • Landfill and cemeteries • Office Park • Service and Maintenance • yards, including water works and WWTW's • High Impact Commercial • High Impact Educational • and Recreation Activities	• Resort Type Development • Low and Medium Impact Residential • Low Impact Commercial • Conservation and Open Space • One Mixed Use Node of low to medium impact • Low impact community facilities • One Mixed Use Node of higher impact for tourism development	• Access to Coastal Public Property Required • EIA for any application within CZ • Development shall be subject to waterborne sewer service being available	• ≤ 20 units per ha for residential use • Coverage ≤ 35% coverage • Building Height restricted to 2 storeys except in the Mixed Use Node and resort node where Height may increase to 3 storeys	• No strip development allowed within 100m and CZ as identified for urban areas in the ICM Act, 2008 • Densities and Urban Form to be determined in EIA for the first 1000m as identified for non-urban areas in the ICM Act, 2008 • No strip development allowed within Estuary and forest Setbacks as identified in detailed EIA along the Umhlali River
6 – Tinley Manor	Residential Township Development with tourism mix	Urban/Non-Urban	• Industrial High Impact residential • Landfill and cemeteries • Office Park • Service and Maintenance	• Resort Type Development • Low and Medium Impact Residential • Low Impact Commercial • Conservation and	• Access to Coastal Public Property Required • EIA for any application within CZ • Development shall	• ≤ 20 units per ha for residential use • Coverage ≤ 35% coverage • Building Height restricted to 2	• No strip development allowed within 100m and CZ as identified for urban areas in the ICM Act, 2008 • Densities and Urban

			yards, including water works and WWTW's • High Impact Commercial • High Impact Educational and Recreation Activities	Open Space • One Mixed Use Node of low to medium impact • Low impact community facilities	be subject to waterborne sewer service being available	storey's except in the Mixed Use Node and resort node where Height may increase to 3 storey's	Form to be determined in EIA for the first 1000m as identified for non-urban areas in the ICM Act, 2008 • No strip development allowed within Estuary and forest Setbacks as identified in detailed EIA along the Umhlali River
10 - Zinkwazi	Residential Township Development with tourism mix With Future property development along Coastal Resort Theme with Branding	Urban/Non-urban	• Industrial • High Impact Residential • Landfill and cemeteries • Office Park • Service and Maintenance yards, including water works and WWTW's • High Impact Commercial • High Impact Educational and Recreation Activities	• Resort Type Development • Low and medium Impact Residential • Low Impact Commercial • Conservation and Open Space • One Mixed Use Node of low to medium impact • Low impact community facilities	• Access to Coastal Public Property Required • EIA for any application within CZ • Development shall be subject to waterborne sewer service being available	• ≤ 15 units per ha for residential use • Coverage ≤ 35% coverage • Building Height restricted to 2 storey's except in the Mixed Use Node where Height may increase to 3 storey's.	• No strip development allowed within 100m and CZ as identified for urban areas in the ICM Act, 2008 • Densities and Urban Form to be determined in EIA for the first 1000m as identified for non-urban areas in the ICM Act, 2008 • No strip development allowed within Estuary Setback as identified in detailed EIA • No encroachment towards Lagoon

4. SUMMARY OF MAIN FINDINGS – MUNICIPAL ENVIRONMENT AND DEVELOPMENT PLANNING

The fast pace of development in KwaDukuza has placed unprecedented pressure on the receiving environment. The findings of the KwaDukuza SEA, as reflected in the IDP, suggest that the coastal strip requires special attention, as development pressure is greatest in this area while simultaneously being the area with the greatest environmental concerns. These sentiments are echoed by the Draft KwaDukuza SDF and LUMS, as well as the KwaDukuza CMP and DPT. Additional commonalities in respect to the municipal policies and plans are presented below.

The KwaDukuza Draft SDF and LUMS highlight the coastal strip as a particularly important element in shaping development in KwaDukuza. The KwaDukuza coastline is undoubtedly the municipality's most prominent and valuable tourism asset, and the demand for tourist-friendly sandy beaches and the pressure to provide space adjacent to bathing beaches for amenities, both for recreational activities and parking is growing. Degradation of the coastline therefore has negative implications for the tourism industry, which is considered crucial for economic development in KwaDukuza (SiVEST Selatile Moloi Team, 2007). In terms of land suitable for development, most areas/resources that have not been developed or transformed are inaccessible or difficult to develop. Fragments of remaining natural areas/resources are separated by large tracts of transformed land and therefore may not be able to support and sustain themselves without intensive management and intervention. The IDP, Draft SDF and LUMS aim to prevent linear or 'ribbon' development along the coastline, and the resultant removal of coastal forests and ecological corridors. These policies additionally aim to zone coastal areas to limit certain types of development (e.g. high density residential) and promote other types of development (e.g. light footprint ecotourism development). The KwaDukuza Draft DMT takes these intentions one step further by proposing precinct-specific recommendations and controls. Commonalities in terms of development guidelines across the three precincts of which the Tugela and Tinley Manor landholdings form part include inter alia:

- Prevention of linear development;
- Adherence to development setback lines, including those around sensitive areas;
- Low residential densities;
- Low impact activities;
- Waterborne sanitation as a prerequisite for any development; and
- Promotion of coastal access critically important.

The Analysis Report component of the KwaDukuza SEA recommends that development planning should focus future tourism development in key areas or nodes, while preserving others for low impact tourism, particularly environmentally sensitive areas. Due to its attractiveness and resource-rich character, additional development is expected to take place in the coastal strip, whereby it is expected that such development should be of low intensity, retaining a largely green coastal environment and providing/retaining appropriate access for all to the coast (Rothaug, 2008). Coastal development needs to adhere to more stringent environmental considerations (such as those provided for by the KwaDukuza Draft DMT). The SDF and LUMS promote the creation of individual and unique clustered development, rather than linear development (Rothaug, 2008). It should also be ensured that public access is retained to the coast, and that river mouths and lagoons and any environmentally sensitive areas are appropriately protected. The expansion of residential development is also likely to be influenced by issues of access to increased physical services and existing land claims (Rothaug, 2008). The location and size of development clusters should be

determined by specific local environmental conditions, the desire to create manageable and unique development entities and to maintain public access to the coast, which should include the provision of appropriate amenities.

The above guidelines and recommendations represent a substantial body of work, and as such should be taken into consideration during development planning processes for the Tugela and Tinley Manor landholdings.

5. LOCAL CONTEXT – ENVIRONMENT

Local data and information in terms of environmental considerations for the landholdings has been derived from ground truthing activities, associated specialist reports and spatial data collected. An additional document in the form of the Addington SEA was utilised in terms of its position between, and proximity to the Tugela and Tinley Manor landholdings, as well as its strategic focus which allowed for a degree of extrapolation in respect to local environmental conditions and land use trends. Local environmental conditions and trends are discussed, firstly in terms of their geology and topography, followed by a generalised description of the coastal area, and lastly, via a visual overview of the landholdings.

5.1. Geological and Topographical Considerations – Tugela and Tinley Manor Landholdings

This information is derived from the Agricultural Potential Assessment for the landholdings (Phipson, 2010) and from the Addington Farm SEA which examined the geology of the region (Bundy, 2007). This section of the KZN North Coast has a relatively stable and clearly defined geological history. The strip of land adjacent to the shoreline along the KZN North Coast is usually made up of 'Grey Recent Sands' which are frequently less than 10 000 years old and which lie immediately above the high tide littoral. Behind this formation lies a belt commonly referred to as 'Red Recent Sands' which is typically 5 km wide and which can be suited to both sugar cane production and to civil construction. Correctly named the 'Berea Formation', this system has evolved from sand dunes formed 10 million years ago. The red colouration is derived from the oxidation of iron in the system. Inland of the sands more difficult soils are encountered arising from interspersed areas of Ecca and Dwyka Groups of the Karoo Super group, formations that came into being some 300 million years ago. Most of the land under review is derived from recent sands.

Regionally speaking, the topography of the area includes slopes that have originated from prehistoric dune systems and steeply incised river valleys, with the steeper slopes located closer to the coastline with the steepest slope occurring toward the north (Bundy, 2007). This area contains topographically undulating terrain, incised by smaller inter-dunal streams as well as larger river systems. Much of the eastern areas consist of seep zones or preferential recharge areas, taking into consideration the high level of seepage and steep grades on the eastern region, this area suggests that the area is prone to slip failure events (Bundy, 2007). A moist dune slack can be found behind the primary dune. Deep Aeolian sands allow high levels of percolation of precipitation. Moderate to high erosion areas are found in areas of shale clay, particularly in the northern regions (Bundy, 2007).

5.2. Tugela Landholdings

Figure 3. Overview of the Tugela landholdings.

From the banks of the Tugela heading south, the coastal area of this land parcel is characterised by remnants of natural coastal forest, approximately two kilometres in extent at its widest point. This is known as the Seyula Forest, and was scored as 7/10 in the Dendrological Assessment of the landholdings (Phipson, 2010). This block was marked down due to the high incidence of alien invaders growing deep into the forest fringes. Apart from inhibiting the growth of

natural forest fringe species, these plants represent a serious fire hazard to the forest. Species of particular note are large Fluted Milkwoods and a strangler fig system that has a 13m circumference.

In terms of the shoreline environment, the stretch between the Tugela and Seyula Point (Plate 1) was observed as a predominantly gently sloping beach which tapers off towards the high-water mark, becoming fairly steep down to the waterline. Few stretches of this section of coast are deemed suitable for swimming, due to the unsheltered nature of the nearshore environment (few sandbars and/or rocky headlands present) and the brown sediment-laden discharge of the Tugela River in close proximity. From Seyula Point towards Zinkwazi, incursions into the remaining natural dune forests are more frequent, and the vegetated dune cordon is reduced to a narrow strip which hugs the shoreline. There appears to be residual damage to the dune cordon in this area from the March 2007 storm event. Coastal Red Milkwoods (*Mimusops caffra*) were observed to be dying off at various points along this stretch of coast, due presumably to prolonged exposure to salt spray and wind shear (Mather, 2010, pers. comm.). The foredune is virtually non-existent in this area with the primary dune giving way to the shore along a fairly steep gradient of approximately 1:2. From the southern end of Zinkwazi town, the approach to the shoreline is characterised by the presence of extensive alien invasive species – mainly Lantana and Chromolaena. Accessing the shoreline at Iti Bay reveals a wide beach which tapers off steeply towards the high-water mark. The approach to the shoreline is too steep to negotiate with a recreational off-road vehicle. Dune vegetation along this stretch appeared to be in fairly good condition, with the formation of 'hummock' dunes noted in concert with remnant damage from the March 2007 storm surge. The dune system between Iti Bay and Garrick Bay appears to be predominantly of Aeolian origin, exhibiting a fine sand grain. Damage from the March 2007 storm surge is still evident but both the dune and beach environments are recovering – vegetation behind the primary dune system appears to be in good condition. The soils behind the dune/coastal environment in this area appear very poor, but improve with an increase in elevation. Travelling inland and towards higher ground by road correlated improved soil with better stands of sugar cane. A significant patch of coastal forest exists in this area, which joins sections of the forest close to the shore. A significant erosion scar or 'donga' was noted in an elevated stand of coastal forest – the origin identified as a historic slip by Andrew Mather in his report (Mather & Swart, 2010). This scar runs for approximately 800m down to the shore at Iti Bay.

5.2.1. Visual Overview – Tugela Landholdings

Plate 1. Southern section of the Tugela landholdings as far as the Nonoti River (Photograph © and courtesy Helena Jacobs, 2009).

Plate 2. Middle section of the Tugela landholdings between Zinkwazi (top left) and Seyula Point (Photograph © and courtesy Helena Jacobs, 2009).

Plate 3. View of vegetated dune cordon and coastal dune forest between Nonoti and Iti Bay (Photograph © and courtesy Helena Jacobs, 2009).

Plate 4. Fragmented coastal forest between Iti Bay and Zinkwazi (Photograph © and courtesy Helena Jacobs, 2009).

Plate 5. Zinkwazi town and estuary, showing fragmented coastal forest and mixed land use (Photograph © and courtesy Helena Jacobs, 2009).

Plate 6. Zinkwazi town visible in the distance. Principal landuse of sugar cane highlighted (Photograph © and courtesy Helena Jacobs, 2009).

5.3. Tinley Manor Landholdings

Figure 4. Overview of the Tinley Manor landholdings.

The dune vegetation between Tinley Manor town and the northern boundary (Figure 4) of the Tinley Manor landholdings appears to be in very good condition, with some remnant damage from the March 2007 event visible. This section appeared better protected than the areas further north due to the apparent integrity of the primary dune vegetation (Mather, 2010, pers. comm.). Milkwood trees along this portion are consequently further back and appear to be in good condition. Although relatively short, this stretch of coast has potential for safe swimming beaches, as the beach profile is not as steep as the areas further north. The approach to the shoreline access between the Umhlali estuary and Christmas Bay is characterised by poor soils and erosion near the access road. Much of this land has been left fallow, and areas planted with sugar cane appear to be of relatively poor quality. Vegetated areas behind the primary dune system have been drained and are currently fallow – this area is very wet and populated with *Phragmites* (Ngcema) reeds. The area adjacent to the access point between the Umhlali Estuary and Christmas Bay exhibits disturbance in the dune vegetation. A portion of the dune along this stretch is indicative of a 'blowout', while a shell midden of potential archaeological significance was noted approximately 50m south of the toe of the dune. The vegetation displays signs of damage along the top of the canopy when driving towards Umhlali Estuary. The Umhlali Estuary is split by an island near the mouth (Plate 7) and consists of a major arm and a minor arm. Large stands of Phragmites reeds stretch from the estuary mouth for approximately 2km inland along the course of the Umhlali River. Informal access to the estuary was previously gained through the bush close to the mouth but this access has since overgrown and closed. Informal access on foot is now gained slightly further upstream through the trees. The estuary mouth used to exit at the northern side of the estuary prior to Cyclone Demoina/Imbua, but post this event, now exits towards the south (hugging the rocky south bank). Rocky ledges were noted both at the estuary mouth and offshore. Wave action near the mouth is potentially conducive to the development of a small swimming beach.

Moving in a southerly direction towards Christmas Bay reveals a number of seepages or drainage lines, evidence of the volume of water contained behind the dune system. Christmas Bay appears fairly suitable for the establishment of a swimming beach, as the rocky headland which shelters the bay provides some relief from rip tides. A rocky ledge was noted offshore, as were numerous rocky outcrops close to the beach. There is potential for a tidal pool to be established within the leeward side of the rocky headland. Moving in a general north-westerly direction, the gradient increases fairly rapidly and allows for excellent views of the coastline and coastal forests, as well as revealing subtidal reefs off Christmas Bay. Coastal forest, although occurring in a narrow band along this portion of coast, appears to be in fairly good condition, and is positioned in such a way as to create a natural setback line. Soil types vary considerably in this area – from sandy, to Berea Red, to dark brown (Mather, 2010, pers. comm.). Success of sugar cane seems to be correlated with the various soil types – certain stands of cane are yielding well, while others are poor. Terrain is undulating, with excellent viewshed opportunities. The area known as the 'amphitheatre' (see Plate 9) overlooking the Umhlali Estuary has perhaps the best development potential – breathtaking views in a 180 degree arc and sufficiently elevated to ensure an excellent viewshed, which includes the estuarine habitat and shoreline in both directions. The inland area north of Tinley Manor appears to be characterised by variable soils (evidenced by variable sugar cane yields), and undulating terrain with some good viewshed opportunities, although not as good as the amphitheatre site. Coastal forest along this portion appears to be in a fairly good condition but is patchy, having been cleared in some areas and replaced by scrub and/or alien vegetation.

5.3.1. Visual Overview – Tinley Manor Landholdings

Plate 7. Umhlali Estuary and island (Photograph © and courtesy Helena Jacobs, 2009).

Plate 8. Mixed land use on the Tinley Manor estate (Photograph © and courtesy Helena Jacobs, 2009).

Plate 9. Umhlali Estuary facing the 'amphitheatre'. Umhlali island visible centre right (Photograph © and courtesy Helena Jacobs, 2009).

Plate 10. Looking south from the northern boundary of the Tinley Manor landholdings.

6. SPATIAL ANALYSIS AND DEVELOPMENT TRAJECTORY TRENDS

The spatial analysis component of this assessment was completed using data derived from a number of sources, and included the generation of new data based on ground-truthing and spatial analysis. The section which follows provides an overview of the approach undertaken in collecting and analysing this data, while the data itself is provided as a GIS product separate to this report.

6.1. Spatial Data

The spatial information provided to the SSI Consortium was sufficient to interpret the spatial distribution of the landholdings. The area has been extensively studied in terms of the data requirements needed to complete a GIS analysis as data on these areas was consistently collected over a number of years, therefore enabling a thorough and accurate representation of the area. Aerial photography circa 2004 and 2006 was provided to SSI, as well as spatial layers in terms of boundaries of the landholdings. Data collected during the ground-truthing site visit has been captured and represented spatially in terms of inter alia sensitive areas, points of interest, and coastal access points. It should be noted that the access points referred to later in the report are only those accesses observed as part of the ground-truthing site visit, and represent only a preliminary assessment of coastal access. A more thorough assessment of coastal access will require the provision of additional spatial data in concert with a more detailed study.

6.2. Historical Condition and Land use of the Landholdings

Limited local level information has been provided to the SSI consortium in terms of historical land use of the Tugela and Tinley Manor landholdings. Anecdotal evidence suggests that the region in which the Tugela and Tinley Manor landholdings are located has been under intense agriculture for sugar cane purposes since the late 1800s. This has been interspersed with small urban nodes, rangeland and scrubland.

6.3. Trends in Land Cover and Development Trajectories

The elevation zones for the landholdings show that elevation decreases from the hinterland towards the coast. Potentially inaccurate data from Stats SA suggests that the Tugela landholding can be categorised demographically as medium to densely settled. 2005 land cover data indicates that the use of the Tinley Manor landholding is mostly under commercial sugar cane farming with minor portions being composed of urban dwellings, rural dwellings, wetlands, and forests. The Tugela landholding has a significant area of undeveloped forest (i.e. the Seyula Forest). The remaining land cover is composed of grassland, bush, rural dwellings and wetlands such as the Zinkwazi Estuary (see Figure 5 and 6 overleaf).

The current trend of both these landholdings is still largely related to agricultural activities, but transformation in the Tinley Manor landholdings, in terms of nightlight activity, has increased which possibly indicates a growing urbanisation trend. The Tugela landholdings show the least change in terms of nightlight activity which suggests that this area is not well developed; this is further supported by the land cover data. The Tugela landholdings, due to the predominantly commercial farming land cover, suggests that the development trajectory of the land will probably remain the same however due to the large presence of wetlands and indigenous forests this area conservation responsibilities will probably play a more significant role.

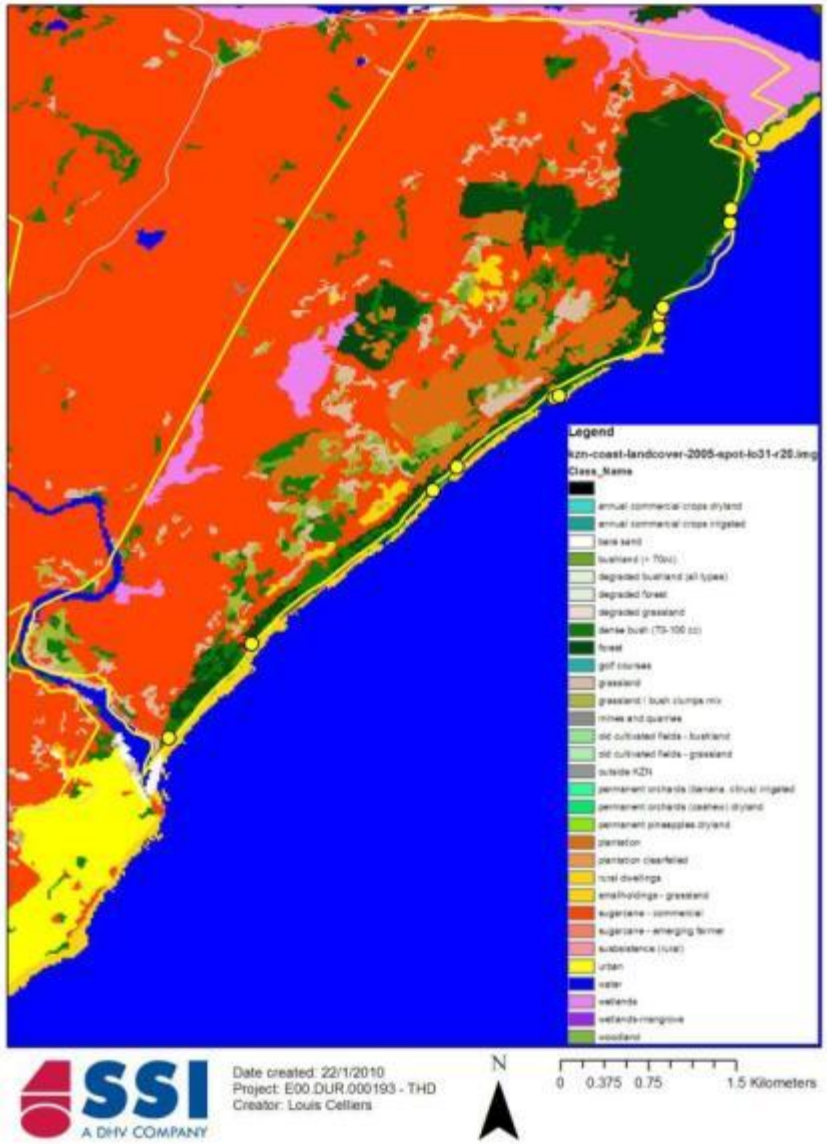


Figure 5. 2005 Landcover for the Tugela landholdings.

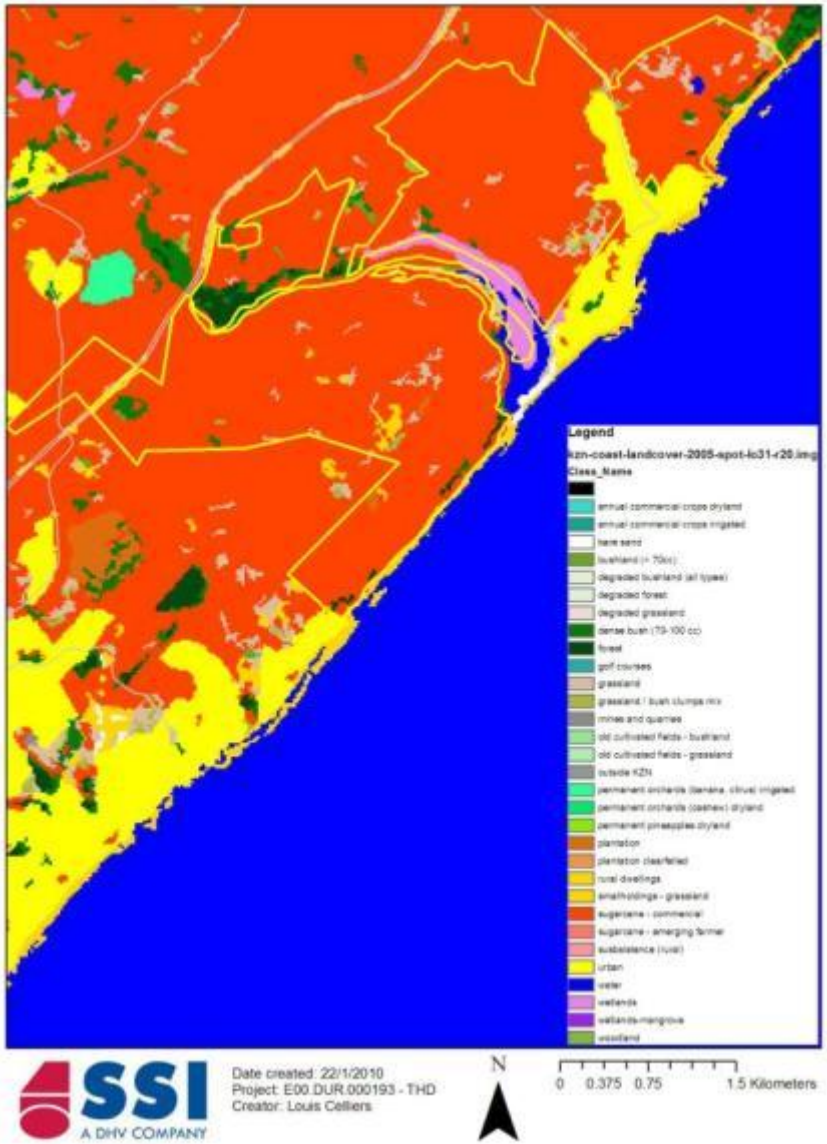


Figure 6. 2005 Landcover for the Tinley Manor landholdings.

6.4. Surrounding Land Use

The dominant land-use outside of urban areas within the area surrounding the landholdings is commercial agriculture, predominantly sugar cane plantations interspersed along the coast and in some inland areas with forestry plantations, while land taken up by other forms of agriculture is limited within KwaDukuza (KwaDukuza Municipality, 2007). Within rural areas, the primary landform is also agriculture with farmhouses, compounds and smaller rural settlements dispersed throughout the area. The only major traditional settlement within the area is located in the northwest portion of the municipality and is not located on or near the Tugela and Tinley Manor landholdings (KwaDukuza Municipality, 2007). At a more localised scale, the surrounding land uses around the Tinley Manor and Tugela landholdings are predominantly agricultural land with sporadic urban nodes, rural dwellings and both indigenous vegetation and degraded rangelands (Phipson, 2010). Natural coastal vegetation in the area is best described as fragmented due to the clearing of land for commercial agricultural and residential purposes. Land uses in the urban areas of the region are typically urban mixed use with a high level of infrastructural and service development and a provision of social facilities and services to support the resident population.

Plate 11. Example of land use surrounding the TH landholdings (Photograph © and courtesy Helena Jacobs, 2009).

Plate 12. Additional typical land use surrounding the TH landholdings (Photograph © and courtesy Helena Jacobs, 2009).

7. LEGAL AND MANAGEMENT CONTEXT OF THE LANDHOLDINGS

The National Environmental Management Act, 1998 (Act 107 of 1998) requires environmental assessment and authorisation for various activities that could have a potential to harm the environment prior to such activities taking place. Such assessments take the form of either a basic assessment or full environmental assessment. Any development or transformation of the land holdings in question will trigger various listed activities which differ based on the type of assessment required to be undertaken.

7.1. NEMA EIA Regulations and Listed Activities

Previous applicable listed activities (based on initial assessment on not on specific development wants) requiring completion of a basic assessment and environmental impact assessment are depicted in Table 3 and 4 below. It is acknowledged that the Regulations were amended as of 18 June 2010 however a review of such amendments forms part of the extension proposal submitted.

Table 3. Applicable Listed Activities for conducting a Basic Assessment.

16.	*Construction or earth moving activities in the sea, an estuary, or within the littoral active zone or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever is the greater, in respect of* *(i) fixed or floating jetties and slipways;* *(Ii) tidal pools;* *(iii) embankments;* *(iv) rock revetments or stabilising structures including stabilising walls;* *(v) buildings of 50 square metres or more; or* *(vi) infrastructure covering 50 square metres or more* *but excluding* *(a) if such construction or earth moving activities will occur behind a development setback line; or* *(b) where such construction or earth moving activities will occur within existing ports or harbours and the construction or earth moving activities will not increase the development footprint or throughput capacity of the port or harbour;* *(c) where such construction or earth moving activities is undertaken for purposes of maintenance of the facilities mentioned in (i)-(vi) above; or* *(d) where such construction or earth moving activities is related to the construction of a port or harbour, in which case activity 24 of Notice 545 of 2010 applies.*
22	*The construction of a road, outside urban areas,* *(I) with a reserve wider than 13.5 m or,* *(ii) where no reserve exists where the road is wider than 8 metres, or* *(iii) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010.*
24.	*The transformation of land bigger than 1000 square metres in size, to residential, retail, commercial, industrial or institutional use, where, at the time of the coming into effect of this Schedule such land was zoned open space, conservation or had an equivalent zoning.*
45.	*The expansion of facilities in the sea, an estuary, or within the Iittora.1 active zone or distance of 100 metres inland of the high-water mark of the sea or an estuary whichever is the greater, for-* *(i) fixed or floating jetties and slipways;* *(ii) tidal pools;*

	(iii) embankments; *(iv) rock revetments or stabilising structures including stabilising walls;* *(v) buildings by more than 50 square metres;* *(vi) infrastructure by more than 50 square metres;* *(vii) facilities associated with the arrival and departure of vessels and the handling of cargo;* *(viii) piers;* *(ix) inter- and sub-tidal structures for entrapment of sand;* *(x) breakwater structures;* *(xi) coastal marinas;* *(xii) coastal harbours or ports;* *(xiii) structures for draining parts of the sea or estuary;* *(xiv) tunnels; or* *(xv) underwater channels* *where such expansion result in an increase in the development footprint of such facilities* *but excluding where such expansion occurs:* *(a) behind a development setback line; or* *(b) within existing ports or harbours where there will be no increase in the development footprint or throughput capacity of the port or harbour*

Table 4. Applicable Listed Activities requiring a Scoping Report and Environmental Impact Assessment.

15	*Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for:* *i. linear development activities; or* *ii. agriculture or afforestation where activity 16 in this Schedule will apply.*
24	*Construction or earth moving activities in the sea, an estuary, or within the littoral active zone or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater, in respect of:* *(i) facilities associated with the arrival and departure of vessels and the handling of cargo;* *(ii) piers;* *(iii) inter- and sub-tidal structures for entrapment of sand;* *(iv) breakwater structures;* *(v) coastal marinas;* *(vi) coastal harbours or ports;* *vii) structures for reclaiming parts of the sea;* *(viii) tunnels; or* *(ix) underwater channels;* *but excluding* *(a) activities listed in activity 16 in Notice 544 of 2010,* *(b) construction or earth moving activities if such construction or earth moving activities will occur behind a development setback line;* *(c) where such construction or earth moving activities will occur in existing ports or harbours where there will be no increase of the development footprint or throughput capacity of the port or harbour; or* *(d) where such construction or earth moving activities takes place for maintenance purposes.*

7.2. ICM Act

The recently enforced Integrated Coastal Management Act of 2008 (Act No. 24 of 2008; ICM Act) emanates from the White Paper for Sustainable Coastal Development in South Africa (Coastal Management Policy Programme, 2000) and proposes to inter alia establish a system of integrated coastal and estuarine management. The enactment and subsequent enforcement of this landmark legislation firmly establishes integrated coastal management as the preferred vehicle for the promotion of sustainable coastal development in South Africa. This is promoted through directives in terms of the conservation and maintenance of the natural attributes of the coastal environment concomitant with development that is both sustainable, and socially and economically justifiable. It defines the rights and responsibilities of all coastal stakeholders including those of organs of State and gives effect to South Africa's international responsibilities in respect to coastal pollution. The ICM Act aims to facilitate the implementation of the principles and guidelines presented by the White Paper and have a number of objectives including:

- The provision of a legal and administrative framework to promote cooperative, coordinated and integrated coastal management;
- The protection of the natural coastal environment as a national heritage;
- The management of coastal resources in the interests of the whole community;
- The promotion of equitable access to the resources and benefits provided by the coast; and
- The fulfilment of South Africa's obligations under international law.

The ICM Act, a complex legal instrument in its own right, would appear to now be in conflict with some of the exceptions, exclusions and interpretations of the new EIA Regulations. This matter has been brought to the attention of the relevant authorities and should be resolved in the future.

7.2.1. Coastal Planning Schemes

A coastal planning scheme is a spatial tool in addition to tools such as coastal management programmes (CMPs), which may be used to achieve coastal management objectives (Celliers et al., 2009). A coastal planning scheme defines areas within the coastal zone or coastal management area which may be exclusively or mainly used for a specified purpose or activity. A planning scheme may also restrict or prohibit certain activities in, or uses of a specified zone. As consistency is one of the strongest themes in the ICM Act, the coastal planning scheme cannot be established without notification in the Government Gazette, and must be aligned with the objectives of the ICM Act and any coastal management programmes or estuarine management plans which apply to that area. Coastal planning schemes may be established by the Minister, the manager of a coastal protected area, the MEC, the municipality or the management authority of a special management area (Celliers et al., 2009). The KwaDukuza Municipality is proposing to adopt its Draft DMT as its coastal planning scheme which, once adopted, will then apply to both the Tugela and Tinley Manor landholdings.

7.2.2. Coastal By-laws

Once a coastal municipality adopts it's CMP, it may prepare by-laws to provide for the implementation, enforcement and administration of the CMP. This is the case in KwaDukuza, where the Municipality have resolved to adopt the Draft DMT as a municipal by-law (see Table 5 overleaf) with the aim of setting the policy directives for later inclusion in the IDP SDF (as revised) and the LUMS (Jacobs, 2010).

Table 5. Inclusion of the Draft DMT as a coastal by-law within the KwaDukuza municipal planning structures (Jacobs, 2010).

Mechanism	Statutory Status	Planning Tool	Policy Tool
CMP in IDP	Have full statutory status being part of IDP and SDF in terms of Municipal Systems Act, but there is no administrative mechanism available to ensure enforcement.	The 'Planning Tool' will serve the purpose of establishing the planning framework and give policy direction for the development of either an independent by-law to control development, or the establishment of a fully fledged Coastal Planning Scheme as part of the LUMS at a later stage.	No remedy is available if contraventions do occur. The planning tool will give policy direction, but there is no development control mechanism available to ensure enforcement.
Independent By-Law	CMP administered through Municipal By-law, and as such enjoys full statutory protection.	The 'Planning Tool' gives policy direction and includes some administrative mechanisms to ensure compliance i.r.o. use zones, controls and setbacks.	This is a development administration tool with limited intervention remedies available.
Coastal Planning Scheme	Enjoys full statutory status as either a full Planning Scheme or part of LUMS.	Enjoys full statutory protection, monitoring, control and compliance status. This mechanism is a Planning Scheme which enjoys full statutory status.	The mechanism is a 'Development Management and Control' tool with full suite of remedies available to ensure compliance.

8. SYNOPSIS OF SPECIALIST INPUT

Four specialist studies were included as part of the consolidated coastal assessment of the Tugela and Tinley Manor landholdings. The full specialist studies were submitted separately to this report, while the executive summaries of the respective reports are included for ease of reference in the following section. Works cited may be found under section 10 of this document.

8.1. Coastal Setback Line Study: Tongaat Hulett Tugela and Tinley Manor Landholdings

This report was prepared for SSI by Andrew Mather and Petrie Swart (Mather & Swart, 2010). The full report was submitted as a stand-alone report.

8.1.1. Executive Summary

This report covers the coastline and estuaries between the Tugela River and Tinley Manor and provides a detailed analysis of present and future coastal processes which would influence this coastline. The objective of this study is to provide a coastal set back line so that:

(a) The planning of new development in this area can be adequately protected from future events; and
(b) To provide input into the process of the official determination of coastal setback lines to be gazetted by the Minister at a future date.

The process of determination of coastal set back lines follows eight steps:

- Step 1. Determining the extent of the active hazard zone. This entailed the calculation of wave run-up along the coastline. Four different wave run-up models which were developed in the USA, Australia, Europe and South Africa, were compared using KZN data collected during the March 2007 sea storm. These comparisons lead to the choice of the locally developed model being chosen for its ease of applicability as well as its superior predictive capability. This model was then run to determine the High water Mark (as defined in the ICM Act) and plotted onto the ground surface.
- Step 2. Determine the extent of future sea level rise at the site. The use of globally developed general sea level rise figures is not always technically correct so a combination of global predictions and local data was examined in detail. As future sea level rise is impossible to accurately predict, the use of three sea level rise scenarios were chosen. These were sea level rises of:
    - 300mm (based on current linear extrapolation of recorded sea level rise at Durban);
    - 600mm (based on an acceleration of current sea level rise at Durban); and
    - 1000mm (to account for acceleration ice melt).
- Step 3. Using these three sea level rise scenarios new High Water Mark positions were calculated using the shoreline regression model developed by Bruun (1954).
- Step 4. At each of these new High water marks the coastline was checked for any undercutting and slips of the dune system. Those areas identified were analysed to map the top of the slip failure edge and a 20m safety buffer was applied to them.
- Step 5. Any environmental assets were identified and the inland edges of these were mapped.
- Step 6. Estuarine areas were separately analysed using an estuary inundation model developed similarly to the wave run-up model. This was used to determine the outer estuarine vegetation edge under future sea level rise scenarios.
- Step 7. A coastal set back line was determined using the inland boundary of the maximum inland position of:
    - The High Water Mark under future sea level rise;
    - The buffered slip failure edge (if present);
    - The environmental asset edge (if present); and
    - The estuarine vegetation edge denoting the estuary.
- Step 8. These lines were compiled into a GIS viewer with the relevant shape files.

This process provides a coastal set back line which takes into account current and future coastal processes and gives guidance to the placement of built form such that the risk of partial or complete failure of these structures is reduced. The table below compares the value of coastal infrastructure to the projected levels of sea-level rise put forward by this study, potentially allowing for a risk-aversive approach in planning for the location of coastal infrastructure. Figure 7 overleaf applies the table below to a section of the Tinley Manor landholdings by way of example. Please note that this is for illustrative purposes only and provides no assessment of the suitability of locating infrastructure in the areas indicated.

Value of infrastructure	Life of infrastructure	Impacts of failure of the infrastructure	Planned amount of sea level rise
Low **(up to R2 million)** i.e. Recreational facilities, car parks, board walks, temp beach facilities	**Short term** Less then 20 years	**Low** Minor inconvenience, alternative facilities in close proximity, short rebuild times	**0.3m**
Medium **(R2 million to R20 million)** Tidal pools, piers, recreational facilities, sewerage pump stations.	**Short to Medium Term** Between 20 and 50 years	**Medium** Local impacts, loss of infrastructure and property	**0.5m**
High **(R20 million to R200 million)** Beachfronts, small craft harbours, Residential homes, sewerage treatment works.	**Medium to Long Term** Between 50 and 100 years	**High** Regional impacts, loss of significant infrastructure and property	**1.0m**
Very High **(greater then R200 million)** Ports, desalination plants, nuclear power stations	**Long term** In excess of 100 years	**Very High** Major disruption to the regional and national economy, failure of key national infrastructure	**2.0m**

Table 9: Planned sea level rise values based on value and risk failure of infrastructure

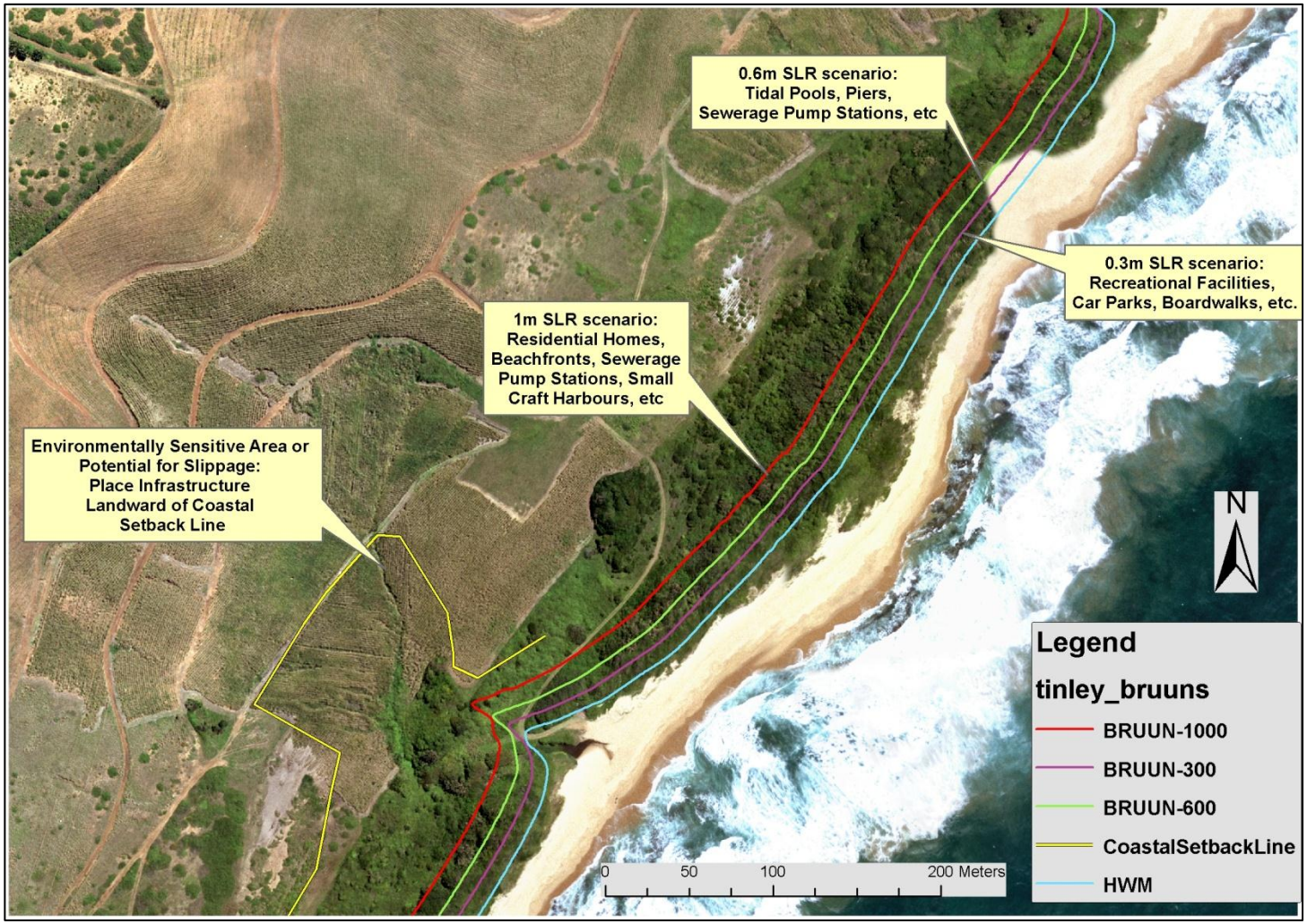


Figure 7. Example of Proposed Infrastructure Placement in relation to the Mather and Swart (2010) SLR Scenarios.

8.2. Agricultural Potential Assessment for the Farms Described as Tinley Manor, Nonoti and Tugela

This report was prepared for SSI by John Phipson (Phipson, 2010). The full report was submitted as a stand-alone report.

8.2.1. Executive Summary

Ever since its inception, economic and management considerations have led the South African Sugar Industry towards economies of scale not only at commercial grower levels but also at miller levels. Urbanization has had an impact on planting and milling geography, but in terms of industry production the subsequent loss of cane is of minimal consequence. While capacity at the mills currently operating in KZN appears to have stabilized, cane production has declined. Industry emphasis and investment is moving away from dry land farming in KZN to irrigated production further north and, more particularly, outside of South Africa.

A trend that is of major concern to millers, to commercial growers and to the KZN Department of Agriculture, Environmental Affairs and Rural Development (DAEA&RD) is the decline of small grower hectarage under cane and the even greater decline in yields per hectare evidenced in small grower production. This trend severely inhibits horizontal expansion of cane production. The three new major sugar milling projects that are currently on the drawing boards, and if approved, are for the production of ethanol only. Thereafter no more water will be allocated to the irrigation of sugar cane. None of the estates under review have access to irrigation water, nor is there any likelihood of new irrigation permits being issued. The total overview on the impact of the change of use from agriculture to recreational and tourist activities, as well as commercial and industrial development needs to also take into account the cumulative loss of sugar cane deliveries to the Darnall Mill. The recreational, commercial or industrial development of these estates will, in the long term present opportunities during both the development and implementation phases that will totally outstrip current employment in sugarcane production and milling.

8.3. Ecosystem Services Supply and Demand Analysis: Tongaat-Hulett North Coast Landholdings

Eco-futures was requested by SSI to facilitate a process of identifying ecosystem goods and services supplied and demanded in the Tongaat-Hulett Landholdings in Tinley Manor and between the Nonoti and Tugela rivers (Mander, 2010). The identification of goods and services was undertaken in a workshop setting with a team of clients and natural resource experts. The full report was submitted as a stand-alone report.

8.3.1. Executive Summary

The following process was adopted to assess the ecosystem services supplied by the TH North Coast landholdings and demand for those services within the broader community. A workshop with local experts was held, with the following steps:

- Introduction to ecosystem services supplied by natural assets: A short introduction to ecosystem services was provided to ensure a common understanding between all workshop participants.
- Introduction to the two discrete land units: The project team identified and discussed the condition and qualities of the terrestrial (natural and croplands), freshwater, estuary and marine ecosystems associated with the two land units.
- Identify the current functionality of the natural assets: The functionality of the natural assets was determined by a composite score of the condition (score between 0 and 3), area (score based on size in hectares) and regional landscape context of each habitat type (score between 0 and 3). The

regional landscape score was weighted as 10% of the combined condition and size. The functionality score provides a comparative indicator of the levels of functionality between various habitat types in its present condition. Scores were developed through discussion and inserted into the tables once consensus was reached.

- Identify the ecosystem services potentially supplied by the natural assets in pristine condition: The services supplied by each habitat type - in pristine condition (and not the status quo) - were scored (0 to 3) as a baseline condition.
- The current supply level score was then calculated: The total score for the services supplied were a product of the functionality of a specific habitat multiplied by the services supplied under pristine conditions. This generated a functionality weighted service score. That is, those habitats highly functional generate a high service score while those of a poor functionality generate a low service score. The habitat specific service scores are then added to generate a total score for the land unit.
- Identify the demand for ecosystem services: The services demanded by local, downstream, and regional users were scored using local knowledge of the site. The following assessment was made:
    - The numbers of individuals benefiting from access to the services supplied at present were estimated (orders of magnitude estimates were used). These estimates show the just how many people benefit from each services supplied by the land units. For example, do 10, 100, 1 000, 10 000, 100000 or 1000000 people benefit from fishing?
    - The level of the users' dependence on the service were scored (score 0 to 3). This score identifies how critical the service is in the user's wellbeing. So people whose livelihood greatly depends on access to the service, will have a high score.
    - For each service the numbers of users were then multiplied by their dependence score, giving a combined demand score. The higher the demand score, the greater the role in society, and therefore the greater implications for land use change.
- Confidence in estimates and scores: The estimates of supply values and demand numbers serve to provide orders-of-magnitude indicators. These values are therefore only indicators useful for comparisons between different services, users and land units. Their relative values are important and not their absolute values, and should therefore be used as such.
- Results and Conclusions: The tables generated during the workshop process show that the Tugela has by far the greatest levels of ecosystem services and demand. The Tugela site plays a national and provincial role for several services – especially for culture related services. On the other hand, the Tinley Manor site is largely a local to district service provider. A significant number of the services do not have robust supply due to poor habitat conditions. The river and estuary habitats are particularly poor. This will constitute a significant constraint to development, as these habitats cannot withstand any further demands placed on them. In summary, the demand and supply of services are wide ranging, and therefore may represent opportunities and constraints for land use changes. These different services and their respective demand supply need to be considered in terms of strengths, weaknesses, opportunities and threats, with a view to developing a suite of land use scenarios for the two sites.

8.4. Living Marine Resources and associated Recreational Opportunities in Tongaat-Hulett Holdings

This report was prepared for SSI by team members from the Oceanographic Research Institute (Fennessy et al., 2010). The full report was submitted as a stand-alone product.

8.4.1. Executive Summary

The central KZN coast is different from the northern and southern KZN coasts, having a much wider continental shelf, so that shallow shelf waters extend much further offshore, and the warm, clear Agulhas Current occurs much further offshore (~50 km) compared to the situation to the northern and southern coasts. Flow from the Tugela River frequently results in turbid seawater, particularly in the northern region. Based on the distribution of species along the coast, distinct biogeographic marine provinces and sub-provinces can be identified, and the Tongaat-Hulett holdings and adjacent coast fall within the Natal Bioregion which extends from Cape Vidal in the north to the central Eastern Cape in the south. The coast in/adjacent to the areas of interest comprises rocky shores interspersed with sandy shores; the offshore shelf mainly comprises sandy substrata, but with considerable quantities of subtidal reef. Broadly, the rocky shores of the northern holding are similar to those of rocky shores elsewhere, but with some differences in community structure; the Zinkwazi and Seyula Point communities in particular are distinctive. There was insufficient information available to us to determine the uniqueness or otherwise of the southern Tongaat-Hulett holding, nor indeed the communities of sandy shores in either holding. Based on knowledge of turbidity-tolerant communities of subtidal reefs in the Richards Bay area, it is likely that the reefs off the northern and southern holdings are intermediate to those of the coral dominated reefs in northern KZN and the algal-dominated reefs of southern KZN; again, limited information was readily available for this report. Subtidal soft-substratum communities are poorly known, except off the inshore northern part of the northern holding, which community is mud-dominated and suitable for prawns and associated turbidity-tolerant organisms, differentiating it from the mainly sand-dominated subtidal communities off the rest of KZN. Overall, the marine communities associated with the northern holding stand out as being typified by turbidity-tolerant communities, relative to communities associated with the southern holding and with the wider KZN coast; however there is considerable detail lacking or unavailable to us for most habitats, which would enable a thorough comparison to be made.

Offshore recreational activities are dominated by boat fishing, particularly recreational fishing in summer months, with most launches occurring in the northern holding from Zinkwazi. Turbidity-tolerant fish such as kobs predominate in catches off the northern holding, while pelagic gamefish are far more common off the southern holding, a reflection of the improved water clarity there; catch rates are higher off the northern holding, for reasons which are not apparent. In contrast, recreational shore-angling catch rates from the northern holding are much lower than those from the southern holding, while angling effort from the latter holding and in KZN in general, is substantially higher, although this pattern is not as marked in recent years. Differences in species composition reflect the higher turbidity off the northern holding, but the reason for disparity in catch rates is not readily apparent. Legal subsistence shore fishing is restricted to the Nonoti area, but the available information on catch and effort is limited; anecdotal information suggests that illegal subsistence fishing/harvesting is at a low level. Differences in recreational harvesting and catch composition of invertebrates between the areas of interest and the rest of the KZN coast are not particularly marked, while spearfishing effort is much higher off the southern holding, likely a function of better visibility there.

The focus of this report on consumptive use of marine resources has largely precluded assessment of the demand or opportunities for non-consumptive usage; currently there appears to be minimal use of launch sites for purposes other than fishing, but increased ease of launching as would be provided by a marina could see increased non-fishing activities – with a corollary that increased fishing effort, which is not desirable, would also result. While facilities such as artificial reefs offer increased opportunities for non-consumptive use, they need careful thought, as their supposed benefits to resources are not guaranteed. While limiting of access to the coast, or strategically moving current access points may offer benefits, these would need to be carefully researched and considered. Finally, the information available to us suggests that there is benefit to be gained from proposed Marine Protected Areas (MPAs) in the areas of interest, with possible additional benefits from co-management opportunities offered by involvement of landowners.

9. COASTAL ASSESSMENT

9.1. Delineation of the Coastal Zone

The term “coastal zone” has as many different definitions as the number of people asked. The coastal zone may have a different extent depending on the nation, organisations or individual and may vary in seaward and terrestrial boundary, at estuarine influences, may be a relative term or may imply absolute boundaries that can be mapped. Be that as it may, a uniform national definition is critical to set the stage for practical and enforceable regulations that arise from a common understanding of the boundary of the coastal zone. The ICM Act defines and prescribes the procedures and measures for delineating and adjusting the coastal zone of South Africa which includes: coastal public property; coastal protection zone; coastal access land; coastal waters; coastal protected areas; special management areas; and coastal set-back lines (Celliers et al., 2009). These zones are reflected in Figure 8 overleaf and the person or body who is responsible for its determination and adjustment is outlined in Figure 7 overleaf. Of particular relevance this coastal assessment is the delineation and assessment of the coastal protection zone, coastal access land and potential coastal set-back lines (dealt with during the specialist study undertaken by Mather and Swart, 2010). These are expanded on in more detail in the next section.

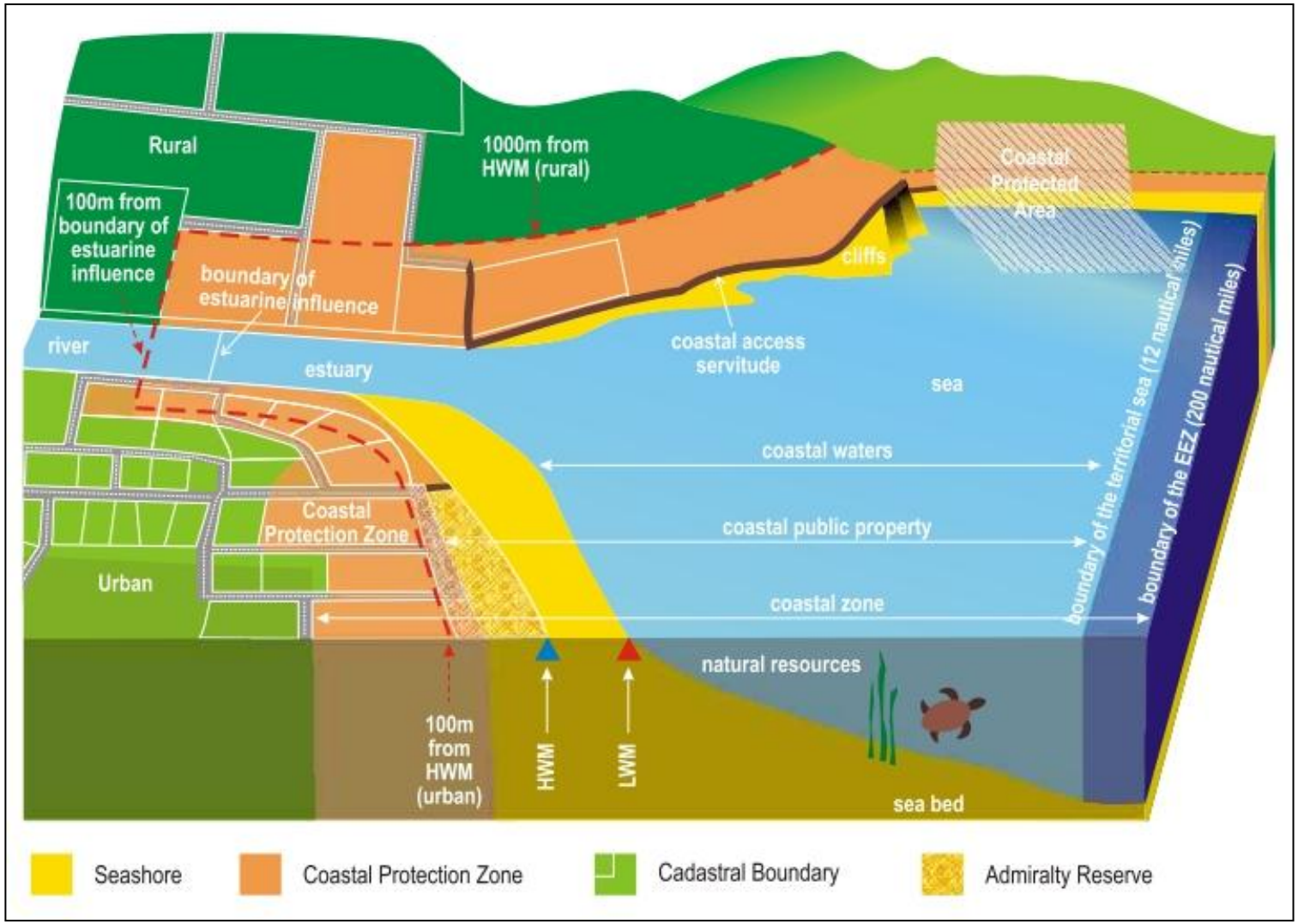


Figure 8. The Coastal Zone of South Africa (Celliers et al., 2009).

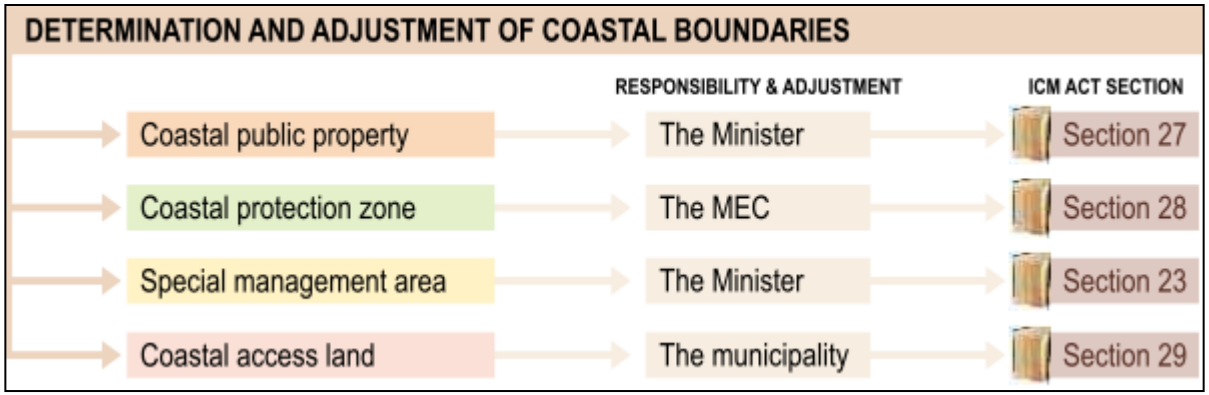


Figure 9. Determination and adjustment of coastal boundaries in terms of the ICM Act (Celliers et al., 2009).

9.2. Coastal Protection Zone

The coastal protection zone was established in terms of the ICM Act in order to manage, regulate and restrict the use of land adjacent to coastal public property, or that plays a significant role in the coastal ecosystem. This zone is a continuous strip of land, starting from the high water mark (HWM) and includes land parcels situated completely or partly 100 metres inland in developed urban areas zoned as residential, commercial, or public open space, or land parcels situated completely or partly 1000 metres inland in areas that remain undeveloped or that are commonly referred to as rural areas (Celliers et al., 2009).

In addition to the above the coastal protection zone consists of:

- Sensitive coastal areas, as defined by the Environment Conservation Act (Act No. 73 of 1989, section 21[1]);
- Any part of the littoral active zone that is not coastal public property;
- Any coastal protected area, or part of such an area, which is not coastal public property;
- Any coastal wetland, lake, lagoon or dam which is situated completely or partially within a land unit situated within 1000 metres of the HWM that was zoned for agricultural or undetermined use, or is within 100 metres of the HWM in urban areas;
- Any part of the seashore which is not coastal public property (including all privately owned land below the HWM);
- Any Admiralty Reserve which is not coastal public property; and
- Any land that would be inundated (submerged or covered) by a 1:50 year flood or storm event (this includes flooding caused by both rain storms and rough seas).

With reference to the Tugela and Tinley Manor land parcels which from part of this coastal assessment, the following is applicable in respect to the default coastal protection zone. Interpretation of the ICM Act has evolved substantially since the preparation of the proposal for this assessment, particularly in light

of guidance received from National government. Significant implications of this revised interpretation are in reference to the delineation of the coastal protection zone (section 28 of the ICM Act). As indicated in the development of the KwaDukuza CMP, the original interpretation of the coastal protection zone was that it stretched only as far as 100m or 1000m from the high water mark (HWM), depending on whether the area in question was zoned as urban or agricultural. Correct interpretation of the ICM Act actually means that the entire land parcel that falls wholly or partially 100m or 1000m from the HWM forms the landward boundary of the coastal protection zone. Dependent on the accuracy of the cadastral data provided to SSI, this essentially would mean that most of both the Tugela and Tinley Manor landholdings would form part of the coastal protection zone, prior to adjustment by the MEC, should he or she deem such adjustment necessary. It is recommended that more emphasis and resources be put towards decision-making in respect to the position of the development setback line, as the delineation of this line will have more far-reaching consequences for coastal landowners.

9.3. Coastal Setback

Coastal and riparian erosion, increased intensity and frequency of flooding and wind generated storm surges that damage coastal areas and riparian areas must be planned for as a matter of urgency. The only solution is the proactive determination and implementation of realistic setback lines for developments, whether they are urban, rural or agricultural (Roets & Duffel-Canham, 2009). Development setbacks can be defined as the amount of open space that should be left between buildings (and other infrastructure) and the shoreline, or in the cases of rivers and wetlands, the 1:100 year flood line (Roets & Duffel-Canham, 2009). The ICM Act includes a specific section related to proposed coastal setbacks which is detailed below.

9.3.1. ICM Act Requirements in respect to Coastal Setbacks

A further tool provided by the ICM Act to coastal managers and decision makers is the establishment of coastal set-back lines. Coastal setback lines are predominantly seen as linear limitations but can also take others forms, for example, height restrictions. Set-back lines will assist in controlling development along an ecologically sensitive or vulnerable area, or any area that poses a hazard or risk to humans (DEAT, 2000).

Coastal set-back lines, once adopted, propose to prohibit or restrict the construction, extension or repair of structures that are either wholly or partly seaward of the line. The intention of the coastal set-back line is to protect or preserve:

- Coastal public property such as beach amenities and other infrastructure such as parking;
- Coastal private property such as private residences and business properties;
- Public safety in the face of extreme climate and other natural events;
- The coastal protection zone as described in Section 16 and 17; and
- The aesthetics or “sense-of-place” of the coastal zone. (Celliers et al 2009)

It should be noted that it is the responsibility of the provincial lead agent for coastal management to establish coastal set-back lines after a process of consultation with municipalities and interested and affected parties (I&APs). This consultation process is via the publishing of a proposed coastal set-back line in the Provincial Gazette. As a key land owner and lead I&AP Tongaat Hulett can influence where this line is placed based on local conditions and knowledge, as well as the study undertaken by Mather and Swart (2010) as part of this assessment.

The agreed upon coastal or development setback, once determined and gazetted, has major implications in respect to the implementation of the NEMA Environmental Impact Assessment Regulations. In these new Regulations (DWEA, 2010) the development setback is defined as "a setback line as defined or adopted by the competent authority and where none has been defined or adopted it will be assumed that no setback line applies". Once determined all listed activities relating to the coastal zone beyond the coastal or development setback could no longer trigger the requirement to undertake a prior environmental assessment. The process of delineation is therefore critically important to any future development prospects along the north coast.

9.3.2.KZN Department of Agriculture, Environmental Affairs and Rural Development Draft Setback

Predominantly as a result of the March 2007 tidal surge and subsequent significant coastal erosion, the KZN Department of Agriculture, Environmental Affairs and Rural Development, (DAE&RD), the KZN provincial lead agent for coastal management, developed a best practice guideline entitled "Living with Coastal Erosion: A short term, best practice guide". This guide endeavours to demystify the dynamic and active nature of the coastal system and calls for coastal societies living alongside the ocean to accept and adapt to the natural variations of this environment. Nine best practice guidelines to manage the human responses to coastal erosion are detailed including the establishment of a coastal setback (Breetzke et al., 2007).

The development setback proposed was designed to protect both the natural environment from encroachment from buildings as well as protect beachfront developments from the effects of storms and accelerated coastal erosion. The National Environmental Management Act's (NEMA's) precautionary principle was applied and a preliminary coastal setback line was set at the 10 meter contour above mean sea level. It should be noted that this was not an *ad hoc* line but was extrapolated from the existing eThekwini erosion line, which was determined scientifically using a 50 year storm event cycle as well an estimated 50 year sea level rise (Breetzke et al., 2007).

This draft setback line has been successfully applied by the DAEA&RD in the environmental review process as a decision support tool and so-called 'trigger' to manage the location of new coastal developments and inform the upgrading of existing developments. Development seaward of this setback is considered to be at high risk from coastal erosion and as such specialist studies are required to be undertaken to review such proposed development. (Breetzke et al 2007)

Figure 10 shows the draft setback line applied to the Tugela landholdings between Nonoti and Zinkwazi. Figure 11 is provided for illustrative purposes only, as all spatial layers will be provided to Tongaat Hulett as part of the consolidated GIS package.

The process of determining coastal setbacks is currently very topical with DAE&RD having hosted a workshop on the 30th of September to discuss the contradictory issues raised previously in this report as well as the way forward. At this workshop it was agreed that KZN would endeavour to adopt two lines, namely a no development or coastal hazard line as well as a limited development line.

Figure 10. KZN DAEA&RD Draft Setback (10m contour) between Nonoti and Zinkwazi.

9.3.3. Tugela and Tinley Manor Setbacks - Quo Vadis?

Climate change preparedness means adopting a precautionary approach to the location of infrastructure in high-risk areas such as the coastal zone. In the interim absence of a gazette provincial directive on the exact position of coastal setback lines in KZN, a comparison between the draft 10m contour setback (Figure 10 above) and the projected sea-level rise scenarios (Mather & Swart, 2010) which formed part of this assessment is necessary. This is illustrated by Figure 11 overleaf.

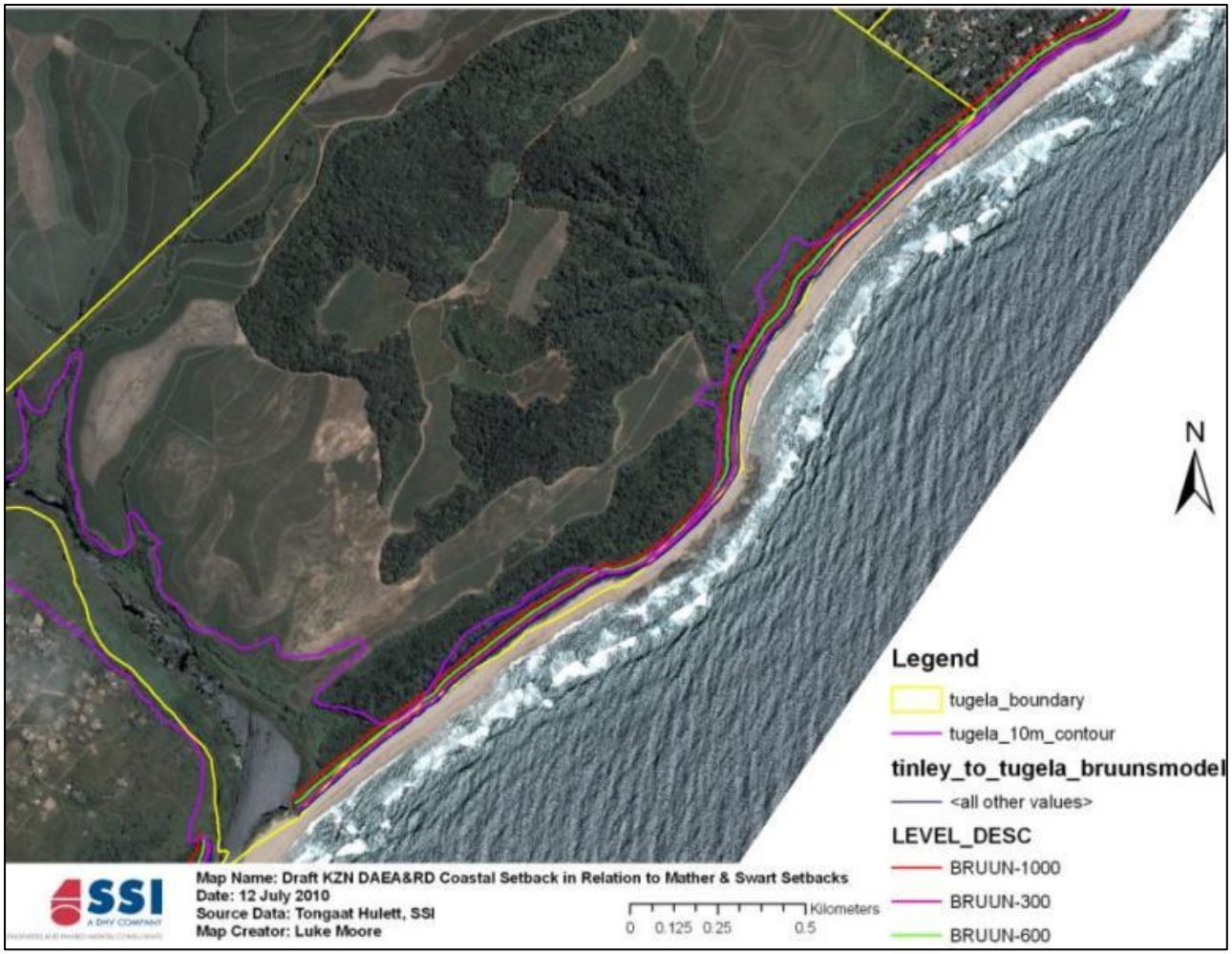


Figure 11. Comparison of KZN DAEA&RD Draft Coastal Setback and Mather & Swart sea-level rise scenarios.

As can be seen from Figure 11 above, there are areas where the KZN DAEA&RD Draft Setback intersects with Mather and Swart's projected sea-level rise scenarios, and others where there are significant discrepancies and discontinuities. Decisions will need to be made in this regard in terms of delineating the final development setbacks, in consultation with the KZN DAEA&RD, for both the Tugela and the Tinley Manor landholdings. As with all spatial information displayed in this document, the layers will be provided to Tongaat Hulett as part of the final deliverable for further analysis and decision-making purposes.

9.4. Estuaries

9.4.1. Background

Estuaries are unique and dynamic systems and can be described as partially enclosed coastal bodies of water which are either permanently or periodically open to the sea and within which, there is a measurable variation of salinity due to the mixture of sea water with fresh water derived from land drainage (Day 1980). Estuaries are part of a continuum which Link Rivers and wetlands to the sea and ultimately to the entire hydrological cycle (SiVEST Selatile Moloi Team, 2007).

Estuaries are commonly classified according to the Whitfield classification as permanently open, temporarily open/closed, estuarine bays, estuarine lakes and river mouths (Forbes and Demetriades, 2008). In this coastal assessment the definition for temporarily open/closed estuary is most significant and these estuarine systems are described as often having sand bars formed in the mouths blocking off connection with the sea. The combination of low river flow conditions and longshore sand movement on the adjacent coast is cited as the reason for the formation of these sand bars which are often opened as a result of flooding which then moves large amounts of sediment. Infill of these systems with sediment, both marine and fluvial can be rapid and hyper saline conditions can occur during times of drought. Water temperature is controlled via tidal and riverine inputs during open conditions. A combination of marine, estuarine and freshwater biota are all found and vary depending on whether the mouth is open or closed (Driver *et al.*, 2004). Estuaries deliver a number of different goods and services that are essential for the survival of many organisms, which ranges from the provision of nurseries for marine dependent species, sanctuary for birds, habitats for estuarine organisms, nutrient cycling, sediment supply to the coastline, water supply, flood defence, waste treatment and recreational activity, erosion control, soil formation, to increased value of property adjacent to estuaries. Estuaries are the product of two very distinct overlapping environments (namely marine and freshwater) and are therefore subjected to changes in the abiotic environment. This results in estuaries having low diversity as many organisms are not adapted to dealing with these sudden changes. Species which can exploit this highly productive area do so with little threat from competitors. This area is generally composed of high densities of biota but with relatively low species diversity compared to the adjacent environments. Primary producers in these systems range from microscopic algae to the more charismatic mangroves. Representatives from the animal kingdom include zooplankton, benthic invertebrates, fish and birds (Forbes and Demetriades, 2008).

The increase in population together with unrelenting development along the coast coupled with urbanisation and industrialisation are some of the major factors degrading these fragile environments (Forbes and Demetriades, 2008). The most serious threats facing estuaries include impoundment of rivers and abstraction of freshwater, accelerated sedimentation as a result of insensitive catchment practices, eutrophication as a result of nutrient enrichment, chemical and organic pollution, habitat loss, invasion of alien species and the direct exploitation of natural resources (Forbes and Demetriades, 2008). Breaching (artificially) of the estuary mouth is common in some parts of country. This is done to prevent flooding of the area or to release polluted water into the sea but this also allows important nutrients to be released from the system into the ocean and the organisms are then at a disadvantage as they are not able to take advantage of the situation (Hay, 2007). The social, economic and ecological value of estuaries needs to be recognised and impacts of surrounding land-use limited (Hay, 2007). Desirable or undesirable practices need to be identified and incorporated into management plans which are implemented with particular emphasis placed on stakeholder education (Hay, 2007). Hay (2007) goes on to state that the activities that change aspects of the natural environment on a

large scale should be prohibited. “Stricter controls on motorized craft or completely ban the use of craft in smaller estuaries” (Hay, 2007). “The health of an estuary is dependent on the quality and quantity of freshwater it receives from the catchment. If there is significant abstraction of freshwater, or, if this is planned, commission an ecological reserve determination study, so as to ensure that the estuary gets its fare share of water. In some instances, particularly where there is a wastewater treatment works on an estuary or in the catchment, the flow of water into the system might be increased. Examine how water from the treatment works can be directed elsewhere” (Hay, 2007). In respect to the estuaries in the KwaDukuza Municipal area, the level of impacts vary between them with some faring better than others but all estuaries are susceptible to catchment change irrespective of length or current condition. Sedimentation in the upper reaches of all the estuaries would have reduced the total area of marine influence. All seven systems in the KwaDukuza Municipal area have been subjected at various times to artificial breaching of the sand bars which form across the mouth during low flow periods. This activity is now recognized as highly disruptive to the natural cycles and control of this activity would have to be incorporated into any rehabilitation program (KwaDukuza SEA, 2007).

9.4.2.ICM Act Requirements in Respect to Estuary Management

Chapter 4 of the ICM Act details the proposed integrated and improved management of estuaries in South Africa by means of a National Estuarine Management Protocol as well as individual management plans for individual estuaries (Figure 12).

As can be seen from the figure above, estuary management plans are required to be developed for each estuary, with responsibility for this important task delegated to local authorities. It is however strongly recommended that TH consider the possibility of public-private partnerships with local government in managing the three estuaries situated on TH land in the interests of contributing to the continued supply of the significant ecosystem goods and services provided by these socially and ecologically important systems.

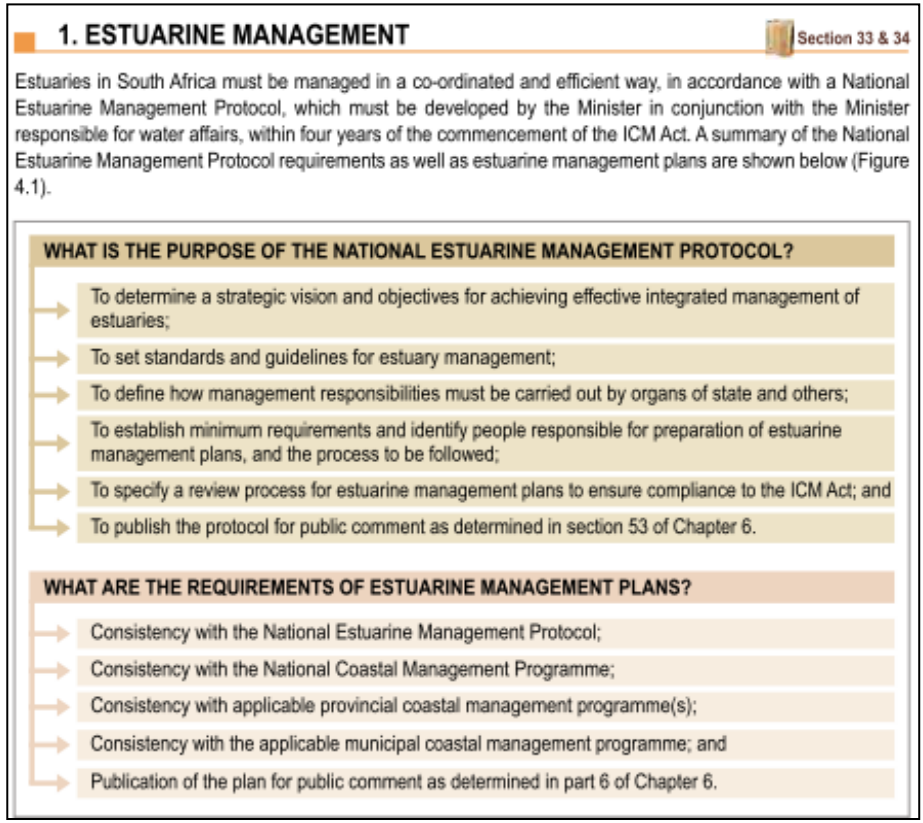


Figure 12: Mechanisms for Estuarine Management as defined in the ICM Act (Celliers et al., 2009).

9.4.3.Zinkwazi Estuary

The Zinkwazi Estuary (Figure 12) is classified as a temporarily open estuary with acute siltation from bad land use management throughout the catchment, inappropriate urban development in a high energy dynamic zone (on the south bank at the mouth). Sewage and cultivation have lead to water quality issues. Artificial breaching events on the estuary have also lead to negative implications in terms of ecological processes. This estuary has a history of recreational use and the condition of the estuary has been categorised as fair to moderate. The presence of a ski boat club and launch site creates a variety of available opportunities but the potential for conflict between different users exits (CZRU, 2003). A major concern for this estuary is due to poor water quality associated with outdated and aging septic tank systems established for the larger residential and tourist facilities which have been deemed to inadequate (CZRU, 2003). Table 6 depicts the Begg classification of this system.

Figure 13: The Zinkwazi Estuary

9.4.4. Nonoti Estuary

The Nonoti Estuary (Figure 13) is classified as a temporarily open estuary which has rural aesthetic qualities with little surrounding development. The estuary contains a short catchment with strong management possibilities. Rehabilitation opportunities are good. Some current recreational use in evident with the condition of the estuary rated as between poor to fair. This system was not sampled by Begg in 1984 (SiVEST Selatile Moloi Team, 2007).

9.4.5. Umhlali Estuary

The Umhlali Estuary (Figure 14) is classified as a temporarily open estuary and this system has both agricultural and industrial factors influencing it as well as having inappropriate urban development in its high energy dynamic zone, namely, on south bank at the mouth. This system is river feeding largely within the municipal boundary and therefore management opportunities are considered to be high and the condition of the estuary is considered to be good. Table 6 overleaf depicts the Begg classification of this system (KwaDukuza SEA, 2007).

Figure 14: The Nonoti estuary

Figure 15. The Umhlali Estuary

Table 6. Classification of Estuaries (Begg, 1984).

	Zinkwazi	Umhlali	Nonoti
Environmental condition	Fair	Fair	Ns
Estuary type	lagoon	Estuary	lagoon
Size	19 ha	21 ha	Ns
Mouth condition	Closed for more than 50 % of the year	Closed for more than 50 % of the year	Ns
salinity	15-30%	5-15%	Ns
Dominant peripheral vegetation	Phragmites	Hibiscus and Sporobolus	Ns

Primary evidence of perturbation	Heavy siltation	Cane encroachment	ns
Species diversity	2nd highest – 37	4th highest- 33	12

Table 7. Extract from Estuarine Health index (Harrison et al 2000).

No.	System	Classification	Biogeography	Ichthyofauna	Water quality	Aesthetics
361	Thukela (Tugela)	open, medium/large (F non-barred systems)	Subtropical	Moderate	Good	Moderate
359	Nonoti	n/s	Subtropical	n/s	Fair	n/s
355	Umhlali	open, medium/large (F non-barred systems)	Subtropical	Good	Good	Good
360	Zinkwazi	Closed, medium (B medium)	Subtropical	Moderate	Fair	Moderate

9.4.6.Estuarine Specific Findings and Recommendations

- Propose estuarine setback as developed and delineated by the Mather and Swart (2010) assessment (data included as part of the consolidated assessment).
- Management responses:
  - Setback for any future urban development or agricultural practices of behind the estuarine setback developed by Mather and Swart;
  - An active campaign of protecting the headwaters in the catchment area as a matter of priority. The first step would be to promote the discontinuance of planting cane right up to the river banks;
  - Contribute to the development of Estuary Management Plans which would then:
    - Improve land use management practices to avoid siltation;
    - Sensitive use of dynamic zone in respect to recreation use;
    - Links to water borne sewage systems and control of disposal of effluent into rivers which then ultimately enters estuarine systems;
    - Management and control of artificial breaching;
    - Management and control of recreation use; and
    - Rehabilitation of systems.
- As identified in the LUMS:
  - Better protection and management of the river, lagoon and wetland systems to maintain and improve appropriate environmental functionality; and
  - The environmentally sensitive coastal strip which, although under substantial pressure for recreational usage and accommodation, needs to be better protected and managed.

9.5. Identification of Sensitive Areas

Ezemvelo KZN Wildlife (EZKNW) has developed a Biodiversity Conservation Plan (hereafter the C-Plan), based on systematic conservation planning principles. It is essentially a strategy to facilitate decision making around land use and conservation. The scale of pixels used is 2 km x 2 km. The process involves settings targets, 'standards', including an irreplaceability index, followed by identifying gaps in the protected area system, and identifying additional areas needing action, based on level of threat and priorities (DEAT, 2004). Whilst it is our understanding that the C-Plan has no legal status and the fact that it has been undertaken at a relatively coarse geographic scale, it does still provide an indication of the sensitivity of the environmental assets within the Tugela and Tinley Manor landholdings. To this end, Figures 16 and 17 show the 'completely irreplaceable' pixels (at a scale of 2 km x 2 km), denoting high biodiversity value and/or environmental sensitivity for the Tinley Manor and Tugela landholdings. As can be seen from Figure 16, significant portions of the Tugela landholdings are considered completely irreplaceable. Notable inclusions are portions of the Seyula Forest, the Zinkwazi and Nonoti estuaries, as well as the dune vegetation between Iti Bay and Zinkwazi town.

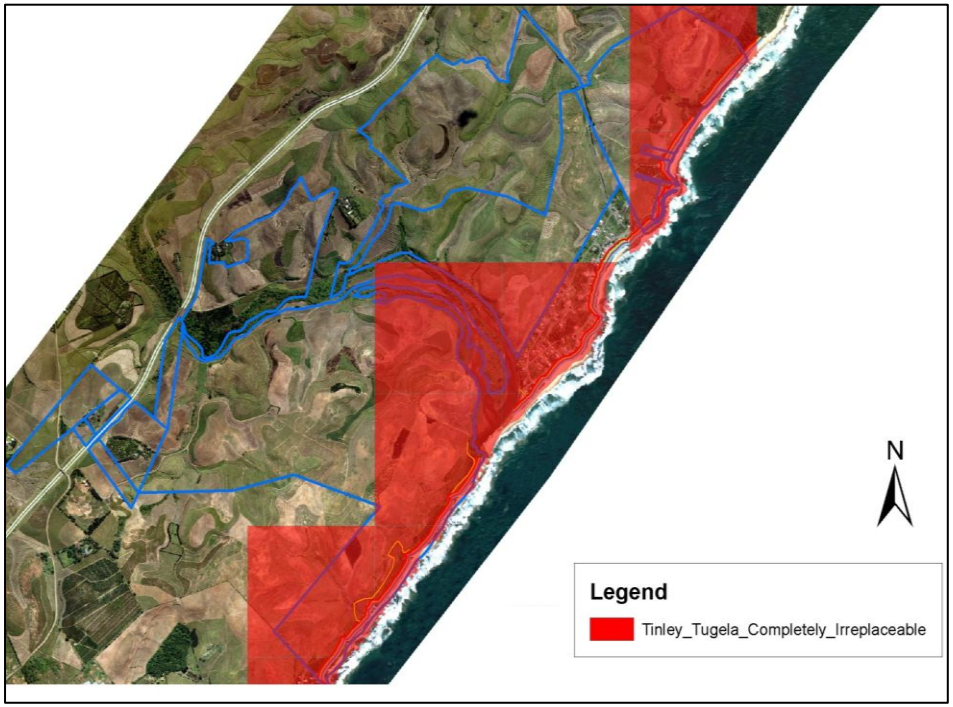


Figure 16. Completely Irreplaceable Biodiversity Elements: Tinley Manor landholdings.

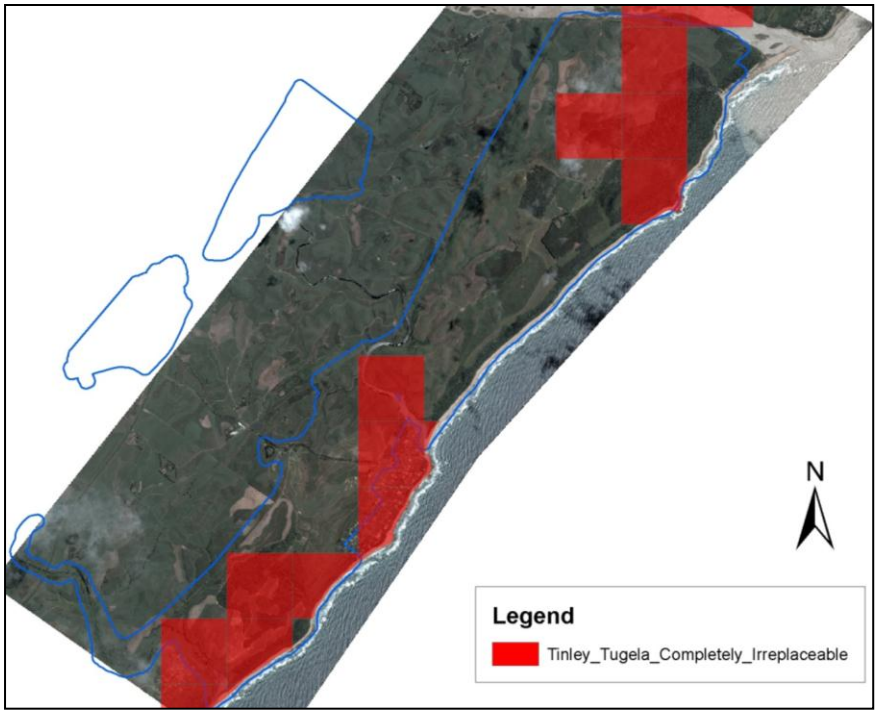


Figure 17. Completely Irreplaceable Biodiversity Elements: Tugela landholdings.

Figure 17 above shows that large portions of the Tinley Manor landholding are considered completely irreplaceable from a biodiversity perspective. These include the Umhlali Estuary, dune vegetation between Tinley Manor town and the northern boundary, as well as between Christmas Bay and the mouth of the Umhlali.

9.5.1. Sensitive Areas Identified During Ground-Truthing

The following site-specific environmentally sensitive areas were identified during the ground-truthing site visit undertaken as part of this assessment.

- Estuaries:
  - Areas below delineated estuary boundary (any specific flood plains);
  - Umhlali 'island'; and
  - All three estuary mouths.
- Littoral active zone (including relict dunes);

- Potential slip areas as identified by Mather and Swart;
- Wetlands;
- Drainage lines and water ways;
- Dune forests including protected Milkwoods;
- Forests (for example Seyula Forest);
- High species diversity (North land holdings);
- Pioneer grasses in open areas (north land holdings);
- Current and potential view sites;
- Current and potential cultural sites (Ultimatum Tree); and
- The fig trees along the border with Seaton Delaval at Tinley Manor South.

These identified sensitive areas are reflected as development opportunities and constraints.

10. SUSTAINABLE COASTAL DEVELOPMENT OPPORTUNITIES AND CONSTRAINTS

The following two tables provide a breakdown of opportunities and constraints and coastal resources and use in relation to the proposed future development of the landholdings. It is noted that based on future development scenarios, opportunities can be deemed as constraints or vice versa. The spatial representation of these opportunities and constraints that follows assumes that the land parcels are proposed to be transformed from agriculture to a mix of middle to upper income mixed use development. It is noted that GIS application, methodology described below, in respect to these spatial representations can be used to reflect alternate futures and outcomes for the landholdings as may be required.

Table 8: Opportunities and Constraints of the Northern Landholdings (Tugela)

Northern Landholding (Tugela/Nonoti)
Opportunities

• Topography and good views (the lie of the land);
• The remaining indigenous vegetation:
  ○ Dune and climax forest Dune Forest:
  ▪ Undisturbed, small and isolated areas with slight erosion of the foredune due to abnormally high tides (Tugela section);
  ▪ undisturbed and good quality due the increasing dune height which shelters the inland side from salt spray (Nonoti Section);
  ▪ Climax Forest- sheltered from any spray and soils are relatively damp, magnificent specimens of Coast Lowlands trees (Tugela Estate);
  ○ Remnants of Sycamore figs;
  ○ Potential to re-establish Lala Palm Savannah;
  ○ Large fluted Milkwoods and a strangler fig system that has a 13m circumference in the Seyula Forest;
  ○ Scrub: opportunities for managed development of open areas interspersed with woodland,
  ○ High incidence of Coastal Red Milkwood saplings;
  ○ Scrub- Bush-tick berry growing on abandoned cane fields should be left to minimise wind and water erosion (Nonoti Section); and
  ○ Grasses : vigorous growth of pioneer grasses in open areas, which growth, if managed, will facilitate the revitalization of grassland flowers and shrubs that would have been common place when these areas were still Lala Palm Savannah (Nonoti Section) map;
• The continued good health of the estuaries: (Nonoti and Zinkwazi);
• The potential to establish indigenous decorative and medicinal plant nurseries;
• The potential to plant sweet sorghum as an alternate or supplement to sugar for ethanol production or for a standalone production facility for paraffin gel;
• Most of the existing sugarcane fields can continue to function as economically viable production units for the medium term, provided high standards of management are maintained;
• The high species diversity of the land holdings (Wildlife: presence of bush pig, bushbuck doe, red duiker, shorebirds, bush bird species and Brownhooded Kingfishers);
• The Eucalypts plantations (value as a potential cash crop);
• The ability to launch a boat (Zinkwazi and Tugela (outside of area)). Used for fishing but opportunity to use for Dolphin watching as well as other boating activities);
• Potential to access to the beach in respect to shore angling (Turbidity tolerant fish such as kob predominate in catches off the northern holding and recreational catch rates are much higher than southern holding);
• The Zinkwazi platform and rocky shore (three endemic community types);
• Seyula Point (densest mussel bed of any site surveyed in KZN);
• Alternate beach activities: oyster harvesting; use of fishing skis; walking; swimming, establishing artificial reefs for diving, the installation of Fish Aggregating Devices (FADs);
• The potential provision of shelter for yachts making passage between Durban and Richards Bay;
• The application of the slip failure approach is effective in providing space for the built and natural environment to respond to future shoreline changes. The risk to infrastructure and buildings is greatly reduced if they are set back 20m from the slip failure edge;
• The opportunity created by the existing naturally vegetated buffer;
• The gently sloping prograding sandy beach;
• The biodiversity rating in respect to the C-plans Irreplaceability index;

- Soil classification as the challenges that presents to cultivation; and
- The opportunity provided by rehabilitating drained wetland areas.

Constraints
• Soil classification (Soils present agronomic challenges - they have excessive permeability making them unsuitable for annual cultivation and have a high erosion risk, severe cultivation restrictions); • Topography (Due to slope, permeability and soil shallowness these estates cannot make full use of the rainfall and this also impacts crop choice and restricts cultivation, more labour intensive to farm) • Alien Vegetation infestation (Impact of cane fires and fires); • Water (No access to irrigation water and no likelihood of new irrigation permits being issued); • Agricultural diversification (Production of other intensive high value cash crops not considered an economic option); • Fishing (Catch rate in terms of shore based recreational fishing is half of those recorded in the southern holding and many of the resident reef fish species found in this area have been severely overexploited; • Quality of swimming beaches (Sub-tidal deposition zone (mud) and Flow from the Thukela River frequently results in turbid seawater; • Increasing difficulties in accessing the coast for various reasons, the expense of participating in fishing (transport costs, recent increases in permit costs, etc.) and increased concerns about personal safety; • Increased level of illegal harvesting taking place; • Vegetation: o Seyula Forest- High incidence of alien invaders growing deep into the forest fringes; o Extensive die back of large and mature Milkwoods; and o Extensive alien infestation; • Exposure of coastline to wind shear and salt spray; • Potential for dune front slippages; • Remnants of ancient dune systems dating back ~1 200 000 years with the potential for slip failures; • Virtually nonexistent foredunes – steep gradient (near Zinkwazi); • Limited swimming opportunities; • Wetland areas drained (herringbone); and • The potential impacts of Sea level rise.

Table 9: Opportunities and Constraints of the Southern Land holdings

Southern Landholding (Tinley Manor)
Opportunities
• Topography Undulating terrain – beautiful Viewsheds - ‘amphitheatre’; • The remaining pockets of indigenous vegetation - Dune and climax forest and remnants of Sycamore figs; • Launching and Boat fishing (Umhlali and Christmas Bay) with high proportion of commercial launches mostly associated with fishing – potential for establishing artificial reefs for diving as well boat based dolphin-watching as well as spearfishing and scuba diving;

- Pyura stolonifera (red bait) is abundant on reefs in the southern region;
- Opportunity for the establishment of a MPA (proposed Zeteni MPA could make a valuable contribution to marine biodiversity protection);
- Offshore: Pelagic gamefish are far more common off the southern holding, a reflection of the improved water clarity;
- Peak in shore angling fishing in winter due to the presence of shad; Shore-angling catch rates are more abundant in this holding and angling effort is approximately double that in the northern holding;
- Near shore – reefs; turbidity intolerant species; red bait abundant, densities of rock lobster similar to south coast; typical shallow reef-associated fish species; mussels and oysters;
- Prograding beach – gentle slope, rocky shores interspersed with sandy shores;
- Tinley manor beach good for swimming Christmas Bay – ideal swimming beach;
- Umhlali – midden, island and stands of mangroves;
- Christmas Bay – potential scuba diving off rocky ledge off shore as well as potential for development of a tidal pool;
- The continued good health of the estuaries: Umhlali Estuary fully within the boundaries of the land parcel;
- The potential to establish indigenous decorative and medicinal plant nurseries;
- The potential to plant sweet sorghum as an alternate or supplement to sugar for ethanol production or for a standalone production facility for paraffin gel;
- Most of the existing sugarcane fields can continue to function as economically viable production units for the medium term, provided high standards of management are maintained;
- The Eucalypts plantations (value as a potential cash crop);
- Alternate beach activities: oyster harvesting; use of fishing skis; walking; swimming, establishing artificial reefs for diving, the possible installation of Fish Aggregating Devices (FADs);
- The potential provision of shelter for yachts making passage between Durban and Richards Bay;
- The application of the slip failure approach is effective in providing space for the built and natural environment to respond to future shoreline changes. The risk to infrastructure and buildings is greatly reduced if they are set back 20m from the slip failure edge;
- The opportunity created by the existing naturally vegetated buffer;
- The biodiversity rating in respect to the C-plans Irreplaceability index;
- Soil classification as the challenges that presents to cultivation; and
- The opportunity provided by rehabilitating drained wetland areas

Constraints

- Soil classification (Soils present agronomic challenges - they have excessive permeability making them unsuitable for annual cultivation and have a high erosion risk, severe cultivation restrictions);
- Topography (Due to slope, permeability and soil shallowness these estates cannot make full use of the rainfall and this also impacts crop choice and restricts cultivation, more labour intensive to farm);
- Alien Vegetation infestation (Impact of cane fires and fires);
- Water (No access to irrigation water and no likelihood of new irrigation permits being issued);
- Less than 30 ha is agronomic ally suitable for arable annual crops;
- Agricultural diversification (Production of other intensive high value cash crops not considered an economic option);
- Vegetation - This estate has little indigenous vegetation of note, largely because of invader infestation and low species diversity and Dune forests are unimpressive as dunes are low, providing little protection from salt spray;

- Shoreline recreational potential low due to resident reef fish species found in this area been severely overexploited;
- Less opportunity for beach recreation due to beaches being very exposed and eroding, generally short (longshore and cross shore) and steep with a narrow inter-tidal area;
- Launch sites - Substantially less launches than north - map; Boat based Catch rates lower than north – species composition different;
- Access: Increasing difficulties in accessing the coast for various reasons, the expense of participating in fishing (transport costs, recent increases in permit costs, etc.) and increased concerns about personal safety. Need to provide access where there is a current lack of access for shore based angling restricted but Increased opportunities for fishing, in general, should not be encouraged, as many of the offshore reef fishes targeted in the area are over-exploited;
- Increased ease of launching as would be provided by a marina could see increased non-fishing activities – with a corollary that increased fishing effort, which is not desirable, would also result;
- Increased level of illegal harvesting taking place whole;
- Commercial harvesting of oysters every four years whole;
- Exposure of coastline to wind shear and salt spray;
- Potential for dune front slippages;
- Remnants of ancient dune systems dating back ~1 200 000 years with the potential for slip failures;
- Virtually nonexistent foredunes – steep gradient (near Zinkwazi);
- Limited swimming opportunities;
- Wetland areas drained (herringbone);
- The potential impacts of Sea level rise**;**
- Limited swimming opportunities ;
- Umhlali – dune blow out; and
- Tinley manor – poor soils and erosion near farm roads.

10.1. Spatial Representation of Opportunities and Constraints for Sustainable Coastal Development

The opportunities and constraints described above have been applied spatially to the Tugela and Tinley Manor landholdings respectively. This has been undertaken by means of a geospatial development index model, which combines a number of factors towards the depiction of a development index score for the two landholdings. The development index was compiled in order to demonstrate what an optimal development configuration would possibly look like spatially. The components which comprise the development index model are those which are unlikely to vary under the development futures or scenarios described under Section 14 of this report. It should be noted that this model is broad, indicative and conceptual, and as such does not indicate absolute values or locations.

10.1.1. Methodology

The development index model was developed using the following steps:

1. A base layer for the development index was required, and land cover was selected for this purpose on the basis that it is a major determinant of where development might occur (Figure 18). Each land cover type was assigned a generic base score (Figure 19) on the estimated value for development as interpreted by the project team. For example, agricultural land was scored the highest in terms of development potential, as development of this land cover will not involve further incursions into natural coastal vegetation. The land cover layer was also weighted more heavily

than some other layers, as it is the most quantifiable of the opportunities and constraints. The landcover base layer was developed using the 2005 KZN landcover layer in conjunction with an analysis of the 2004 aerial photography provided by Tongaat Hulett. The final addition to this layer was a further analysis of the land cover features on an individual basis, and scores were amended based on specific opportunities or constraints identified by the various specialists or during the ground-truthing site visit and as detailed above.

2. A consistent spatial unit was also required in order to 'join' features across various layers. Hexagons measuring 1 ha x 1 ha (i.e. 10000 m^2) were overlaid on the extent of the two landholdings (Figure 21) for this purpose.
3. Secondary layers were then selected from the available data to be joined to and overlayed on the landcover layer, split by the 1 ha hexagonal units. For the purposes of this spatial representation of the model, these layers consisted of:
    a. Elevation zone (where hexagons were assigned a score of between -1 and 5 based on which elevation zone they fall under);
    b. Distance from the shoreline (where hexagons were assigned a score of between -1 and 5 based on what was considered an optimal distance from the sea);
    c. Distance from the estuarine boundary and setback (where hexagons were assigned a score of between -1 and 5 based on what was considered to be the optimal distance away from the estuary setback);
    d. Distance from the 1m SLR scenario where hexagons situated seaward of this line were assigned a score of -1, and those situated landward were assigned a base score of 3. This score was weighted the same as the land cover layer, as any development seaward of this line can not realistically be considered sustainable in the long term.
4. The consolidated scores were added and the relevant weighting applied. ArcMap was set up to automatically calculate the consolidated score for each hexagon based on the sum of all the joined fields derived from the other layers, resulting in a quantifiable development index (Figures 22 and 23). The higher the development index scores for a particular hexagon, the higher the potential for sustainable coastal development.

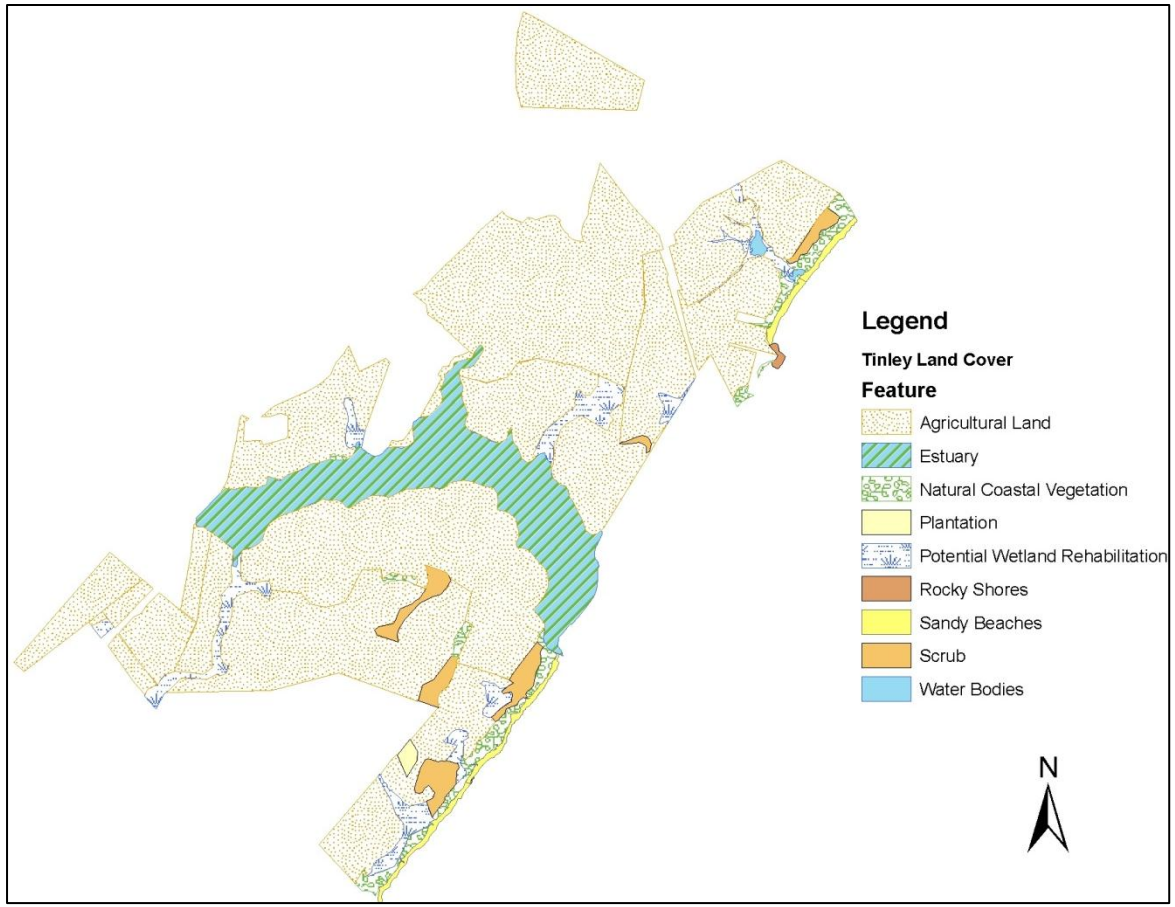


Figure 18. Land Cover for the Tinley Manor Landholdings (2004).

Attributes of Tinley_Opportunities

FID	Shape	Id	Feature	Dev_Score
15	Polygon	0	Agricultural Land	5
16	Polygon	0	Agricultural Land	4
18	Polygon	0	Agricultural Land	4
19	Polygon	0	Agricultural Land	3
22	Polygon	0	Agricultural Land	5
23	Polygon	0	Agricultural Land	5
24	Polygon	0	Agricultural Land	5
27	Polygon	0	Agricultural Land	5
28	Polygon	0	Agricultural Land	5
29	Polygon	0	Agricultural Land	4
30	Polygon	0	Agricultural Land	3
31	Polygon	0	Agricultural Land	3
33	Polygon	0	Agricultural Land	3
34	Polygon	0	Agricultural Land	3
36	Polygon	0	Agricultural Land	3
37	Polygon	0	Agricultural Land	4
38	Polygon	0	Agricultural Land	4
39	Polygon	0	Agricultural Land	4
40	Polygon	0	Agricultural Land	4
45	Polygon	0	Agricultural Land	5
46	Polygon	0	Agricultural Land	5
47	Polygon	0	Agricultural Land	5
4	Polygon	0	Estuary	0
0	Polygon	0	Natural Coastal Vegetation	1
1	Polygon	0	Natural Coastal Vegetation	1
2	Polygon	0	Natural Coastal Vegetation	1
3	Polygon	0	Natural Coastal Vegetation	1
9	Polygon	0	Natural Coastal Vegetation	1
11	Polygon	0	Natural Coastal Vegetation	1
12	Polygon	0	Natural Coastal Vegetation	1

Record: 0 Show: All Selected Records (0

Figure 19. Development Score by Land Cover Feature for the Tinley Manor Landholdings.

As can be seen from Figure 19, certain land cover features were scored higher than others of the same feature type, due to locally identified opportunities. For example, agricultural land with known viewsheds was scored higher than the base score assigned to other agricultural land features.

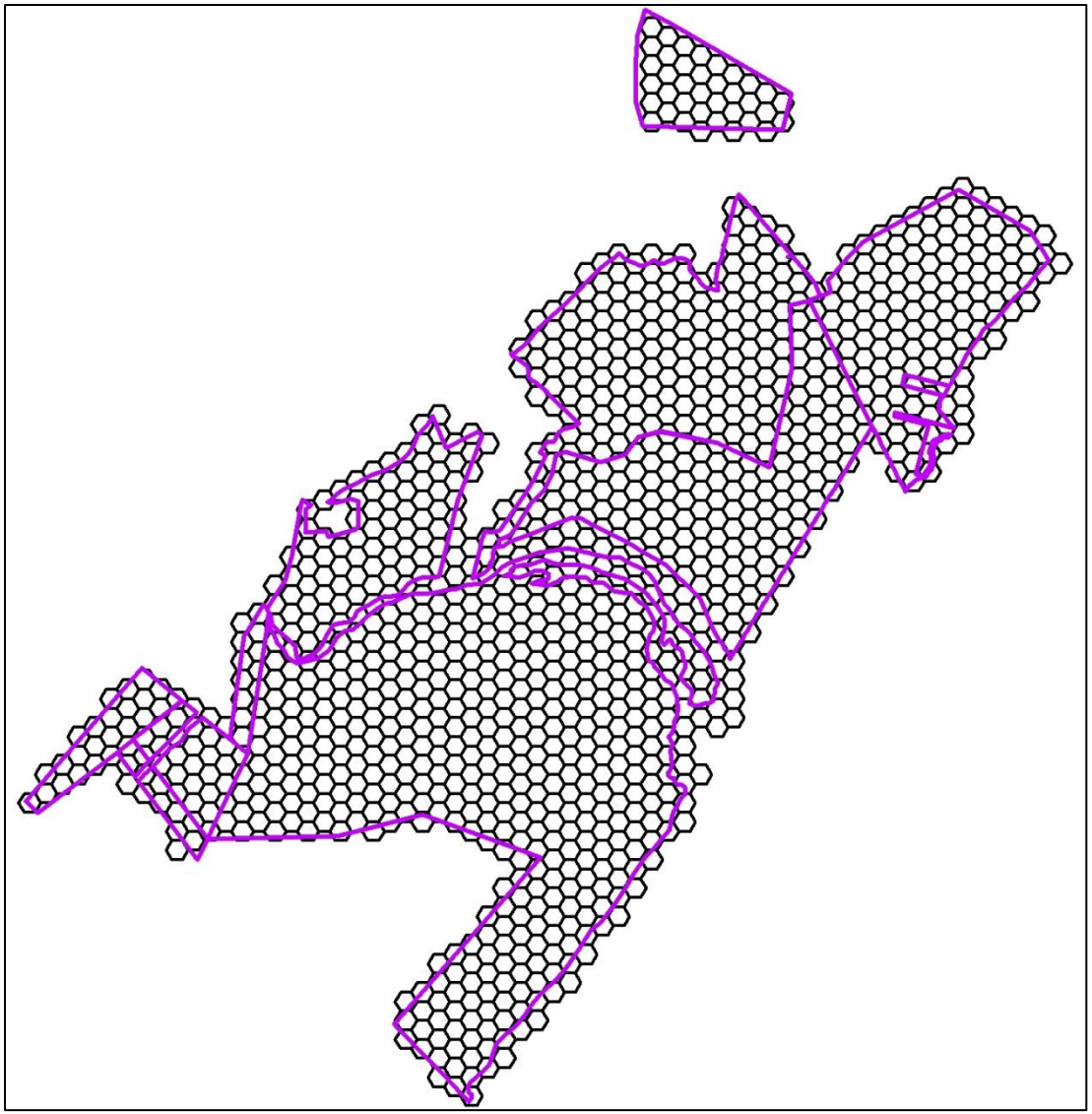
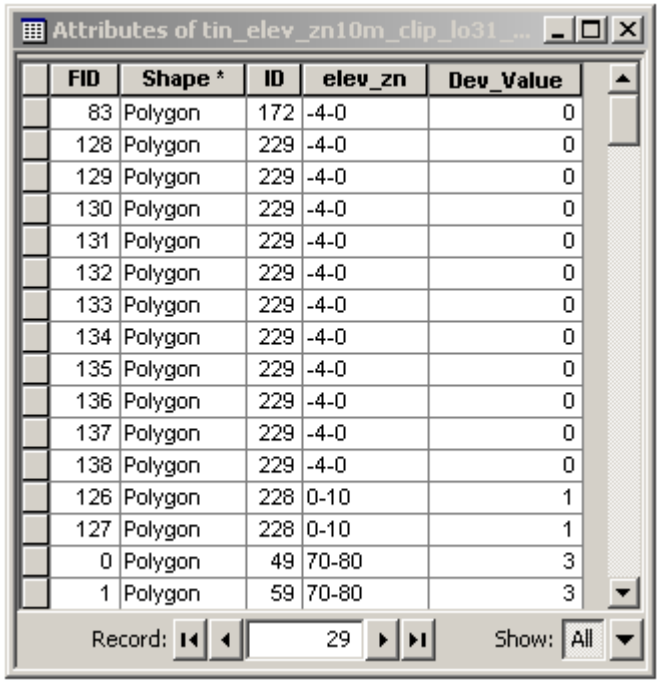


Figure 20. Hexagonal Overlay used to calculate the Development Index Score for the Tinley Manor Landholdings.

Figure 21 shows the categorization of the elevation zones for the Tinley Manor landholdings, as well as the associated development value assigned.



FID	Shape *	ID	elev_zn	Dev_Value
83	Polygon	172	-4-0	0
128	Polygon	229	-4-0	0
129	Polygon	229	-4-0	0
130	Polygon	229	-4-0	0
131	Polygon	229	-4-0	0
132	Polygon	229	-4-0	0
133	Polygon	229	-4-0	0
134	Polygon	229	-4-0	0
135	Polygon	229	-4-0	0
136	Polygon	229	-4-0	0
137	Polygon	229	-4-0	0
138	Polygon	229	-4-0	0
126	Polygon	228	0-10	1
127	Polygon	228	0-10	1
0	Polygon	49	70-80	3
1	Polygon	59	70-80	3

Figure 21. Development Score by Elevation Zone for the Tinley Manor landholdings.

This process was repeated for the remainder of the layers selected as part of the development index, by instructing ArcMap to sum the assigned development value for each layer, resulting in a composite development index score. The first iteration of this model for the Tugela (Figure 22) and Tinley Manor (Figure 23) landholdings are shown below.

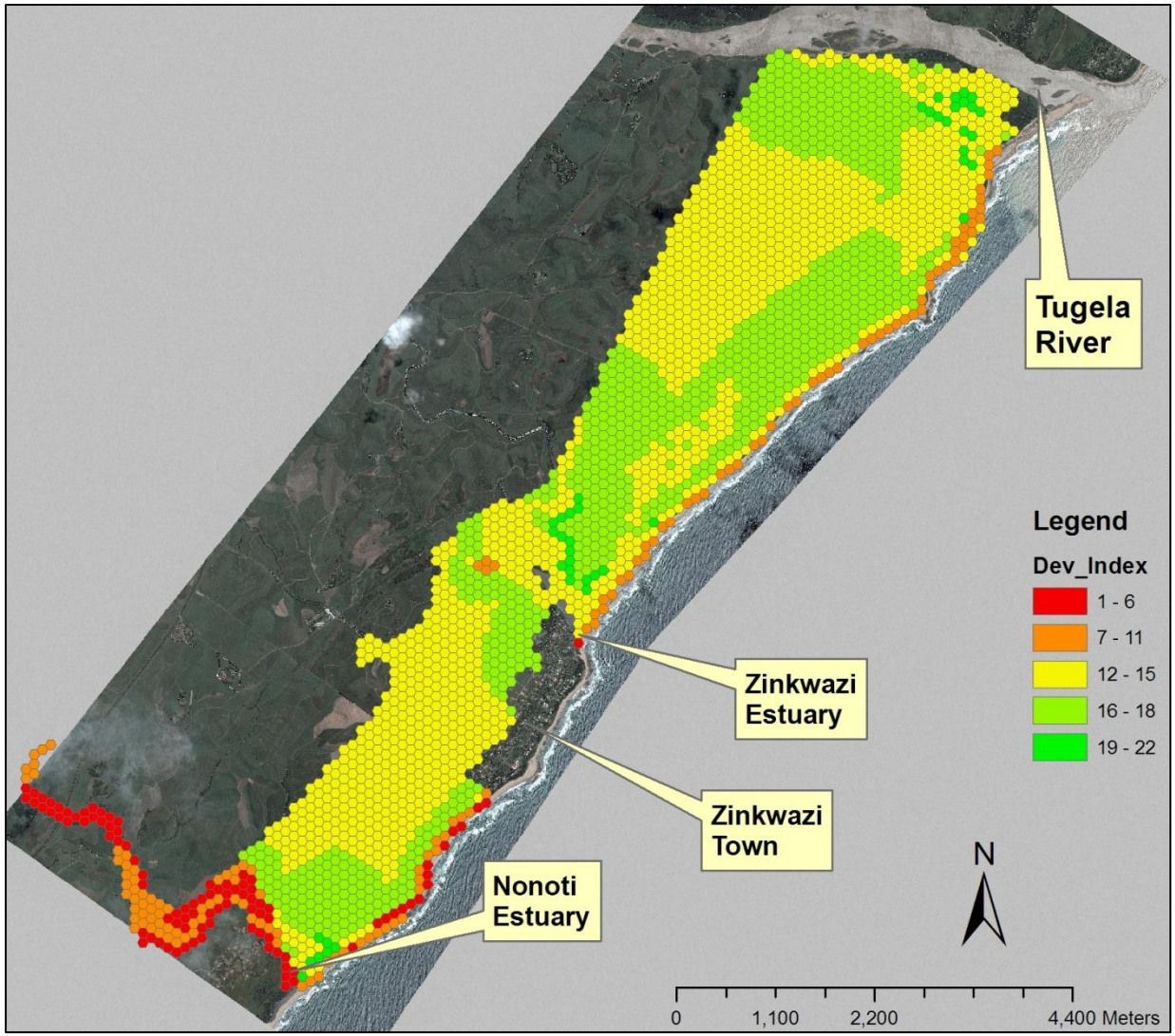


Figure 22. Development Index Model for the Tugela Landholdings.

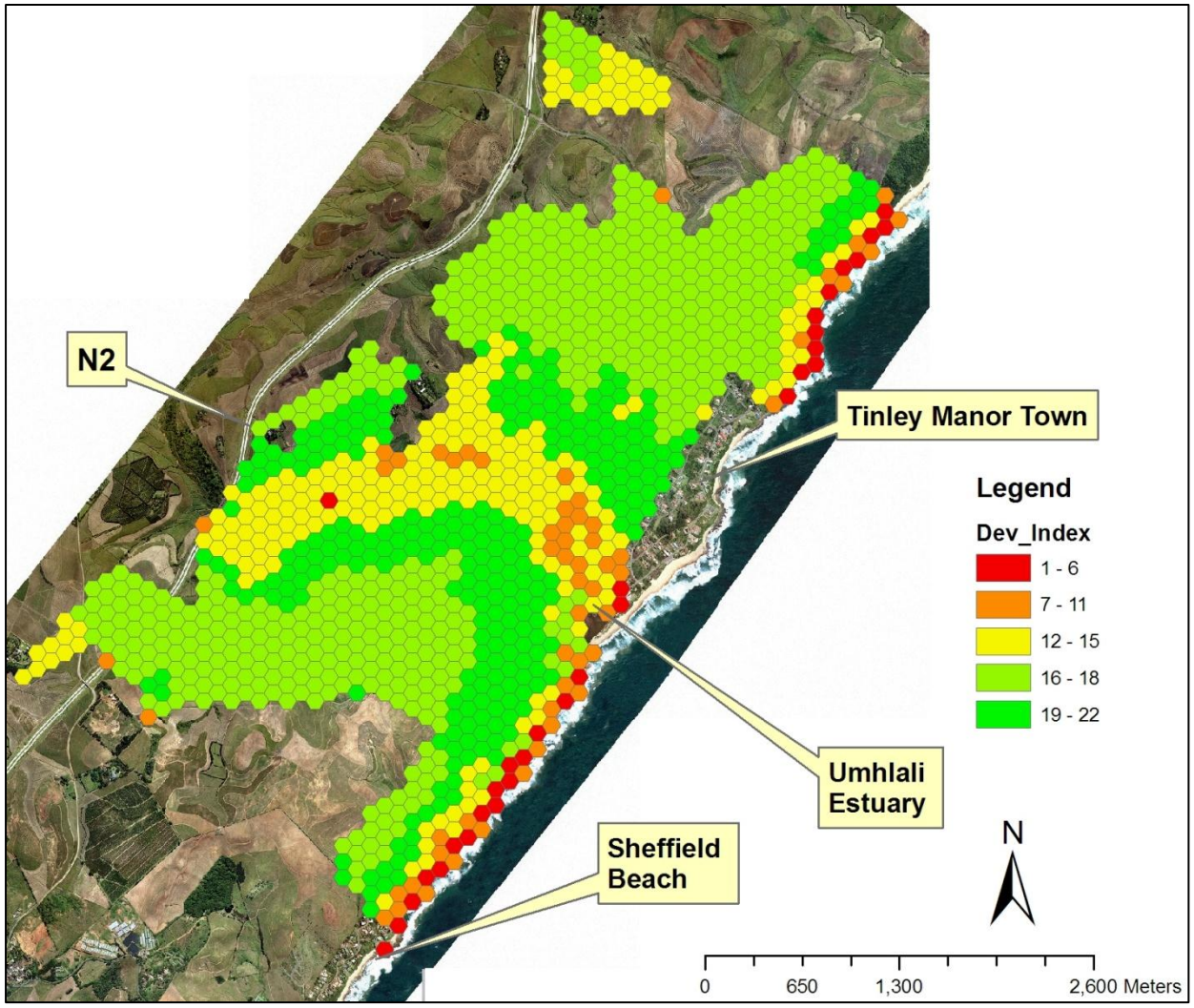


Figure 23. Development Index Model for the Tinley Manor Landholdings.

10.1.2. Results of the Development Index Model

Figure 22 and 23 show the results of the Development Index Model developed to spatially depict the opportunities and constraints identified by the project team during the course of this assessment. From the scores generated by the model, it would appear that the following criteria would constitute the most favourable development areas or 'hotspots' (indicated by development index scores of between 16 and 22):

- Agricultural landcover;
- Close to the coastline/beach;
- Landward of the 1m SLR scenario;
- Away from the estuary setback; and
- Sufficient elevation for potential sea and estuary views.

Conversely, areas to stay away from or to consider rehabilitation or very limited development (indicated by development index scores of between 1 and 15) would be:

- Natural coastal vegetation land cover;
- Wetland landcover;
- Areas considered at risk to sea level rise;
- The estuarine floodplain; and
- Areas further away from the coast and low-lying.

10.1.3. Assumptions and Shortcomings of the Development Index Model

The development index model makes a number of assumptions in assigning quantitative values to geographical features. Among these are the weighting of the various values, which are based on the project team's interpretations of what would constitute an environment favourable to development of the landholdings (opportunities) or what would detract from this environment (constraints). This is in itself a limitation, as these values are largely subjective based on personal bias, training, opinions, etc, and a single 'sampling' event. It is for this reason that as many layers as possible were used, in an attempt to highlight areas within the landholdings that fulfill a variety of criteria that would elevate the sustainability of their development value.

The strength of this approach lies in its ability to be customized, based on which attributes are deemed to be more important in determining development value. Therefore, the results of the model presented for the purposes of this report are able to be adjusted and updated based on new interpretations of development value, as opposed to those based solely on the project team's interpretations. A more detailed analysis of features such as slope, viewsheds, aspect, and various other proximity related fields could be investigated, limited only by the existence and provision of the base data layers. Such an approach could potentially incorporate the expertise of a variety of individuals, if required, as well as being able to integrate a number of development scenarios.

11. CLIMATE CHANGE VULNERABILITY ASSESSMENT

11.1. General Overview

The impacts of climate change are often described in terms of sensitivity (how much change can potentially occur), vulnerability (what is the risk associated with this potential change) and potential adaptation responses or measures (options available to counteract this risk) (Kirker, N.D). Generally there is agreement in respect to the potential impacts of climate change on the east of South Africa but it is important to recognise the potential conflict between the first and second economies on the coast as the coast presents a prime growth opportunity (residential, industrial, agricultural etc) while also in many instances, provides the most basic ecosystem services, free of charge to poor communities.

11.2. Coastal Assessment Implications:

In respect to this coastal assessment the following climate change issues and implications are noted:

- Some ancient dunes are found in both sites, these were created by windblown sand and unconsolidated sandy sediment, they are typically red in colour due to the presence of ferrous oxides in the clay coating around quartz particles, as a result of these clay coatings these sands are particularly mobile when water is applied to the dune;
- Slip failures often occur during extreme weather events and occur with no prior warning;
- Predictions from recent KZN climate Change research has yielded increased temperatures for all parts of the coast
- Increased storminess;
- Coastal erosion;
- Sea-level rise;
- Change in weather patterns – Weather experts' current predictions are that rainfall figures will not drop in the foreseeable future. However they are emphatic that rainfall incidences will become further apart and precipitations will increase in severity;
- This trend will inevitably lead to more run off and less retention of rainfall water on poorer and more difficult soils;
- Flooding; and
- Health issues – increase in malaria.

11.3. Potential Adaptation Measures

Potential adaptation options per sector with adaptation measures are described in table 10 overleaf.

Table 10. Potential adaptation options - adapted from Kirker (n.d.) and Mather & Swart (2010).

Sectors	Relevant adaptation measures
Water Resources	• Plan across whole catchment to co-ordinate finding water quality and quantity solutions; • Make marginal but appropriate changes to the design and construction of infrastructure; • Conserve and encourage efficient water use; • Control pollution;

	• Plan for contingencies in order to respond to extreme events (flooding); • Harvesting of Eucalypts plantations; and • Provision for catching and storing run off water from developed areas should form an integral part of future planning.
Agricultural	• Enhance seed banks and develop new crops – diversify; • Plant heat a drought resistant crops; • Promote agricultural drought management; • Tailor land use management (change) to consider the potential impacts of climate change; • Shift the geographical location of crops to match areas of growth potential; • Improve monitoring and forecasting systems for fire hazard management and droughts; • Promote the use of nitrogen –containing supplements; and • Investigate potential methane reduction / carbon credits.
Human health	• Improve clinic and prevention systems for diseases and improved access to disease control; and • Consider business partnerships to control medical/ health issues to reduce vulnerability of work force to diseases.
Biodiversity	• Better vegetation management to take advantage of rare rainy seasons and immediately thereafter droughts; • Consider protected area networks and local refugia ; • Consider direct intervention actions for particular species; • Establish an inventory and monitoring network; • Establish a procedure for early detection of invasive species and a ongoing programme for eradication; • Support the expansion of marine protected areas; • Include estuarine requirements in fresh water management; and • Determine ecological reserves for rivers and estuaries.
Coastal specific	• Plan appropriately for potential slip failures; • Rehabilitate and re-vegetate dune fronts to prevent slippages; • Rehabilitate wetland areas; • Plan for future storm surges and sea level rise; • Set high value infrastructure back from the coast behind a naturally vegetated buffer; and • Prevent and manage erosion and dune blow outs.

12. COASTAL ACCESS ASSESSMENT

Coastal access is dealt with under the ambit of this assessment due to the fundamental legislative changes which have arisen with the enactment of the ICM Act, with particular reference to the instatement of the concept of coastal public property. Through this concept, ownership of large sections of the coastal zone vests with the citizens of South Africa, to be held in trust by the State (Celliers et al., 2009). With this concession comes a concomitant requirement to provide reasonable access to coastal public property. Local authorities are tasked with ensuring that the public have access to the coastal zone through the provision of coastal access servitudes, to be maintained and operated by municipalities. It is foreseeable that the directive for provision of coastal access has

the potential for conflict between landowners, the public and municipalities due to potential conflicts of interests between private and public interests and/or rights. It is therefore necessary to approach the assessment of coastal access with some caution, particularly in the interim in the absence of a clear directive from National government on the preferred methods of assessment to provide coastal access which is reasonable to all stakeholders.

It should also be noted that a detailed assessment of coastal access would require an in-depth spatial assessment in conjunction with some direction in terms of the development concepts for the coastal area in question. In the absence of this study and information, the principles for the provision of coastal access are presented in conjunction with a preliminary assessment of existing coastal access (i.e. the status quo), which may form the basis of a detailed coastal access assessment in future. The provisional access assessment (specifically the GIS component) highlights existing shoreline accesses which were identified during the ground-truthing site visit. This data has been included as part of the consolidated GIS product. In summation, the coastal access assessment component of this report consists of provision of the principles in respect to provision of public access, as well as how to apply these principles based on our interpretation of how government will implement the provisions of the ICM Act.

12.1. Introduction

With a strong anthropogenic focus and an emphasis on the sustainable use of coastal resources for the benefit of all South African citizens, the ICM Act is firm in its directive for the provision of appropriate access and accessibility to the coastal zone. It follows then that no coastal assessment would be complete without a concomitant review of coastal access in terms of the ICM Act. For the purposes of this report, policy information in terms of coastal access has been derived from “A Toolkit for implementing the Integrated Coastal Management Act” (Celliers et al., 2010).

The interface between the marine and terrestrial environments is sensitive, often dynamic over short periods, naturally changing with the seasons, and is often home to a diversity of animals and plants. The interaction between humans and this environment, in relation to gaining access to this dynamic interface, requires specific management interventions in order to maintain the benefits accruing from coastal natural resources. Accessing the shoreline for recreation, relaxation, and education should also not compromise the privacy, safety, and quality of life for adjacent residents or the value of coastal private property.

With the promulgation of the ICM Act, coastal management in South Africa entered a new and exciting period of change. Included in this change is the manner in which the public gains access to the shoreline and coastal public property as a whole. Free and unhindered access to coastal public property is a right entrenched in the Act, but not a right “at all costs” with the onus being placed on, and legal responsibility assigned to municipalities and landowners to plan, manage and control appropriate shoreline access.

Shoreline access and accessibility (see Encyclopaedia of Coastal Science, 2006) are terms often used interchangeably but have different meanings:

- Coastal accessibility – refers to the means and ways to gain access to the wider coastal zone that are not always explicit i.e. cannot always be mapped. Accessibility is often impeded by a lack of parking facilities, high entry fees, or in an urban context, a lack of public transportation to the beach.

- Shoreline access – refers to the ability to move from an existing “right-of-way” such as a road or public parking area, to a public beach. This is in all likelihood a route that provides direct access to the sea shore and that can be indicated on a map.

Coastal access in this report implies both coastal accessibility and shoreline access. In terms of the benefits provided by the coastal zone, access and accessibility are two critical concepts in integrated coastal management (ICM). Providing access is not only an inalienable civil right, but also provides many other social and economic opportunities for local businesses. The broad access and accessibility principles communicated by the ICM Act are:

- The public has an expectation and right to access the coast and shoreline;
- Access to the coast must be planned and managed to protect coastal resources, their values and public safety;
- Access facilities to the foreshore, ocean and adjacent features must be planned and managed in a coordinated manner to avoid or minimise adverse impacts; and
- Coordination of coastal access is now the responsibility of municipalities.

Beaches are important recreational areas for both South African citizens as well as international tourists. This creates a demand for access by pedestrians and vehicles, in the case of boat launch activities. In some locations, developed private land on the coast has not made provision for public access to beaches and the shoreline. Coastal access issues are likely to intensify with population growth and resulting public demand and therefore municipalities must consider creating, managing and enhancing appropriate public coastal access to achieve the ICM Act objectives. In some cases municipalities will have to reduce informal access and instate planned, formalised and managed shoreline access. In other cases, rapid urban growth and ribbon development has reduced the number of access points and in such cases, reinstating shoreline access will be the challenge. In planning for new urban land uses on the coast, the following additional matters are to be considered with respect to public access and use of the shoreline:

- The need for new or upgraded public access and beach amenities (such as life guard facilities, showers, toilets);
- Pedestrian boardwalks, park areas and vehicle access where appropriate i.e. disabled access, boat launching and emergency access;
- Appropriate location and design with respect to sensitive coastal resources and their values;
- Maintenance of coastal access; and
- Public safety, if access is provided.

12.2. Coastal access provisions in the ICM Act

The intention of coastal access land, as detailed in the ICM Act, is to provide and facilitate public access to coastal public property via public access servitudes. As coastal access is very much a local issue, it is the responsibility of local municipalities to declare coastal access servitudes. The ICM Act tasks the municipality with three important actions in regards to the provision of coastal access land. These are:

- Coastal access servitudes must be declared within four years of the establishment of the ICM Act;
- Coastal access land must be established using by-laws; and

- The status of coastal access must be reported to the MEC every two years.

The designation and adjustment processes of coastal access land, as well as the responsibilities of local municipalities are summarised in Figure 24 below.

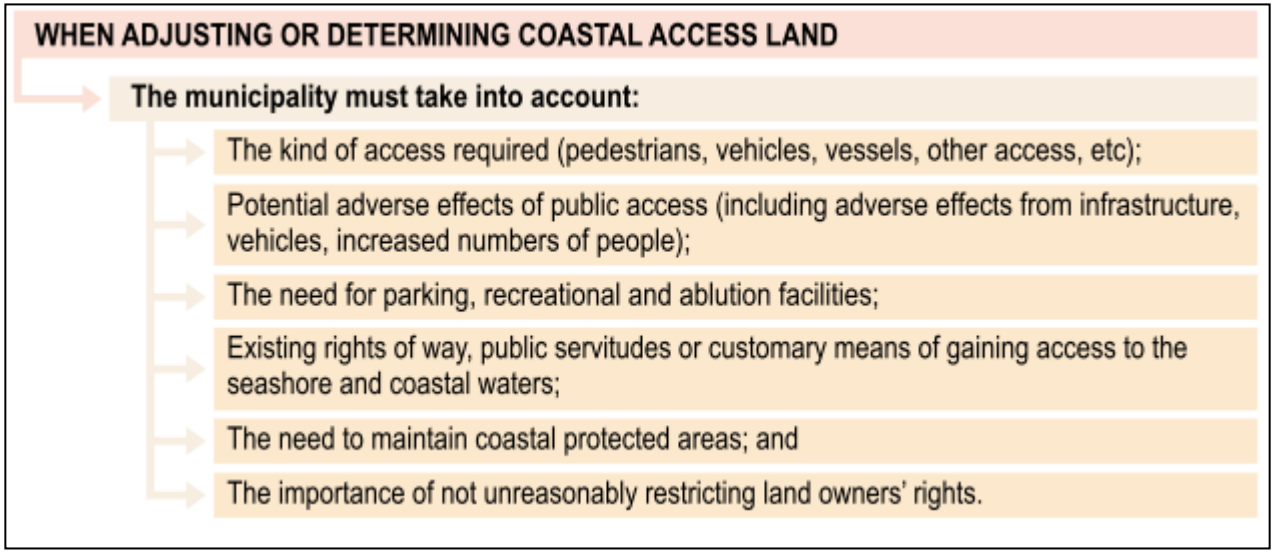


Figure 24. Considerations and requirements for the determination of coastal access land.

12.3. Current Access – Tugela and Tinley Manor

It should be noted that this assessment of current coastal access for the Tugela and Tinley Manor landholdings is preliminary and based on ground-truthing and analysis of spatial data. Due to the nature of the prevailing land use and the nature of the activity in both the Tugela and Tinley Manor landholdings, public access to the general coastal area has been fairly strictly controlled in terms of access through these landholdings, while access along the shoreline is not regulated or controlled. Ground-truthing indicated that a number of illicit access routes through Tongaat Hulett property exist, presumably for recreational and/or subsistence use of marine resources. As can be seen from Figure 25 and 26 overleaf, access points vary considerably throughout both landholdings. Some accesses are formalised vehicular access points, while others are informal, pedestrian and sporadically used.

12.3.1. Preliminary Status of Access – Tugela Landholdings

Figure 25. Preliminary Status of Access for the Tugela Landholdings.

12.3.2. Preliminary Status of Access – Tinley Manor Landholdings

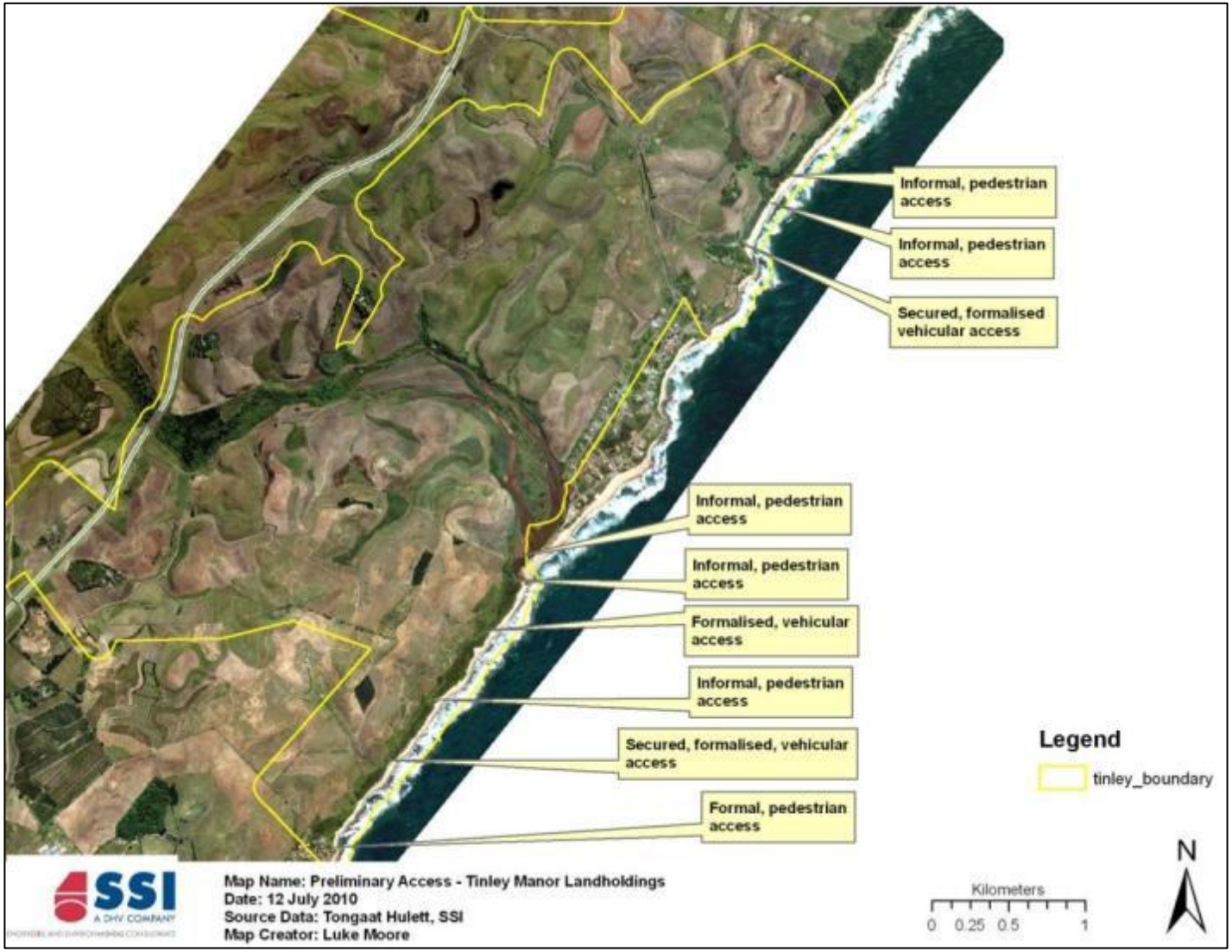


Figure 26. Preliminary Status of Access for the Tinley Manor Landholdings.

12.4. Coastal Accessibility

As described previously, coastal accessibility refers to the means and ways to gain access to the wider coastal zone. Accessibility is often impeded by a lack of parking facilities, high entry fees, or in an urban context, a lack of public transportation to the beach. As can be seen from Figure 27 below, due to the requirement for multitudinous access roads for commercial sugar cane, accessibility appears to be adequately addressed; bearing in mind of course that any access into the landholdings is strictly controlled. Coastal access and accessibility will be dealt with further in the recommendations section.

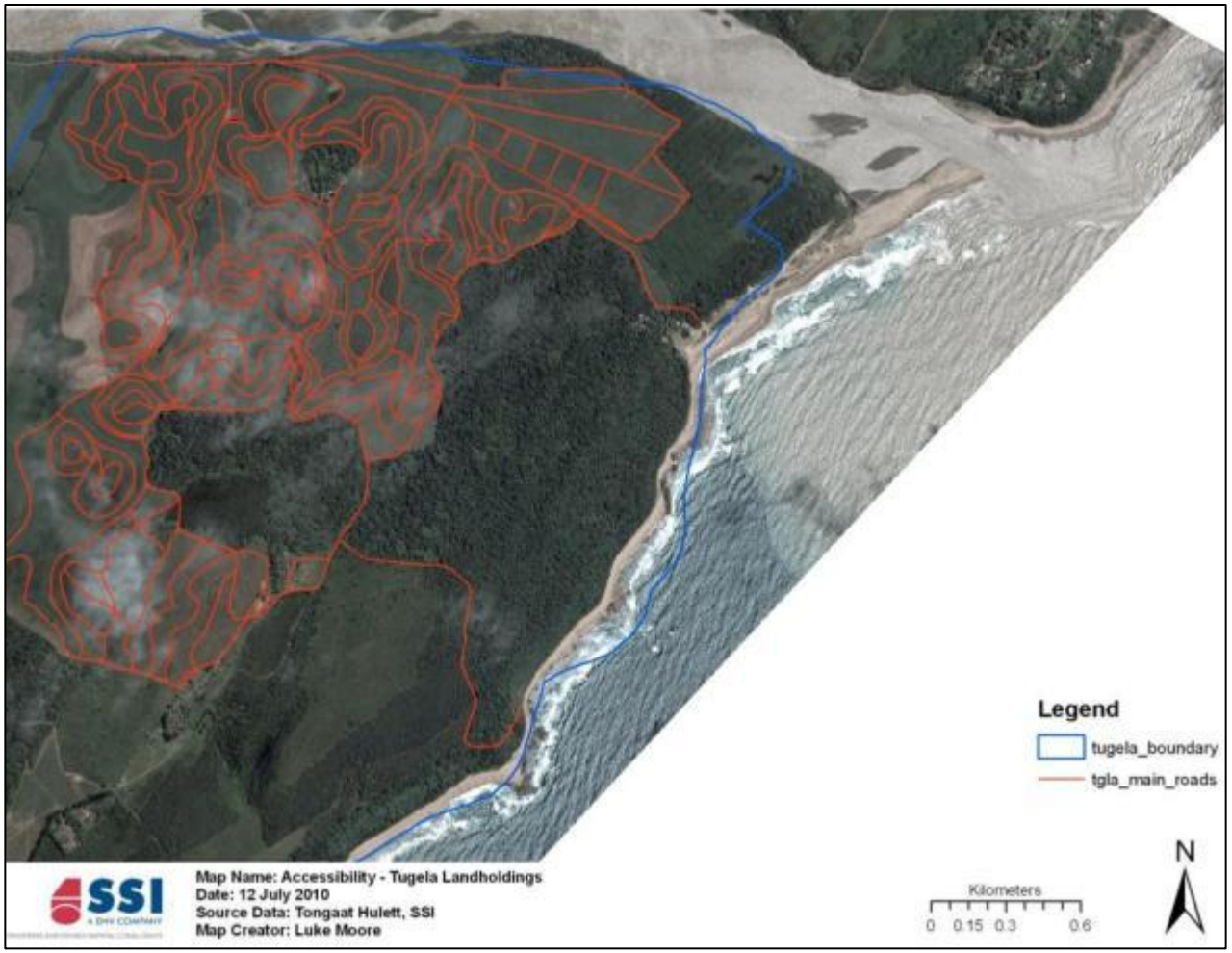


Figure 27. Example of coastal accessibility within the Tugela landholdings.

13. DEVELOPMENT VISION

Examining the regional and municipal contexts of the Tugela and Tinley Manor landholdings has necessitated active engagement with a number of municipal policies such as district and local IDPs, SDFs and CMPs. Common to the majority of these policies is the development of some sort of vision or desired state

for the region. While sectorally divergent, these visions have generally undergone a process of public participation in their formulation. To a certain extent then, these visions represent the desired state of the region from a cross-sectoral societal perspective. The societal vision for the Tugela and Tinley Manor landholdings has been developed through an identification of the broad strategic thrusts and commonalities between these visions.

13.1. Policy Visions Examined in Determining the Societal Development Vision

The visions examined for the purposes of this assessment include the iLembe IDP for 2008/9; the KwaDukuza IDP for 2007-2012; the Draft KwaDukuza SDF and LUMS 2008; and the KwaDukuza CMP 2010. The visions are as follows:

1. iLembe IDP: *"To be a world class South African destination, for excellent services and quality of life for its people"*
2. KwaDukuza IDP: "*By 2015 KwaDukuza will through unity and good governance, be an economic powerhouse, delivering services in an affordable and sustainable manner within a safe and healthy environment."*
3. Draft KwaDukuza SDF and LUMS: "*The spatial development framework will contribute to the balanced physical development of the municipality by establishing a spatial development structure guiding the management of future development, accommodating development pressures and additional investment, maintaining and further developing the economic potential of the municipality, while protecting and integrating the natural environment of the area*."
4. KwaDukuza CMP: *To sustainably manage the KwaDukuza coast, in so doing ensuring a safe home for residents and a regionally prominent and world-class destination for visitors where the free benefits and services that the coast provides are equally accessible to all. This will be achieved through sharing the responsibility of management of all coastal activities including recreation and development, thereby uniting all stakeholders in a spirit of stewardship. Furthermore, the philosophy which informs coastal management in KwaDukuza must promote a balance between conservation and the sustainable use of coastal resources, as well as acknowledge the dynamic an interconnected nature of the KwaDukuza coast and its hinterland while fostering a growing awareness and understanding of the important relationship that we have with our coast*.

13.2. Societal Development Vision for the Tugela and Tinley Manor Landholdings

While the above visions are sectorally specific and integrated only in their applicability to the geographic area of the Tugela and Tinley Manor landholdings, the identification of common strategic thrusts is necessary in order to develop a holistic vision for the landholdings from a societal perspective. From the above visions, the following elements have been identified to this end:

- Provision of sustainable services through good governance;
- People-centeredness (Anthropocentrism);
- Economic development in synergy with environmental conservation;
- Equitable access to environmental goods and services;
- Acknowledgement of dynamic and unique nature of the coastal area; and

- Safety of residents.

14. POSSIBLE DEVELOPMENT FUTURES

The second workshop undertaken as part of this assessment consisted of the development of four possible 'development futures' for the Tugela and Tinley Manor landholdings. The purpose of this exercise was to inform development decisions based on possible future economic conditions and local environmental opportunities and constraints. Following an introduction to the scenario generation process, the workshop participants developed four distinct scenarios with an emphasis on what types of landuse patterns were likely to emerge under each scenario. Through a participatory process, important factors and criteria to be considered in the formulation of these futures were discussed, and two of the most critical were chosen, namely **governance** and **economic growth** (Figure 28 overleaf).

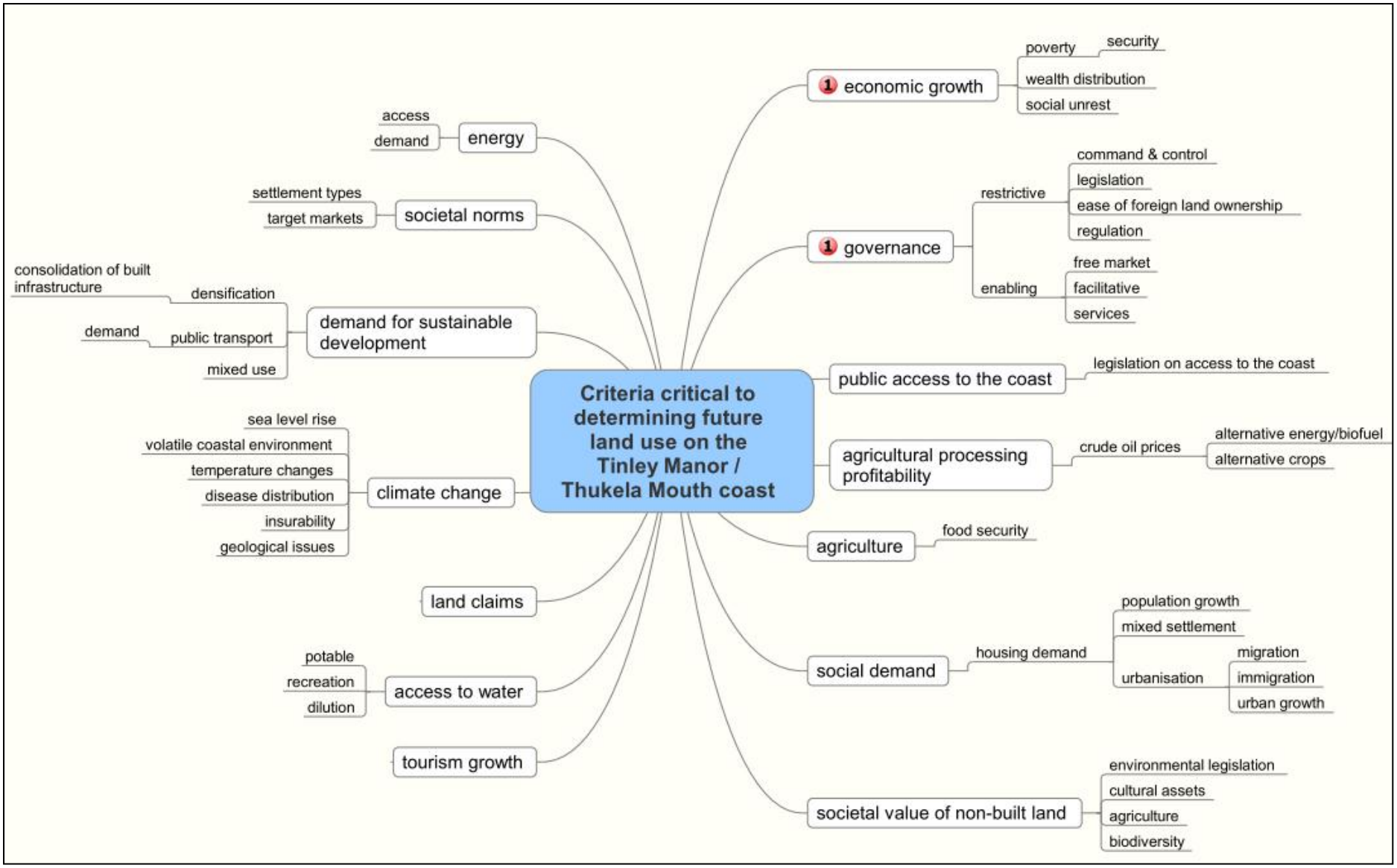


Figure 28. Factors influencing potential development futures.

The extremes for these two criteria were defined as ‘high growth’ versus ‘low growth’ and ‘free market’ as opposed to an ‘interventionist’ government. These were then developed into an axis, with two scenarios divided by the intersection of each access, making four development scenarios or possible futures in all (Figure 29 below).

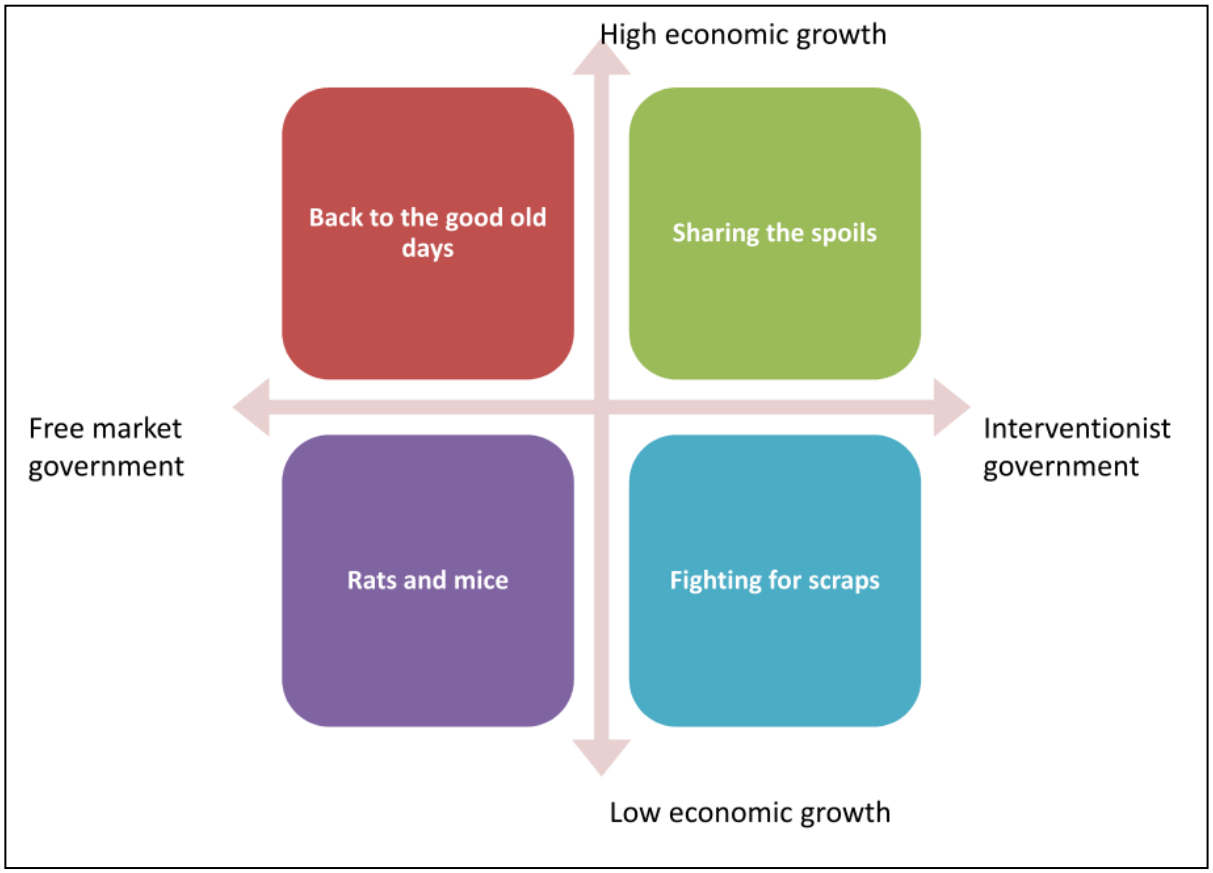


Figure 29. Possible Development Scenarios for the Tugela and Tinley Manor Landholdings.

Each scenario or future was then further developed in terms of a short storyline, and how the landuses and environmental conditions might look under each scenario. The details for the four scenarios were then captured and consolidated into separate mind maps for ease of reference. These are briefly presented in the following section, and attached as Appendices to the final report.

14.1. High Growth and Free Market Development Scenario

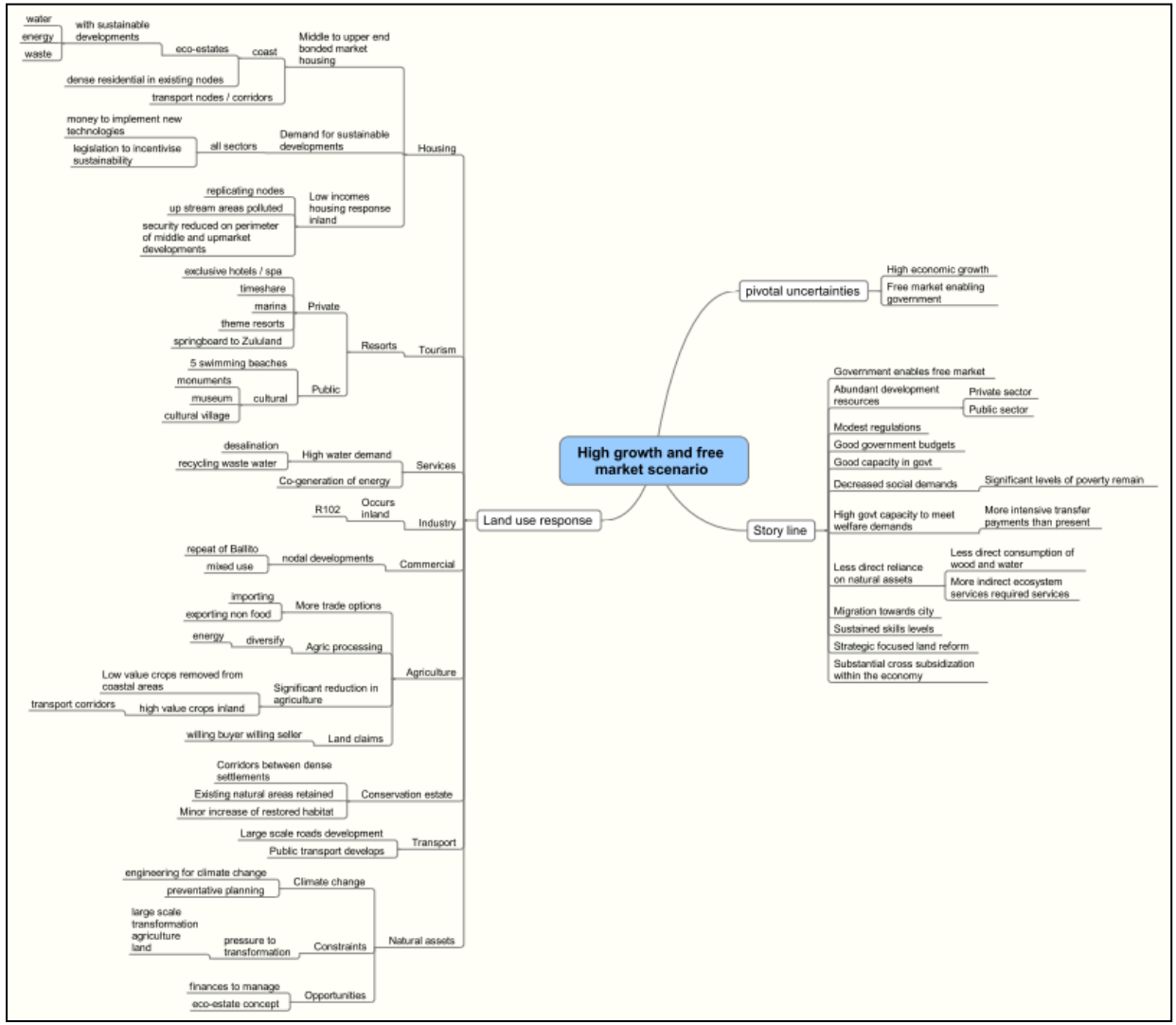


Figure 30. High Growth and Free Market Development Scenario

14.2. High Growth and Social Interventionist Government Development Scenario

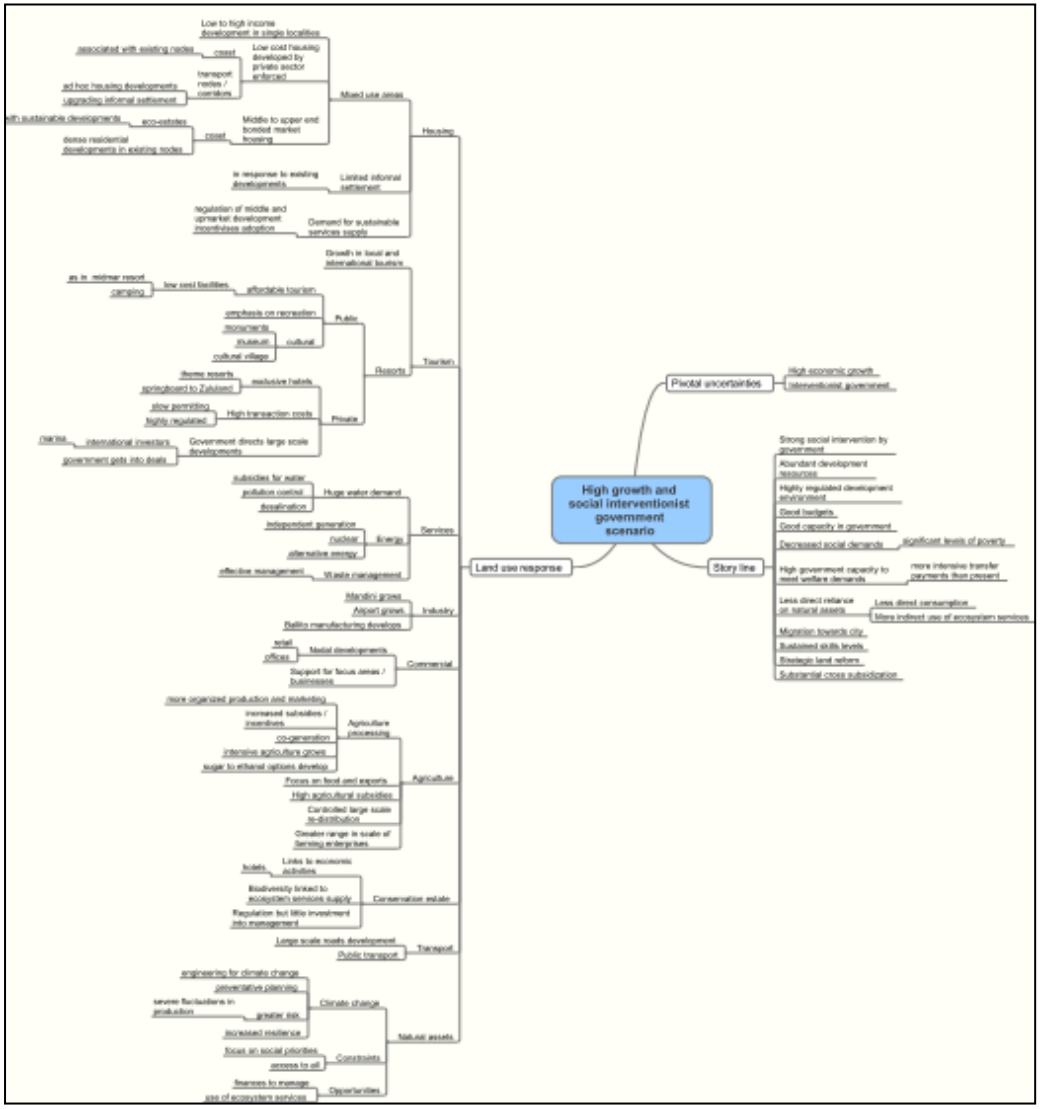


Figure 31. High Growth and Social Interventionist Government Scenario.

14.3. Low Growth and Free Market Development Scenario

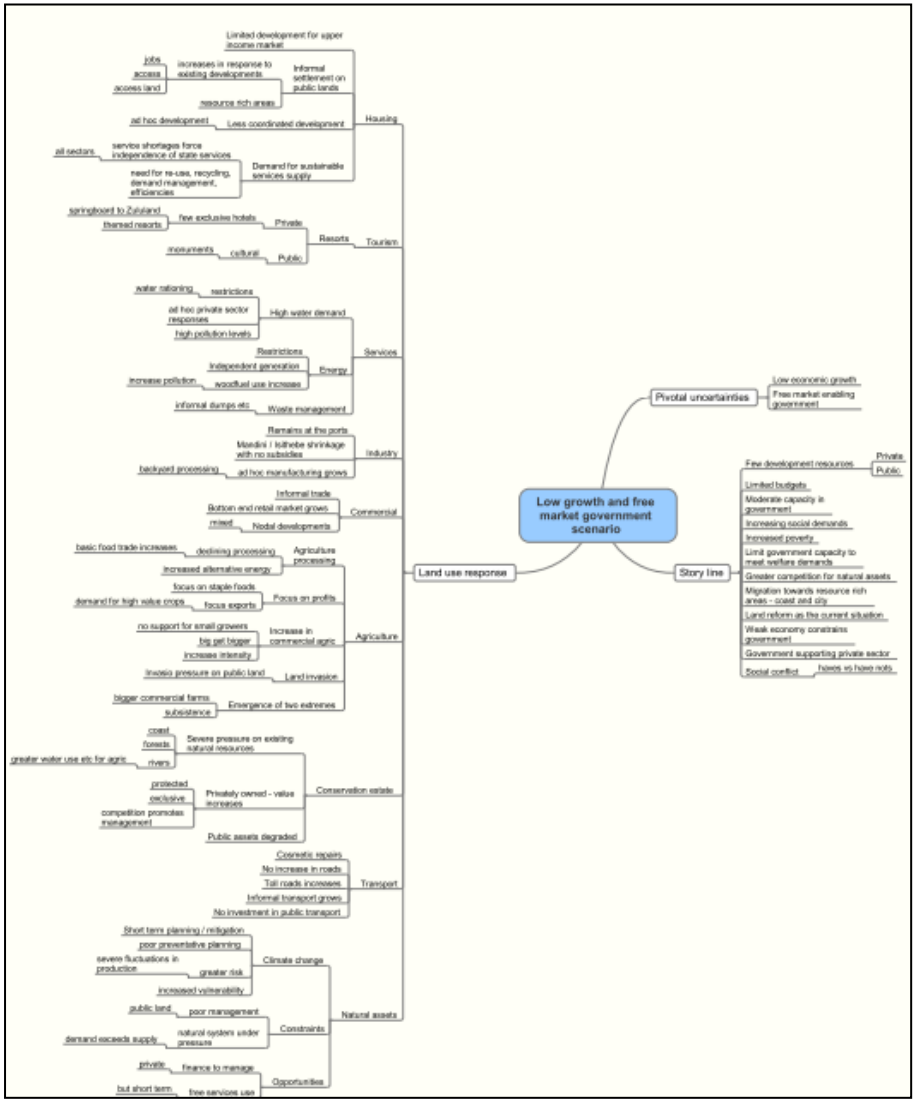


Figure 32. Low Growth and Free Market Development Scenario.

14.4. Low Growth and Interventionist Government Development Scenario

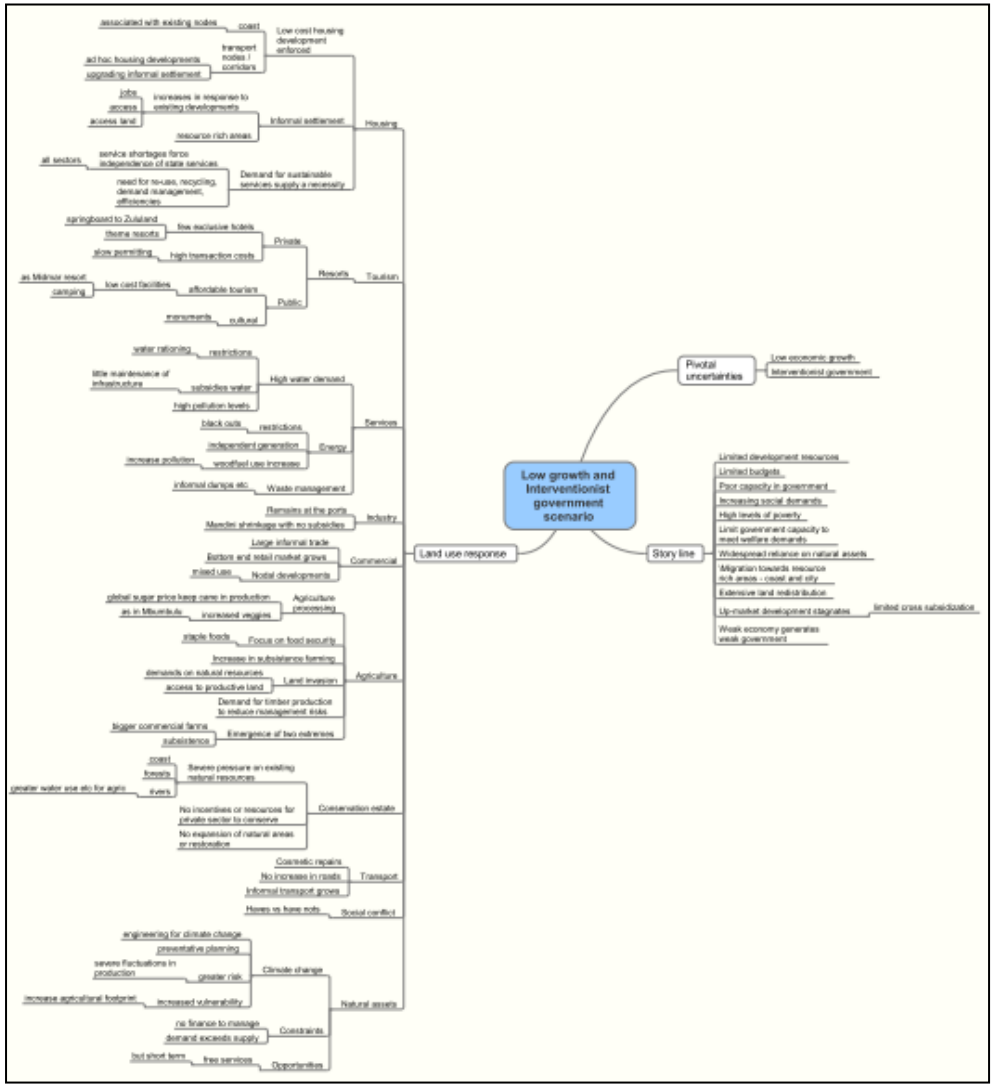


Figure 33. Low Growth and Interventionist Government Scenario.

15. CONSOLIDATED FINDINGS AND THE WAY FORWARD

The scarcity of undeveloped land in coastal areas is illustrative of the desirability of such coastal land and the fact that human settlement is drawn towards the resources which occur naturally in this environment as well as the benefits of living in this environment. Coastal development in South Africa has proceeded largely unchecked with little regard for the cumulative impacts and effects of ribbon development on the larger coastal system at regional and national scales. This has resulted in a situation whereby much of the natural environment of the coastal strip has become fragmented and isolated between large tracts of developed land which impacts negatively on the provision of ecosystem goods and services provided by these environments to the benefit of coastal residents.

Current thinking in terms of integrated development planning tends towards a more strategic approach, in so doing recognizing the inherent link between environmental integrity and human wellbeing. Such an approach involves upfront identification of opportunities and constraints of specific landholdings to development, thereby allowing for the reduction of environmental risk, and also providing scope for the potential incorporation of social issues in respect to access to environmental resources.

Recent changes to South Africa's body of environmental legislation in the form of the ICM Act have brought with it a need to rethink traditional trajectories of coastal development. The underlying philosophy of the ICM Act promotes sustainability of coastal settlement and growth, as well as integrated as opposed to sectoral assessment of environmental risk, opportunities and constraints. Whilst the enactment of the new legislation may possibly be viewed as a constraint in terms of permissible activities, it does present a legislative basis for innovation in terms of coastal sustainability. That is to say, prospective developers who are able to demonstrate innovation, holism, integration and forward planning in their development concepts are likely to have more success when applying for environmental authorisation than the 'business as usual' approach. In this sense, TH is uniquely positioned as the single landowner of large, continuous tracts of coastal land which are valuable not only in development terms, but also in conservation terms. There is thus an opportunity to promote an overarching vision based on sustainable coastal development that includes an imperative to balance economic growth and prosperity with the basic needs of individuals, communities as well as the sustainability needs of society as a whole. It is also an opportunity to promote development within the context of the diversity and ecological importance of the natural coastal environment. Sustainability factors have been prioritised in light of the scarcity of coastal land and the high societal demand described above, bearing in mind that environmental protection needs to be balanced against company shareholder demands.

In summary, this assessment is best described as a strategic coastal assessment, which draws from multiple sources in categorizing and depicting the opportunities and constraints to future development of the Tugela and Tinley Manor landholdings.

In order to increase the body of reliable data and information on the study area, the services of five specialist providers were employed to undertake specific aspects of the project. These specialists were selected based on their previous experience or their access to relevant data. This comprised the following specialist areas of study:

- Agricultural Potential;

- Coastal Setback Line;
- Ecosystem Goods and Services; and
- Living Marine Resources.

These specialist assessments have been considered in conjunction with a coastal specific assessment which considered among others legal and policy issues, as well as estuarine, coastal access and climate change adaptation strategies. A section detailing the opportunities and constraints identified across all the assessments was developed in the interests of providing a consolidated overview of the environmental opportunities and constraints facing the Tugela and Tinley Manor landholdings respectively. Those opportunities and constraints, which readily lend themselves to spatial representation, were incorporated into a development index model which was used to indicate areas of development potential based on the project team's interpretation of what might constitute a favourable development scenario.

An additional workshop exercise was undertaken which considered a number of possible development 'futures' for the landholdings based on a number of criteria. These comprise a suite of scenarios with the variations of the criteria mentioned above, all of which will have different implications for TH. Whilst the preceding components of this assessment have been largely assessment driven, these scenarios or development futures are much more conceptual in nature, and as such require a different approach. In terms of integration, it is suggested that the primary aim of this report be to highlight the status quo of the environmental opportunities and constraints of the landholdings, indicate where development might be best placed from a sustainability perspective, and then link this process with the development scenarios as illustrated in figure 34 below.

Figure 34: Process flow chart

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16. WORKS CITED

- Begg, G.W., 1984. *The Comparative Ecology of Natal's Smaller Estuaries*. Natal Town and Regional Planning Board.
- Breetzke, T., Celliers, L., Moore, L.R. & Jacobs, H., 2010. *Inaugural KwaDukuza Coastal Management Programme. Prepared for KwaDukuza Municipality*. SSI Engineers and Environmental Consultants.

- Bundy, S., 2007. *Addington Farm Strategic Environmental Assessment*. Sustainable Development Projects.
- Celliers, L., Breetzke, T. & Moore, L.R., 2010. *A Toolkit for implementing the Integrated Coastal Management Act*. SSI Engineers and Environmental Consultants.
- Celliers, L., Breetzke, T., Moore, L.R. & Malan, D., 2009. *A User-friendly Guide to South Africa's Integrated Coastal Management Act*. The Department of Environmental Affairs and SSI Engineers and Environmental Consultants.
- Coastal Management Policy Programme, 1998. *Coastal Policy Green Paper: Towards Sustainable Coastal Development in South Africa*. Cape Town: The Department of Environmental Affairs and Tourism.
- Coastal Management Policy Programme, 2000. *White Paper for Sustainable Coastal Development in South Africa*. Department of Environmental Affairs and Tourism.
- Fennessy, S., Maggs, J., Kruger, A. & Mann, B., 2010. *Living Marine Resources and associated Recreational Opportunities in Tongaat-Hulett holdings on the KZN coast*. Oceanographic Research Institute.
- Forbes, A.T. & Demetriades, N.T., 2009. *Estuaries of Durban, KwaZulu-Natal, South Africa*. Marine and Estuarine Research.
- Harrison, T.D., Cooper, J.A.G. & Ramm, A.E.L., 2000. *State of South African Estuaries: Geomorphology, Ichthyofauna, Water Quality and Aesthetics. State of the Environment Series: Report No. 2*. Department of Environmental Affairs and Tourism.
- iLembe District Municipality, 2008. *iLembe District Municipality IDP Review 2008-2009*. iLembe District Municipality.
- Jacobs, H., 2010. *KwaDukuza Coastal Management Programme: Development Management Tool*. Helena Jacobs PSF.
- Kiker, G.A., n.d. *South African County Study on Climate Change Synthesis Report for the Vulnerability and Adaptation Assessment Section*. School of Bioresources, Engineering and Environmental Hydrology. University of Natal.
- KwaDukuza Municipality, 2007. *KwaDukuza Municipality Integrated Development Plan 2007/08-2011/12*. Integrated Development Plan. KwaDukuza Municipality.
- Mander, M., 2010. *Ecosystem Services Supply and Demand Analysis : Tongaat-Hulett North Coast Land Holdings*. Ecosystem Goods and Services Report. Eco-Futures.
- Mather, A.A. & Swart, P., 2010. *Report on the Establishment of a Coastal Setback Line for the Tongaat Hulett Properties: Tinley Manor to the Tugela River Mouth, KwaZulu-Natal.* SSI Consortium.
- Phipson, J.S., 2010. *Agricultural Potential Assessment : THS North Coast Corridor : the Farms Described as Tinley Manor, Nonoti and Tugela : In Extent 3557 Ha. Rev 001.* SSI Consortium. Top Crops.
- Roets, W. & Duffel-Canham, A., 2009. *Implementing Setback Lines: Development Planning For Climate Change*. Cape Nature.
- Rothaug, I., 2008. *Draft KwaDukuza SDF and LUMS*. KwaDukuza Municipality.
- SiVEST Selatile Moloi Team, 2007. *KwaDukuza Municipality Strategic Environmental Assessment*. SiVEST.

17. DOCUMENT DESCRIPTION

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