TONGAAT HULETT DEVELOPMENTS

Tinley Manor South Development

Vegetation Report

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SPECIALIST REPORT DETAILS

This report has been prepared as per the requirements of Section 32 of Government Notice No. R. 543 dated 18 June 2010 (Environmental Impact Assessment Regulations) under sections 24(5), 24M and 44 of the National Environmental Management Act, 1998 (Act 107 of 1998).

I, **Richard Kinvig** declare that this report has been prepared independently of any influence or prejudice as may be specified by the Department of Economic Development, Tourism & Environmental Affairs (EDTEA).

Signed:  Date: February 2015

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Document Title:	Tinley Manor South Development: Vegetation Report
Authors:	Dr. Richard Kinvig
Signature:	
Revision Number:	1
Checked by:	Liandra Bertolli
Approved:	Liandra Bertolli
Signature:	
For:	
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TINLEY MANOR SOUTH DEVELOPMENT

VEGETATION REPORT

Contents **Page**

TINLEY MANOR SOUTH DEVELOPMENT

VEGETATION REPORT

1. INTRODUCTION

SiVEST Environmental, represented by Dr. Richard Kinvig was appointed by Tongaat Hulett Developments to undertake a vegetation assessment to feed into the overarching Environmental Impact Assessment Process, being conducted by Royal Haskoning DHV.

2. PROJECT DESCRIPTION & MOTIVATION

The proposed development of the Tinley Manor South (**Appendices 1-5**) will see the establishment of a mixed use development. The current land holdings are, for the most part, under sugarcane. Areas where sugarcane was historically planted and are now fallow have been colonised and dominated by indigenous pioneer species and alien invasive species. The only remaining indigenous vegetation of any significance is confined to the wetland areas on site, steep slopes and the "Primary Dune" area (**Appendix 6**). The development proposal as it currently stands takes these areas into consideration and apart from services that may potentially have to traverse these areas they will remain intact. It must be noted that the crossing of environmentally sensitive environments will need to occur, however, the positioning of these crossings needs to be managed and informed by the vegetation and wetland assessment surveys.

3. REGULATIONS GOVERNING THIS REPORT & LEGISLATION

Further to the Terms of Reference, the following protocol is extracted from the National Environmental Management Act, Act 108 of 1998 (NEMA). The relevant Section is Section 32 and is included below for your ease of reference:

32. Specialist reports and reports on specialised processes

(1) An applicant or the EAP managing an application may appoint a person who is independent to carry out a specialist study or specialised process.

(2) The Person referred to in sub-regulation (1) must comply with the requirements of Regulation 17.

(3) A specialist report or a report on a specialised process prepared in terms of these Regulations must contain –

(a) details of –

(i) the person who prepared the report; and

(ii) the expertise of that person to carry out the specialist study or specialised process;

(b) a declaration that the person is independent in a form as may be specified by the competent authority;

(c) an indication of the scope of, and the purpose for which, the report was prepared;

(d) a description of the methodology adopted in preparing the report or carrying out the specialised process;

(e) a description of any assumptions made and any uncertainties or gaps in knowledge;

(f) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;

(g) recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority;

(h) a description of any consultation process that was undertaken during the course of carrying out the study;

(i) a summary and copies of any comments that were received during any consultation process; and

(j) any other information requested by the competent authority.

In addition there are various Sections of the legislation that would be applicable to the proposed development and / or the land as it currently is.

3.1 National Environmental Management Act, Act No. 107 of 1998 (NEMA)

NEMA requires, *inter alia*, that:

- "Development must be socially, environmentally, and economically sustainable",
- "Disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied."
- "A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions",

NEMA also states that;

"The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage."

3.2 National Water Act (Act 36 of 1998)

Water use

21. For the purposes of this Act water use includes—

- *a. taking water from a water resource:*
- *b. storing water:*
- *c. impeding or diverting the flow of water in a watercourse:*
- *d. engaging in a stream flow reduction activity contemplated in section 36;*
- *e. engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1):*
- *f. discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit:*
- *g. disposing of waste in a manner which may detrimentally impact on a water resource;*
- *h. disposing in any manner of water which contains waste from or which has been heated in any industrial or power generation process;*
- *i. altering the bed, banks course or characteristics of a watercourse:*
- *j. removing, discharging or disposing ot' water found underground if it is necessary for the efficient continuation of an activity or for the safety of people: and*
- *k. using water for recreational purposes,*

In the case of the proposed Mthandeni Irrigation Scheme the need will arise to traverse wetland areas with infrastructure as well as develop a small earthen walled dam that will form the role of storage and balancing to facilitate irrigation of the lands during the summer months.

3.3 National Forests Act (Act No. 84 of 1998)

According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that;

"No person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister."

Any disturbance, removal, pruning or transplanting of these species would require a licence from the administrators of the National Forests Act, who are an extension of the Department of Agriculture, Forestry and Fisheries (DAFF) based in Pietermaritzburg.

3.4 National Environmental Management: Biodiversity Act (Act No. 10 of 2004)

In terms of the Biodiversity Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).

- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development

within the area are in line with ecological sustainable development and protection of biodiversity.

- Limit further loss of biodiversity and conserve endangered ecosystems.

3.5 Conservation of Agricultural Resources (Act No. 43 of 1983) as amended in 2001

Declared Weeds and Invaders in South Africa are categorised according to one of the following categories:

- **Category 1** *plants: are prohibited and must be controlled.*
- **Category 2** *plants: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread.*
- **Category 3** *plants: (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.*

3.6 Permit / Licence requirements

In terms of the National Forests Act, 1998 (Act No. 84 of 1998) and Government Notice 1339 of 6 August 1976 (promulgated under the Forest Act, 1984 (Act No. 122 of 1984) for protected tree species), the removal, relocation or pruning of any protected plants will require a license.

Protected indigenous plants in general are controlled under the relevant provincial Ordinances or Acts dealing with nature conservation. In KZN the relevant statute is the 1974 Provincial Nature Conservation Ordinance. In terms of this Ordinance, a permit must be obtained from *Ezemvelo* KZN Wildlife to remove or destroy any plants listed in the Ordinance.

4. METHODOLOGY

One of the major advantages that technology has provided is the access to information. As a result of this and the ongoing pursuance of environmental knowledge, databases which can be interrogated to provide general information regarding the site have been developed.

This information in turn potentially records what may occur on the site and the sites value from a regional / provincial perspective in terms of conservation and biodiversity. The caveat here is that the majority of these databases are created at the landscape level. In addition, the factors which are often utilized to determine many of the outputs are related to abiotic characteristics, such as rainfall, temperature, soil types, underlying geology, elevation and aspect. . A number of databases have been interrogated in the process of undertaking the Desktop Analysis. A summary of the methodology utilised for the generation of each of the databases, as well as the pertinent results for each are included in Section 5 below under the various titled sub-sections.

The result therefore is the development of a database that provides a high level assessment of the area, which requires substantial ground-truthing to illustrate the various components that comprise the landscape.

4.1 Ground-truthing Site Assessment

The field survey will highlight areas of conservation significance and biodiversity richness as well as provide information regarding the *status quo* and what will be required in terms of management to ensure improvement in the *status quo* and ensure that limited long term impacts are being imparted.

A random vegetation sampling technique was utilised. Resulting from the current land use a "hotspot[1]" assessment technique was utilised which focused all of the sampling effort on areas where natural vegetation or the vegetation was dominated by indigenous species. Areas identified as being dominated by alien invasive plant species, were sampled less vigorously. Individual plant species observed during the assessment were recorded to give an indication of species diversity and the overall species assemblage.

Please note that the intensity of the sampling procedure is prescribed by budgetary constraints. The sampling procedure proposed for this study is satisfactory for providing a general overview and rapid assessment of the plant diversity and assemblages that will occur within the proposed property boundaries.

This methodology allows sufficient information to be gathered to make the necessary inferences as to the ecological state of the receiving environment and to assess the possible impacts that may be imparted as a result of the proposed development activities.

4.2 Conservation Importance Assessment

The classification and identification of the plant species and the communities on site provide us with information that may be utilised to make inferences as to the health of the system, its functionality and contribution to conservation and biodiversity goals as outlined by *Ezemvelo* KZN Wildlife. In order to encapsulate this information biodiversity noteworthiness and the functional integrity / future sustainability are given numerical values to assist with ranking vegetation areas on the site and an indication of their ability to potentially except change or their conservation importance.

Within the context of this vegetation assessment, conservation importance is broadly defined as the importance of the encountered vegetation communities (vegetation fragment) as a whole, in terms of the role these areas will fulfil in the preservation and maintenance of biodiversity in the local area. Biodiversity maintenance / importance are a function of the specific biodiversity attributes and noteworthiness of the vegetation communities in question and the biotic integrity and future viability of these features.

The biodiversity noteworthiness of the system is a function of the following:

- species richness/diversity;
- rarity of the system;
- conservation status of the system;

[1] **Hotspot in this context refers to areas in the landscape, such as rocky outcrops and wetlands that supply refugia to plant species that would otherwise not exist in said landscape due to disturbance.**

- habitat (real or potential) for Red Data Species; and
- presence of unique and/or special features,

The integrity and future viability of the system is a function of the following:

- Extent of buffer around the system;
- Connectivity of system to other natural areas in the landscape;
- Level of alteration to indigenous vegetation communities within the system;
- Level of invasive and pioneer species encroachment system; and
- Presence of hazardous and/or obstructive boundaries to fauna.

The scores for each function of biodiversity maintenance were determined according to the scoring system shown in **Table 1** below. The scores were totaled and averaged to determine the biodiversity maintenance services score. Thereafter, the overall scores were rated according to the rating scale in **Table 2** below.

Table 1. Biodiversity maintenance services score sheet (Template and Description)

	Scores				
Biodiversity Noteworthiness	0	1	2	3	4
Diversity	Low	Med-Low	Medium	Med-High	High
Rarity	Low	Med-Low	Medium	Med-High	High
Conservation Status	Least Concern	Near-Threatened	Vulnerable	Endangered	Critically Endangered
Red Data	No	-	-	-	Yes
Uniqueness / Special features	None	Med-Low	Medium	Med-High	High
Integrity & Future Viability	0	1	2	3	4
Buffer	Low	Med-Low	Medium	Med-High	High
Connectivity	Low	Med-Low	Medium	Med-High	High
Alteration	>50%	25-50%	5-25%	1-5%	<1%
Invasive/pioneers	>50%	25-50%	5-25%	1-5%	<1%
Size	<1 ha	1 – 2 ha	3 - 10 ha	10 – 15 ha	>15 ha

Table 2. Rating Scale for Biodiversity Maintenance services based on Assessment scores

Score:	0-0.8	0.9-1.6	1.7-2.4	2.5-3.2	3.3-4.0
Rating of the likely extent to which a service is being performed	Low	Moderately Low	Intermediate	Moderately High	High

5. ASSUMPTIONS & LIMITATIONS

A number of limitations have been placed on the field assessment and need to be noted:

- The site has only been visited twice, namely January 2014 and January 2015
- The vegetation that was recorded in 2014 was undertaken to inform the Present Ecological State (PES) and the Ecological Importance and Sensitivity (EIS) of the wetlands identified on site.
- Vegetation falling outside of wetland areas was not assessed during the 2014 vegetation sampling.
- Vegetation assessed was only done so in areas where sugarcane was not present. Areas which were under plantation were assessed at a relatively cursory level for indigenous vegetation and the species identified were recorded.
- In the Primary Dune areas the vegetation was extremely dense and this did make assessment difficult however, two transects were walked through the vegetation and these transects returned the same species composition and thus an assumption was made that the vegetation was homogenous within these areas.

6. DATABASE INTERROGATION / DESKTOP ANALYSIS

One of the major advantages that technology has provided is the access to information. As a result of this and the ongoing pursuance of environmental knowledge, databases which can be interrogated to provide general information regarding the site have been developed.

This information in turn potentially records what may occur on the site and the sites value from a regional / provincial perspective in terms of conservation and biodiversity. The caveat here is that the majority of these databases are created at the landscape level. In addition, the factors which are often utilized to determine many of the outputs are related to abiotic characteristics, such as rainfall, temperature, soil types, underlying geology, elevation and aspect. The result therefore is the development of a database that provides a high level assessment of the area, which requires substantial ground-truthing to illustrate the various components that comprise the landscape. The field survey will highlight areas of conservation significance and biodiversity richness as well as provide information regarding the *status quo* and what will be required in terms of management to ensure improvement in the *status quo* and ensure the limited long term impacts being imparted. A number of databases have been interrogated in the process of undertaking the Desktop Analysis. A summary of the methodology utilised for the generation of each of the databases, as well as the pertinent results for each are included below under the various titled sub-sections.

6.1 Ezemvelo KZN wildlife C-Plan & SEA Database

The C-Plan is a systematic conservation-planning package that runs with the GIS software ArcGIS, and which analyses biodiversity features and landscape units. C-Plan is used to identify a national reserve system that will satisfy specified conservation targets for biodiversity features (***Ezemvelo* KZN Wildlife, 2010**). Biodiversity features can be land classes or species, and targets are set within area units either for land classes, or as numbers of occurrences of species for species locality data sets (***Ezemvelo* KZN Wildlife, 2010**). These units or measurements are used as surrogates for un-sampled data. The C-Plan is an effective conservation tool when determining priority areas at a

regional level and is being used in South Africa to identify areas of high conservation value. The SEA (**Goodman, 2004**) modelled the distribution of a selection of 255 red data and endemic species that have the potential to occur in the area.

6.1.1 Irreplaceability Analysis

The following is referenced from **Goodman (2004)**: "The first product of the conservation planning analysis in C-Plan is an irreplaceability map of the planning area, in this case the province of KwaZulu-Natal. This map is divided into grid cells called 'Planning Units'.

Each planning unit has associated with it an 'Irreplaceability Value', which is a reflection of the planning units' importance with respect to the conservation of biodiversity. Irreplaceability reflects the planning unit's ability to meet set 'targets' for selected biodiversity 'features'. The irreplaceability value is scaled between 0 and 1.

Irreplaceability value – 0. Where a planning unit has an irreplaceability value of 0, all biodiversity features recorded here are conserved to the target amount, and there is unlikely to be a biodiversity concern with the development of the site.

Irreplaceability value – 1. These planning units are referred to as totally irreplaceable and the conservation of the features within them is critical to meet conservation targets. (EIA very definitely required and depending on the nature of the proposal unlikely to be granted).

Irreplaceability value > 0 but < 1. Some of these planning units are still required to meet biodiversity conservation targets. If the value is high (e.g. 0.9) then most units are required (few options available for alternative choices). If the value is low, then many options are available for meeting the biodiversity targets. (EIA required and depending on the nature of the proposed development, permission could be granted)."

6.2 Critical Biodiversity Areas and Ecological Support Areas

6.2.1 Critical Biodiversity Areas

The Critical Biodiversity Areas (CBAs) can be divided into two subcategories, namely *Irreplaceable* and *Optimal*. Each of these can in turn be subdivided into additional subcategories (**Table 1**).

The CBA categories are based on the optimised outputs derived using systematic conservation planning software, with the Planning Units (PU) identified representing the localities for which the conservation targets for one or more of the biodiversity features contained within can be achieved. The distribution of the biodiversity features is not always applicable to the entire extent of the PU, but is more often than not confined to a specific niche habitat e.g. a forest or wetland reflected as a portion of the PU in question. In such cases, development could be considered within the PU if special mitigation measures are put in place to safeguard this feature(s) and if the nature of the development is to commiserate with the conservation objectives. Obviously this is dependent on a site by site, case by case basis.

Using C-Plan, these areas are identified through the MINSET analysis process and reflect the negotiable sites with an Irreplaceability score of less than 0.8. Within the C-Plan MINSET analysis this

does not mean they are of a lower biodiversity value however, only that there are more alternate options available within which the features located within can be met. The determination of the spatial locality of these PU's is driven primarily by the Decision Support Layers.

Table 3. Summary of CBA Categories (from Ezemvelo KZN Wildlife, Biodiversity Spatial Planning Terms).

Category	C-Plan	MARXAN	Expert Input/ Desktop	Biodiversity Sector and Regional Plans
CBA: Irreplaceable (SCA)	Irreplaceability = 1	No equivalent		CBA:Irreplaceable
CBA: High Irreplaceable(SCA)	Irreplaceability Score >= 0.8 and <1.0	Selection frequency value = 80% –100%		CBA:Irreplaceable
CBA: Irreplaceable Expert Input			Expert input	CBA:Irreplaceable
CBA: Irreplaceable Linkage			Desktop and expert input	CBA:Irreplaceable
CBA: Optimal (SCA)	Irreplaceability Score > 0 and < 0.8	"Best" solution from MARXAN runs less the identified CBA High Irreplaceability areas		CBA:Optimal
CBA: Optimal, High Degradation	Irreplaceability Score > 0 and < 0.8	"Best" solution from MARXAN runs less the identified CBA High Irreplaceability areas	Field Assessment	CBA:Optimal
CBA: Optimal Low Degradation	Irreplaceability Score > 0 and < 0.8	"Best" solution from MARXAN runs less the identified CBA High Irreplaceability areas	Field Assessment	CBA:Optimal
CBA: Optimal Expert Input			Expert input	CBA:Optimal

6.2.2 Ecological Support Areas

Ecological Support Areas (ESAs) are required to support and sustain the ecological functioning of Critical Biodiversity Areas (CBAs). For terrestrial and aquatic environments, these areas are functional but are not necessarily pristine natural areas. They are however, required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the CBAs, and contribute significantly to the maintenance of Ecological Infrastructure[2] (EI).

[2] **A term referring to areas in the landscape which provide significant Ecosystem Services which contribute positively to the economy and human welfare. Examples include 'Flood mitigation' and 'Good Water Quality' (provided**

Landscape Corridors

A series of bio-geographic corridors were created in KZN to facilitate evolutionary, ecological and climate change processes to create a linked landscape for the conservation of species in a fragmented landscape.

Local Corridors

Corridors were developed at a district scale to create fine scale links within the landscape that facilitate ecological processes and ensure persistence of critical biodiversity features.

6.3 SEA, C-Plan and CBA Biodiversity Features / Species within Project Area

In terms of the desktop analysis undertaken, the site is classified as 0, i.e. all biodiversity features recorded here are conserved to the target amount, and there is unlikely to be a biodiversity concern with the development of the site. The Minset analysis mirrors the C-Plan data with the irreplaceable area being deemed as not requiring protection.

There are four features present on the site which are considered to be of environmental significance and conservation importance. These are included in **Table 4** below. In terms of the SEA and C-Plan data generated, through the physical characteristics that are present on site, a number of groups have been identified as potentially present on the site, and these groups are wholly significant in terms of conservation significance or parts thereof. The Tables below identifies which groups are significant.

Table 4. SEA Data taken from Ezemvelo KZN Wildlife

YES	NO
Frogs	
	Mammals
Vegetation - Wetlands	
	Vegetation - Forests
	Vegetation - Grasslands
	Protected Plants
	Birds
Invertebrates	
Reptiles	
	Medicinal Plants

both by wetlands and well maintained water catchments). Ecological infrastructure is the stock of functioning ecosystems that provides a flow of essential system services to human communities – services such as the provision of fresh water, climate regulation and soil formation. Ecological infrastructure includes features such as healthy mountain catchments, rivers, wetlands, and nodes and corridors of natural grassland habitat which together form a network of interconnected structural elements within the landscape. If this ecological infrastructure is degraded or lost, the flow of ecosystem services will diminish and ecosystems will become vulnerable to shocks and disturbances, such as the impacts of climate change, unsustainable land use change and natural disasters like floods and droughts. It is important to note that when ecological infrastructure is degraded or fails, the direct monetary cost to society and government is often very high. Ecological infrastructure is, therefore, the nature-based equivalent of hard infrastructure, and is just as important for providing the vital services that underpin social development and economic activity.

Table 5. C-Plan Data taken from Ezemvelo KZN Wildlife indicating species that are rare or threatened that are known to or predicted to occur on site.

Species name	Type
Doratogonus falcatus	Millipede
Euonyma lymneaeformis	Snail
Cochlitoma semidecussata	Snail
Edouardia conulus	Snail
Vernonia africana	Plant
Barleria natalensis	Plant
Gnomeskelus spectabilis	Millipede
Gulella separata	Snail
Doratogonus natalensis	Millipede
Doratogonus peregrinus	Millipede
Eremidium erectus	Grasshopper

The CBA map indicates that the area is predominately natural land with a large portion classified as CBA: Irreplaceable **(Appendix 3)**.

6.4 Bio Resource Units

A Bio-Resource Unit is a demarcated area in which the environmental conditions such as soil, vegetation, climate and, to a lesser degree, terrain form, are sufficiently similar to permit uniform recommendations of land use and farm practices to be made, to assess the magnitude of crop yields that can be achieved, to provide a framework in which an adaptive research programme can be carried out, and to enable land users to make correct decisions **(Camp, K.G.T. 1998)**.

The environmental factors defined in a BRU should give an indication of habitat suitability for both plant and animal species. On the other hand, knowing the habitat requirements of any particular species, it should be possible to map locations suitable for such species. There are 590 BRUs in KwaZulu-Natal.

6.5.1 Bioresource Units(s) within the project area

In terms of Camp, 1998, there is one Bio Resource Unit for the site. The general characteristics of the site is as follows:

Ya14 – North Coast
Bioresource Group 1: Moist Coastal Forest, Thorn and Palm Veld
BRG Subgroup 1.3
Vegetation pattern: The vegetation is primarily bushed grassland and bushland thicket.

Indicator Species: Acacia karroo, Acacia mearnsii, Acacia nilotica, Acacia robusta, Acacia sieberiana, Albizia adianthifolia, Aristida junciformis, Combretum spp., Digitaria eriantha, Hyphaene natalensis, Lantana camara, Panicum maximum, Phoenix reclinata, Pteridium aquilinum, Sclerocarya birrea, Strelitzia nicolai, Syzygium cordatum.

The rainfall average is 973 mm of per annum. The mean temperature is 20.5 ^{0}C and the climate rating is C1, Local climate is favourable for good yields for a wide range of adapted crops throughout the year. There is no frost hazard and the erosion rating for the site is 3.9, which translates to a high risk of erosion.

Table 6. North Coast climate table

	Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
RAINFALL													
Median rainfall (mm)		11	110	10	5	27	1	14	2	56	8	101	108
Mean rainfall (mm)	973	12	127	11	7	55	3	26	4	68	9	111	110
TEMPERATURE													
Mean (^{0}C)	20.5	23	24	23	21	19	16	16.5	17	19.1	20	21.4	23.1
Maximum (^{0}C)	25.5	28	28.3	27	26	24.7	22	22.7	23	24.1	24	25.7	27.6
Minimum (^{0}C)	15.5	19	19.7	18	16	13.3	10	10.3	11	14.1	15	17.1	18.7
EVAPORATION													
A-pan (mm)	1692	17	161	15	12	108	9	100	11	134	16	166	188
SUNSHINE													
Hours/day (Oct-Mar)	6												
Mean annual (hours)	6.5												

There are nine (9) perennial rivers and one (1) annual river for this BRU. The named perennial rivers are as follows: Mdloti, Mgeni, Mhlali, Mvoti, Nonoti, Ohlanga, Tongati and Tugela River. Please note there are a number of drainage lines, non-perennial streams and wetlands that are not captured at the coarse level at which this data has been defined.

6.6 Environmental Potential Atlas

The following is referenced from the Department of Environmental Affairs and Tourism (2007): The Environmental Potential Atlas (ENPAT) developed from a single map of Gauteng to a complete spatial data set of the entire South Africa.

ENPAT was updated in July 2001 and is used by the National Department of Environmental Affairs and Tourism and various provincial environmental management departments as a decision-making tool in the process of environmental impact assessments. ENPAT includes the decision-making parameters such as: high-risk development category indications and potential impacts are linked to the 1:250 000 spatial databases on national and provincial level.

The main purpose of ENPAT is to proactively indicate potential conflicts between development proposals and critical or sensitive environments. ENPAT can also be used for development planning since it indicates the environment's potential for development.

ENPAT consists of two distinct, parallel sets of information: natural or environmental characteristics, and social-economic factors. The environmental character maps depict geology, land types, soils, vegetation, and hydrology. The socio-economic factors consist of land cover, cadastral aspects and infrastructure, land use and culture.

These two sets of information are combined and assessed in terms of their potential or latent environmental sensitivity. Sensitivity is assigned based on the ability of a resource to absorb change or impact. A value of **0** indicates a **low sensitivity** - thus a high ability to accept change and a value of **1** indicates a **high sensitivity**, or a low ability to accept change. Areas of low sensitivity are thus available or suitable for development.

6.6.1 ENPAT Data for the project area

The ENPAT data provides the following information about the soils and geology for the site:

The geology the site is comprised mainly of Red dune cordon sand of the Berea Formation which has a low sensitivity to disturbance, and can accept disturbance well.

6.7 Mucina and Rutherford's Vegetation Assessment

Mucina and Rutherford present an up-to-date and comprehensive overview of the vegetation of South Africa and the two small neighbouring countries of Lesotho and Swaziland. This account is based on vegetation survey using appropriate tools of contemporary vegetation mapping and vegetation description. They aimed at drawing a new vegetation map that depicts the complexity and macro-scale ecology and reflects the level of knowledge of the vegetation of the region. This is an extensive account of the vegetation of a complex and biologically intriguing part of the world, offering not only insights into structure and dynamics of the vegetation cover, but containing a wealth of base-line data for further vegetation- ecological, biogeographical, and conservation-oriented studies. The map and the descriptive account of the vegetation of South Africa, Lesotho and Swaziland offers a powerful decision-making tool for conservationists, land and resource planners, and politicians as well as the interested public at large.

KwaZulu-Natal (KZN) province is rich in natural diversity. In terms of vegetation, the site falls within the Indian Ocean Coastal Belt.

In terms of the vegetation on site, the general classification is made at a very coarse scale, i.e. low resolution and falls within the KwaZulu-Natal Coastal Belt vegetation type:

Vegetation Type: KwaZulu-Natal Coastal Belt

Distribution:
KwaZulu-Natal Province: Long and in places broad coastal strip along the KwaZulu-Natal coast, from near Mtunzini in the north, via Durban to Margate and just short of Port Edward in the south. Altitude ranges from 20-450 m.

Conservation:
The vegetation type is considered **Endangered**. The conservation target of 25%. Only a very small part is statutorily conserved in Ngoye, Mbumbanzi and Vernon Crookes Nature reserves.

Threats:

About 50% transformed for Cultivation, by urban sprawl and for road-building. Alien plant species include; *Chromolaena odorata, Lantana camara, Melia azedarach,* and *Solanum mauritianum.* Erosion is low to moderate.

Indicative Plant Species:
Small Trees and Tall Shrubs: *Bridelia micrantha* (d), *Phoenix reclinata* (d), *Syzygium cordatum* (d), *Acacia natalitia, Albizia adianthifolia, Antidesma venosum.* **Low shrubs:** *Clutia pulchella, Gnidia kraussiana, Phyllanthus glaucophyllus, Tephrosia polystachya.* **Woody climbers:** *Abrus laevigatus, Asparagus racemosus, Smilax anceps.* **Graminoids:** *Aristida junciformis* subsp. galpinii (d), *Digitaria eriantha* (d), *Panicum maximum* (d), *Themeda triandra* (d), *Alloteropsis semialata* subsp. *eckloniana, Cymbopogon caesius, Cymbopogon nardus, Eragrostis curvula, Eulalia villosa, Hyparrhenia filipendula, Melinis repens.* **Herbs:** *Berkheya speciosa* subsp. *speciosa* (d), *Cyanotis speciosa* (d), *Senecio glaberrimus* (d), *Alepidea longifolia, Centella glabrata, Cephalaria oblongifolia, Chamaecrista mimosoides, Conostomium natalense, Crotalaria lanceolata, Dissotis canescens, Eriosema squarrosum, Gerbera ambigua, Hebenstretia comosa, Helichrysum cymosum* subsp. *cymosum, Helichrysum. pallidum, Hibiscus pedunculatus, Hybanthus capensis, Indigofera hilaris, Pentanisia prunelloides* subsp. *latifolia, Senecio albanensis, Senecio bupleuroides, Senecio coronatus, Senecio rhyncholaenus, Sisyranthus imberbis, Stachys aethiopica, Stachys nigricans, Vernonia galpinii, Vernonia oligocephala.* **Geophytic Herbs:** *Bulbine asphodeloides, Disa polygonoides, Hypoxis filiformis, Ledebouria floribunda, Pachycarpus asperifolius, Schizocarphus nervosus, Tritonia disticha.* **Low shrubs:** *Ceropegia sandersonii.*

Biogeographically important Taxon (Coastal belt element, Southern distribution limit)

Graminoids: *Cyperus natalensis, Eragrostis lappula.* **Small Tree and Tall shrubs:** *Anastrabe integerrima* (d), *Acacia nilotica* subsp. *kraussiana.* **Shrubs:** *Helichrysum kraussii, Agathisanthemum bojeri, Desmodium dregeanum.* **Herbs:** *Helichrysum longiflorum, Selago tarachodes, Senecio dregeanus, Sphenostylis angustifolia*. **Mega-herb:** *Strelitzia nicolai* (d). **Geophytic Herb***: Kniphofia gracilis, Kniphofia littoralis, Kniphofia rooperi, Pachystigma venosum, Zeuxine africana.* **Geoxylic Suffrutices:** *Ancylobothrys petersiana, Eugenia albanensis, Salacia kraussii.*

Endemic Taxa:

Herb: *Vernonia africana* (extinct). **Geophytic herb:** *Kniphofia pauciflora*.

6.8 National Freshwater Ecosystem Priority Areas (NFEPA)

NFEPA was a three-year partnership project between South African National Biodiversity Institute (SANBI), CSIR, Water Research Commission (WRC), Department of Environmental Affairs (DEA), Department of Water Affairs (DWA), Worldwide Fund for Nature (WWF), South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks) **(Van Deventer *et al.* 2010)**. NFEPA map products provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. These strategic spatial priorities are known as Freshwater Ecosystem Priority Areas, or FEPAs.

FEPA maps and supporting information form part of a comprehensive approach to sustainable and equitable development of South Africa's scarce water resources. They provide a single, nationally

consistent information source for incorporating freshwater ecosystem and biodiversity goals into 2 planning and decision-making processes. For integrated water resource management, the maps provide guidance on how many rivers, wetlands and estuaries, and which ones, should remain in a natural or near-natural condition to support the water resource protection goals of the National Water Act (Act No. 36 of 1998; RSA, 1998a). FEPA maps are therefore directly applicable to the National Water Act, feeding into Catchment Management Strategies, classification of water resources, reserve determination, and the setting and monitoring of resource quality objectives. FEPA maps are also directly relevant to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004; RSA, 2004) (hereafter referred to as the Biodiversity Act), informing both the listing of threatened freshwater ecosystems and the process of bioregional planning provided for by this Act. FEPA maps support the implementation of the National Environmental Management: Protected Areas Act (Act No. 57 of 2003; RSA, 2003) (hereafter referred to as the Protected Areas Act) by informing the expansion of the protected area network. They also inform a variety of other policies and legislation that affect the management and conservation of freshwater ecosystems, including at the municipal level.

FEPAs are strategic spatial priorities for conserving freshwater ecosystems and supporting sustainable use of water resources. FEPAs were determined through a process of systematic biodiversity planning and were identified using a range of criteria for conserving ecosystems and associated biodiversity of rivers, wetlands and estuaries.

FEPAs are often tributaries and wetlands that support hard-working large rivers, and are an essential part of an equitable and sustainable water resource strategy. FEPAs need to stay in a good condition to manage and conserve freshwater ecosystems, and to protect water resources for human use. This does not mean that FEPAs need to be fenced off from human use, but rather that they should be supported by good planning, decision-making and management to ensure that human use does not impact on the condition of the ecosystem. The current and recommended condition for all river FEPAs is A or B ecological category. Wetland FEPAs that are currently in a condition lower than A or B should be rehabilitated to the best attainable ecological condition.
FEPA wetlands and / or rivers onsite

There are no recorded FEPA wetlands or rivers on site.

7 SITE SPECIFIC ASSESSMENT

In order to simplify and identify the various vegetation communities on site, the various communities have been separated into homogenous units and will be discussed at this level. The following communities have been identified (**Appendix 6**):

- Incised Wetland Units
- Open Valley Bottom Wetlands
- Umhlali River and Associated riparian vegetation
- Fallow Lands re-colonised by indigenous and alien vegetation
- “Primary Dune” Areas

7.1 General Vegetation Statement

The vegetation in general terms, apart from the "Primary Dune" areas and portions of the vegetation closest to the mouth of the Umhlali River, are relatively disturbed and transformed. The vegetation could not be considered pristine, due to the impacts of agricultural practices taking place on their periphery and the effects of alien invasive vegetation being prevalent within the species assemblage.

7.2 Incised Wetland Areas

These incised wetland areas (**Plate 1**) are restricted to the steepest portions of the site. These areas are represented in **Appendix 6.** The plant species contained within these areas is predominantly woody in nature and well established (**Appendix 7**). The typical structure of this vegetation type are numerous large woody species which create a closed canopy over the incised drainage line with limited indigenous plant species comprising the under-storey. The limited indigenous species results from the presence and high abundance of alien invasive species which are able to out-compete the indigenous under-storey species. The most prevalent species associated with these areas were: *Dracaena aletriformis, Clerodendrum glabrum, Rhoicissus tomentosa, Isoglossa woodii, Trichilia emetica, Drypetes arguta, Dalbergia armata, Dalbergia obovata, Brachylaena discolor, Canthium inerme, Setaria megaphylla, Combretum kraussii,* ***Drimiopsis maculata*** and *Bridelia micrantha.* Other species which were identified, but less common include, ***Scadoxus puniceus****, Ekebergia capensis,* ***Cryptocarya latifolia*** and *Commiphora harveyi.* Common alien species growing within this area were *Anredera cordifolia* and *Ipomoea purpurea.* This incised system sits above the Waste Water Treatment Works and can be described as relatively intact. In addition, it has three species of importance. The *S. puniceus* (**Plate 4**) and *D. maculata* (**Plate 3**) are protected under the KwaZulu-Natal Nature Conservation Ordinance. The third species *C. latifolia* (**Plate 2**) is Red-Listed and declining in the wild as a result of bark harvesting for the *muthi* trade and habitat destruction. This tree species however is considered resilient and will persist within degraded drainage lines if protected from bark harvesting.

From the proposed layout (**Appendix 4**) it is evident that the wetland system will be retained in its current state, with the removal of alien invasive vegetation going forward, and thus the species of concern within this environment will be maintained. The potential exists through management for these species to proliferate as the competitive advantage for niche occupancy within the incised drainage line / wetland exhibited by alien species will be removed.

Plate 1. Typical incised drainage line, on the lower reaches of a headland wetland system.

Plate 2. Leaves of *Cryptocarya latifolia* (red-listed and declining tree species).

Plate 3. *Drimiopsis maculata* growing on the drainage line embankment.

Plate 4. *Scadoxus puniceus* growing on the drainage line embankment.

7.3 Open Valley Bottom Wetlands

The Open Channel Valley Bottom Wetlands are characterised by an “open channel” (**Plate 5**), i.e. they are not confined within the landscape by steep slopes adjacent thereto. The topography of the area determines their area, with the flows being typically confined to subsurface flows through the soil profile. The caveat being that in high rainfall events surface flow is registered and there are topographical features where the water does daylight. In addition, numerous portions of the wetlands have been canalised (drainage of the wetlands to reduce soil moisture) to facilitate sugarcane planting within their rich and fertile soils.

In these open wetland systems the vegetation component is significantly different compared with the incised channel wetlands. The vegetation is dominated by *Cyperus* species and Graminoids (members of the Poaceae - grass family. The most common species encountered were *Typha capensis, Phragmites australis, Cyperus dives, Cyperus latifolius, Cyperus denudatus, Cyperus compressus, Pycreus polystachys, Mariscus macrocarpus* and *Mariscus solidus.* Other species which were recorded by not in high abundances and usually in restricted stands within the greater wetland were; *Eleocharis limosa, Bulbostylis hispidula* and *Isolepis prolifera.* In terms of the herbaceous species which were common within the wetland boundaries, *Ethulia conyzoides* was dominant. To a lesser extent and more isolated in their overall distribution across the wetland systems and their associated buffers, *Desmodium dregeanum, Priva cordifolia, Helichrysum ruderale* and *Ludwigia octovalvis.*

Numerous alien invasive plant species are associated with the wetlands on site, as these areas are often deemed to be waste areas, as agricultural pursuits are not taking place within their boundaries. The most commonly occurring aliens are *Lantana camara, Solanum mauritianum, Chromolaena odorata, Eclipta prostrata, Ageratum conyzoides, Phragmites mauritiana, Ipomoea purpurea, Ambrosia artemisiifolia, Cyperus esculentus, Canna indica, Paspalum notatum, Eragrostis ciliaris, Cuscuta* sp. and *Verbena bonariensis.*

Plate 5. Open wetland system. (This system has had artificial drains constructed to drain it to allow cultivation to occur).

Plate 6. River bank on the left island on the right (*Phragmites australis*) with a channel dominated by grasses in the centre.

7.4 Umhlali River and associated Riparian vegetation on the floodplain

The upper reaches of the Umhlali River, in close proximity to the N2 is heavily sedimented. This sedimentation has allowed for the establishment of preferential flow paths which remain open for water flow with sediment islands forming and being maintained by the establishment of vegetation thereon. A large proportion of the vegetation growing on these islands is dominated *Phragmites australis* (**Plate 6**). Within the channels *Ischaemum afra*, *Setaria sagittifolia* and *Leersia hexandra* are dominant.

The river banks are dominated for the most part by *Barringtonia racemosa, Bridelia micrantha* and *Trichilia emetica.* We would make the assumption that the majority of these trees have been planted. The reasoning is that the trees for the most part appear to be relatively young c.a. 20 years old, they are all of a similar size and appear to be planted on the lip of the channel, allowing for maximum utilisation of the adjoining floodplain for sugarcane cultivation. In amongst these planted indigenous species *Schinus terebinthifolius, Montanoa hibiscifolia, Tithonia diversifolia. Melia azedarach* and *Eucalyptus* sp. have established.

In the lower reaches and just behind the beach area, the vegetation along the estuary (**Plate 7**) is dominated by ***Hibiscus tiliaceus*** (**Plate 8**) a protected tree species under the KZN Conservation Ordinance. In addition to this species other species present in the assemblage are ***Barringtonia racemosa*** (protected under the National Forests Act)*, Derris trifoliata, Ipomoea cairica* and *Rhoicissus*

Plate 7. View over the estuary with fringing *P. australis.*

Plate 8. *Hibiscus tiliaceus* dominated woody vegetation fringing the Umhlali Estuary.

rhomboidea. The remainder of the vegetation occurring in this area is on the periphery of the wooded portions and is comprised on the following *Paspalum urvillei, Centella asiatica, Ipomoea purpurea, Ipomoea alba, Stenotaphrum secundatum, Setaria sagittifolia, Ethulia conyzoides, Ludwigia octovalvis* and *Phragmites australis.* The majority of the above mentioned species fall within the wetland areas that are associated with the riparian collar that runs the length of the estuary. Within the actual estuary *Phragmites australis* is the dominant fringing species and where tall species, such as, *P. australis* are precluded by shading, the dominant submerged species is *Potamogeton pusillus.*

This area as denoted **Appendix 6** will not be able to be developed as the vegetation in this area is extremely sensitive and plays a significant role in protecting the banks of the Umhlali River and associated Estuary. In addition, the floodplain sits adjacent the riparian vegetation fringing the River and this area is not suitable to receive development either.

7.5 Follow lands Non-Woody

These areas are areas where sugarcane production has ceased. The vegetation is dominated for the most part by herbaceous and woody herbaceous species (**Plate 9**). The most commonly occurring indigenous plant species are *Helichrysum kraussii, Triumfetta rhomboidea, Chamaecrista mimosoides, Crotalaria lanceolata, Commelina benghalensis, Melinis repens, Eragrostis ciliaris, Panicum maximum, Kyllinga* sp., *Hewittia malabarica, Wahlenbergia grandiflora, Alectra sessiliflora, Abutilon sonneratianum, Rhynchosia caribaea, Helichrysum ruderale* and *Asystasia gangetica.* Interspersed within this matrix of herbaceous and graminoid species were some woody shrubs and

tree species. The following tree species were recorded: *Trema orientalis, Erythrina lysistemon, Clerodendrum glabrum* and *Trichilia emetica* subsp. *emetica. Chrysanthemoides monilifera* was an abundant woody shrub within the grassland matrix. There were also a relatively high proportion of alien invasive species present within the plant species assemblage. The most prevalent species were; *Melia azedarach, Schinus terebinthifolius, Chromolaena odorata, Lantana camara, Euphorbia* sp., *Spilanthes decumbens, Oenothera stricta, Gomphrena celosioides, Richardia brasiliensis, Plectranthus barbatus* var. *grandis, Bidens pilosa* and *Taraxacum officinale.*

In an isolated section of the fallow lands, there were quite a number of different species to the ones mentioned above. It is assumed that as this area lies adjacent to an old cadastral boundary demarcated by woody vegetation, and the potential exists for the woody vegetation to act as a reservoir for plant species. The following species were recorded over and above the species mentioned previously; *Vigna vexillata, Blumea alata, Solanum panduriforme* and ***Crotalaria vasculosa*** (**Plate 10 & 11**). The last species is a ruderal[3] species, however, it is not a commonly recorded species south of Richards Bay and thus makes this an interesting record.

Plate 9. Typical view of Fallow Lands that are non-woody.

[3] **A ruderal species is a plant species that is first to colonise disturbed lands. The disturbance may be natural (e.g., wildfires), or due to human influence - constructional (e.g., road construction, building construction or mining), or agricultural (e.g., abandoned farming fields or abandoned irrigation ditches).Ruderal species typically dominate the disturbed area for a few years, gradually losing the competition to other native species.**

Plate 10. *Crotalaria vasculosa* fruit

Plate 11. *C. vasculosa* inflorescence

7.6 Fallow Lands Woody

This designation of land cover for the most part was restricted to the Primary Dune areas and some isolated fragments in close proximity to the Umhlali River. The most dominant species in these areas is *Chrysanthemoides monilifera* which is a woody herbaceous species. Its growth form is such that it forms dense stands which prevent, through shading out, smaller herbaceous and graminoid species from establishing. In addition, these species stabilise the loose soils that are associated with this site. These stands of *C. monilifera* are punctuated by a number of woody species. The following species were commonly occurring: *Eugenia capensis, Brachylaena discolor,* ***Mimusops caffra*** and *Allophylus natalensis.* Two of the species above are protected, ***M. caffra*** is protected by the National Forests Act, and the *E. capensis* by the KZN Ordinance. Should these areas be disturbed in anyway and the two protected species are required to be removed / destroyed and or uplifted a licence from DAFF and permit from *Ezemvelo* KZN Wildlife will be required respectively. It must be clearly stated that the establishment of these species is opportunistic, and all of the individuals encountered were small and have established themselves within the last 10 years. This factor may make relocation out of the development footprint possible and with a high level of success. Other species were also associated with this vegetation community, however they were recorded in lower abundances. The following species were recorded: *Erythrina lysistemon, Scutia myrtina, Searsia chirindensis, Clerodendrum glabrum* and *Deinbollia oblongifolia.* Other plant species were also recorded within these zones, however, they were relatively sparsely distributed and were not contributing at a significant level in terms of biomass or conservation significance. The entire species list for the Tinley Manor site is included at **Appendix 7.**

7.7 Primary Dune and Coastal Dune Scrub / Forest

In terms of size and value these areas provide the most significant conservation and diversity maintenance option that currently exists on the site. In addition, these areas are perforated by wetlands which feed from the secondary dune slope and crest down onto the back of dune environment prior to flowing into the sea. The various zones that will be discussed are schematically illustrated in **Figure 1** below.

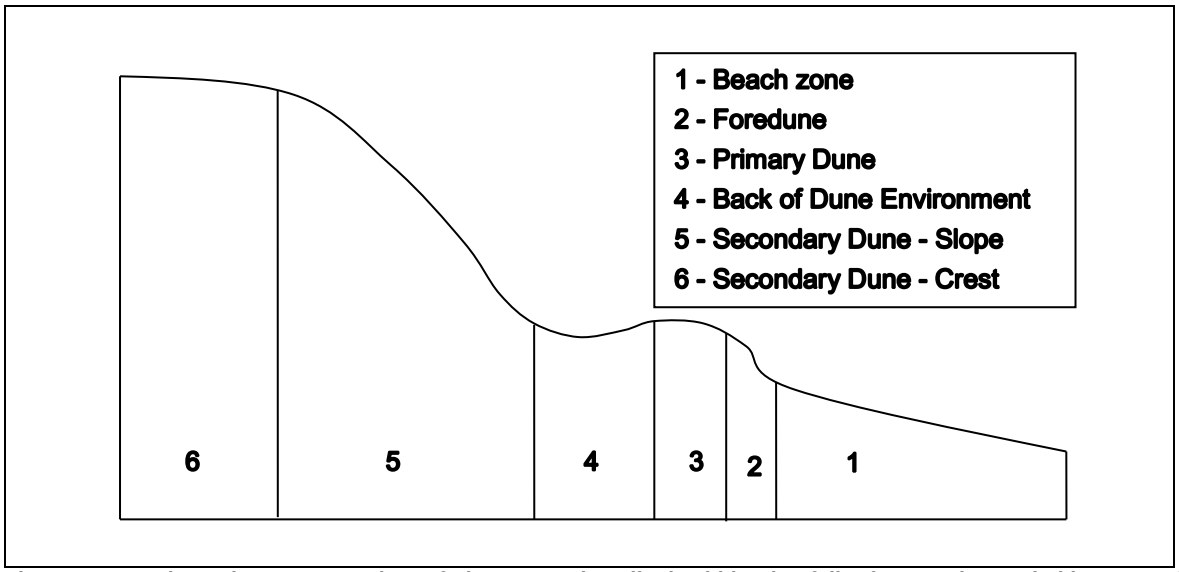

Figure 1. A schematic representation of the areas described within the following sections of this vegetation assessment report.

On the base of the secondary dune, agricultural practices for the most part have ceased and these are demarcated in **Appendix 6.** The vegetation contained within this area is as above, i.e. fallow lands dominated by woody species.

7.7.1 Primary Dune

In the Primary Dune area the vegetation is a combination of indigenous pioneer species and alien invasive species. The vegetation is thick and almost impenetrable and lacks an under-storey. The most common woody shrubs are: *Chrysanthemoides monilifera* and *Lantana camara* (**Plate 12**). Within this are clumps of woody species usually centred on individuals of *Brachylaena discolor.* Associated with this species were the following woody species: *Pavetta revoluta, Dracaena aletriformis, Scutia myrtina, Ficus natalensis, Putterlickia verrucosa* and *Tricalysia sonderiana.* Numerous creeper species were also encountered, the majority of which were associated with the woody species however, one species, namely, *Tragia glabrata* var. *glabrata* was commonly occurring only on the woody shrubs. The other species which was common was *Asystasia gangetica. Rhoicissus digitaria* and *Rhoicissus rhomboidea* were only found in the woody vegetation clumps. The primary dune vegetation can thus be classified as an early successional vegetation state that is dominated by pioneer species. With time and limited interventions this successional stage will alter the microhabitat and climate and if left undisturbed will lead to later successional species. The species composition at this stage will have shifted from woody shrubs to woody species and later forest which is composed of a clearly defined tree layer and an under-storey layer.

Plate 12. Primary dune that is in an early successional phase of re-establishment', post disturbance.

7.7.2 Fore Dune

The Fore dune area between the crest of the fore dune and leading down towards the beach the vegetation is markedly different to the Primary dune. As mentioned above the vegetation in this zone is representative of forest, with a clearly defined and stratified layering of vegetation. The most commonly occurring woody species within the core of this area, where the vegetation has not been exposed to the elements are: ***Mimusops caffra****, Cussonia zuluensis, Gymnosporia arenicola, Ficus natalensis, Dovyalis rhamnoides, Putterlickia verrucosa, Brachylaena discolor, Allophylus natalensis, Canthium inerme* and *Grewia occidentalis.* In terms of non-woody vegetation the most common species were *Dracaena aletriformis* (**Plate 13**)*, Isoglossa woodii, Carissa bispinosa* (**Plate 14**), *Rhoicissus digitaria, Secamone alpini* and *Cynanchum obtusifolium.*

Plate 13. Dense stands of *Dracaena aletriformis*

Plate 14. *Carissa bispinosa*

This portion of the site plays an important role in dune stabilisation as well as preventing blowouts from occurring. The proposed development will remain outside of these areas and thus the management of these areas should only see the intermittent clearing of alien vegetation.

7.7.3 Beach & Frontal Vegetation

The vegetation on this portion of the site is typical of vegetation that is exposed to the elements and salt spray. The vegetation stunted and for the most part is hardy vegetation. The most common species that were seen on the beach and slightly beyond were: ***Aloe thraskii***[4]*, Ipomoea pes-caprae, Chrysanthemoides monilifera.* This vegetation will remain unaffected by the development layout and will continue to deliver valuable stabilisation and protection of the vegetation beyond.

7.7.4 Areas adjoining the road to beach and where cane is still planted

The vegetation along the ecotone (disturbed edge impacted upon by anthropogenic influences) has a very different suite of plant and woody species occurring on it. The most commonly occurring woody species are *Eugenia capensis, Gymnosporia arenicola, Maytenus procumbens, Ficus burtt-davyi, Allophylus natalensis, Clerodendrum glabrum* and *Psychotria capensis.* The vegetation as a result of exposure is relatively short and in some cases stunted. Many of the woody species are multi-stemmed species as a result of the climate in which they are living. A relatively unusual record was ***Sclerocarya birrea*** **subsp.** ***caffra*** which was growing next to a roadway that bisects the Dune Scrub / Forest. It was in all likelihood a result of a monkey and / or human eating the fruit and throwing the seed into the vegetation at the side of the roadway. Other species of herbaceous plant and creeper that were identified in these areas were: *Gloriosa superba, Cyphostemma flaviflorum, Cynanchum obtusifolium, Grewia occidentalis, Scadoxus puniceus, Deinbollia oblongifolia, Commelina benghalensis* and *Desmodium incanum.*

7.8 Concluding Statements regarding the Vegetation on Site

The vegetation on the site is relatively transformed for the most part, with the sugarcane activities and the planting of plantations having removed the traditional land cover and replaced it with high intensity agriculture. There are pockets of vegetation that are still representative of what one would expect to find in a less transformed area. The isolated pockets of vegetation that are still of a high quality and provide a valuable functional role has been considered in the proposed layout and it is unlikely that vegetation of any significance will be lost as a result of the proposed development.

8 BIODIVERSITY ASSESSMENT

In terms of assessing the impacts of the proposed Tinley Manor Development on the receiving environment, it is imperative that the current state of the environment is assessed and the level at which it contributes currently is considered and recorded.

It is bearing this in mind that we have developed an assessment matrix which will assist in determining the current biodiversity and conservation value of the various landscape (vegetation types) that were encountered during the field survey.

In addition we need to consider the biodiversity noteworthiness of the receiving environment (i.e. does the environment hold any rare species, protected species and unique landscape features) as well as

[4] **Protected under the KZN Ordinance**

the functional integrity and future sustainability of the vegetation types in the immediate vicinity of the Irrigation Scheme. The final condition score is calculated by adding the Biodiversity noteworthiness score with the Functional integrity and Sustainability score. It must be noted that the two scores are weighted 50:50% respectively.

8.1 Biodiversity noteworthiness

In terms of the vegetation classifications that were identified from the aerial photography and ground truthed on site, the following assessment was made in terms of the noteworthiness of the vegetation that grows within the Proposed Tinley Manor Development Node.

Table 7. Biodiversity noteworthiness for the Incised Wetland Areas

	Scores				
Biodiversity Noteworthiness	**0**	**1**	**2**	**3**	**4**
Diversity			✓		
Rarity					✓
Conservation Status					✓
Red Data Species					✓
Uniqueness / Special features			✓		
OVERALL VALUE	Total Score/number of categories is 16 / 5= **3.2**				

Table 8. Biodiversity noteworthiness for the Open Channel Valley Bottom Wetlands

	Scores				
Biodiversity Noteworthiness	**0**	**1**	**2**	**3**	**4**
Diversity		✓			
Rarity	✓				
Conservation Status		✓			
Red Data Species	✓				
Uniqueness / Special features	✓				
OVERALL VALUE	Total Score/number of categories is 2 / 5= **0.4**				

Table 9. Biodiversity noteworthiness for the Umhlali River and associated Riparian vegetation on the floodplain

	Scores				
Biodiversity Noteworthiness	**0**	**1**	**2**	**3**	**4**
Diversity				✓	
Rarity					✓
Conservation Status					✓
Red Data Species					✓
Uniqueness / Special features					✓
OVERALL VALUE	Total Score/number of categories is 19 / 5= **3.8**				

Table 10. Biodiversity noteworthiness for the Fallow lands Non-Woody areas

	Scores				
Biodiversity Noteworthiness	**0**	**1**	**2**	**3**	**4**
Diversity		✓			
Rarity	✓				
Conservation Status	✓				
Red Data Species	✓				

Uniqueness / Special features	✓				
OVERALL VALUE	Total Score/number of categories is 1 / 5= **0.2**				

Table 11. Biodiversity noteworthiness for the Fallow lands Woody areas

	Scores				
Biodiversity Noteworthiness	**0**	**1**	**2**	**3**	**4**
Diversity			✓		
Rarity	✓				
Conservation Status	✓				
Red Data Species					✓
Uniqueness / Special features	✓				
OVERALL VALUE	Total Score/number of categories is 4 / 5= **0.8**				

Table 12. Biodiversity noteworthiness for the Primary Dune and Coastal Dune Scrub / Forest

	Scores				
Biodiversity Noteworthiness	**0**	**1**	**2**	**3**	**4**
Diversity					✓
Rarity					✓
Conservation Status					✓
Red Data Species					✓
Uniqueness / Special features					✓
OVERALL VALUE	Total Score/number of categories is 20 / 5= **4**				

8.2 Functional Integrity and Sustainability

The functional Integrity and sustainability speaks to the impact of the proposed activity on the receiving environment and the likelihood that it will be of significance and whether there are significant mitigation and or amelioration measures that are required to be put in place to ensure that the impacts are manageable and will not prove deleterious to the vegetation type as a whole, which falls within the current proposed area of disturbance.

Table 13. Future Integrity and viability of the Incised Wetland Areas

	Scores				
Integrity & Future Viability	**0**	**1**	**2**	**3**	**4**
Buffer		✓			
Connectivity			✓		
Alteration	✓				
Invasive/pioneers		✓			
Size			✓		
OVERALL VALUE	Total Score/number of categories is 6 / 5= **1.2**				

Table 14. Future Integrity and viability of the Open Channel Valley Bottom Wetlands

	Scores				
Integrity & Future Viability	**0**	**1**	**2**	**3**	**4**
Buffer		✓			
Connectivity		✓			
Alteration	✓				
Invasive/pioneers		✓			
Size			✓		
OVERALL VALUE	Total Score/number of categories is 5 / 5= **1**				

Table 15. Future Integrity and viability of the Umhlali River and associated Riparian vegetation on the floodplain

	Scores				
Integrity & Future Viability	**0**	**1**	**2**	**3**	**4**
Buffer				✓	
Connectivity				✓	
Alteration	✓				
Invasive/pioneers		✓			
Size					✓
OVERALL VALUE	Total Score/number of categories is 11 / 5= **2.2**				

Table 16. Future Integrity and viability of the Fallow lands Non-Woody areas

	Scores				
Integrity & Future Viability	**0**	**1**	**2**	**3**	**4**
Buffer		✓			
Connectivity		✓			
Alteration	✓				
Invasive/pioneers	✓				
Size			✓		
OVERALL VALUE	Total Score/number of categories is 4 / 5= **0.8**				

Table 17. Future Integrity and viability of the Fallow lands Woody areas

	Scores				
Integrity & Future Viability	**0**	**1**	**2**	**3**	**4**
Buffer		✓			
Connectivity				✓	
Alteration	✓				
Invasive/pioneers	✓				
Size				✓	
OVERALL VALUE	Total Score/number of categories is 4 / 5= **0.8**				

Table 18. Future Integrity and viability of the Primary Dune and Coastal Dune Scrub / Forest

	Scores				
Integrity & Future Viability	**0**	**1**	**2**	**3**	**4**
Buffer					✓
Connectivity					✓
Alteration			✓		
Invasive/pioneers				✓	
Size				✓	
OVERALL VALUE	Total Score/number of categories is 16 / 5= **3.2**				

The current state of the, site is deemed overall to be in a moderately poor state and the Biodiversity Maintenance score for each vegetation type is currently assessed in the table below:

Table 19. Scores for the Biodiversity Maintenance services based on Assessment scores

Vegetation type	Biodiversity Maintenance Scores
Incised Wetland Areas	**2.2**
Open Channel Valley Bottom Wetlands	**0.7**
Umhlali River and associated Riparian vegetation on the floodplain	**3**
Fallow lands Non-Woody	**0.5**
Fallow lands Woody areas	**0.8**
Primary Dune and Coastal Dune Scrub / Forest	**3.6**

Some of the vegetation on site is considered to be highly degraded and is functioning at a significantly reduced level. The abundance of alien invasive vegetation has resulted in the reduction in indigenous cover and thus the overall value of the vegetation and its contribution to the goals of conserving conservation worthy areas. Whereas other of the vegetation types are functioning at higher level due to their position on the site which affords them greater resistance to degradation.

9 RECOMENDATIONS

The following recommendations for the vegetation occurring on the Tinley manor South Site are as follows:

- Should the layout change in any way, and the resultant change affect the vegetation identified in the map at **Appendix 4** then a re-assessment of the changes in relation to the vegetation must be undertaken.
- All of the nationally protected tree species that occur on the site and within the proposed development nodes need to have GPS co-ordinates associated with them and a licencing process with DAFF initiated and approval obtained.

- Many of the trees i.e. ***Mimusops caffra*** are small and will potentially be easily relocated. Any relocation undertaken must be done under the guidance of a qualified Botanist.
- The provincially protected plant species will also require a permit for the upliftment / destruction and this permit will need to be obtained from the extension officer at *Ezemvelo* KZN Wildlife.
- The two species (***Crotalaria vasculosa*** and ***Cyphostemma flaviflorum***) which are not protected by the legislation but are considered to be rare and thus deserving of relocation must be removed and placed in areas outside of the development nodes.
- An alien management programme must be compiled and implemented to ensure that succession, particularly along the primary dune and the Umhlali River is able to continue. The succession of these areas will be vital to the overall feel of the development as well as the Goods and Services offered by these Open Space Areas.

10 CONCLUSIONS

Three areas of significance exist on the site in terms of vegetation, and these are the Umhlali River and associated Estuary area, the Primary Dune and Coastal Dune Scrub / Forest and the Incised wetland area above the Waste Water Treatment Works. All of these areas are currently unimpeded by the proposed development layout and thus the loss of the pioneer vegetation occurring across the majority of the site will not have a significant impact in terms of the conservation goals and diversity of the flora in the province. The caveat, however, it that the recommendations made in the above section need to be adhered to and implemented.

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