Royal HaskoningDHV
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Tinley Manor Southbanks Coastal Development

Draft Environmental Impact Assessment Report

30 March 2015

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Tongaat Hulett DEVELOPMENTS

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REVIEW OF THE
DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

This Draft Environmental Impact Assessment Report is available for comment for a period of ***40 days*** (excluding Public Holidays) from **Monday, 30 March 2015** until **Monday**, **18 May 2015**. Copies of the Environmental Impact Assessment Report are available at strategic public places in the project area (see below) and upon request from Royal HaskoningDHV.

The report is available for viewing at:

- Impulse by the Sea Restaurant: 167 Seaview Drive, Tinley Manor
- Tongaat Hulett Developments: Zimbali Resort Offices – Zimbali (Adjacent to Sales centre just before northern gatehouse)
- Royal HaskoningDHV Website: www.rhdhv.co.za/pages/services/environmental.php

OPPORTUNITIES FOR PUBLIC REVIEW

The following methods of public review of the Environmental Impact Assessment Report are available:

- Completing the comment sheet enclosed with the Background Information Document (BID);
- Written submissions by e-mail or fax; and/or
- Telephonic submissions.

DUE DATE FOR COMMENT ON DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MONDAY 18 MAY 2015

SUBMIT COMMENTS AND QUERIES TO

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Executive Summary

Introduction and Background

Tongaat Hulett Developments proposes to develop the Tinley Manor Southbanks Coastal Development into a mixed-use coastal development including a large residential component. Tinley Manor Southbanks Coastal Development is an approximately 480 ha site, located between the coastal towns of Tinley Manor and Sheffield Beach within the KwaDukuza Municipality, KwaZulu-Natal.

The proposed Tinley Manor Southbanks Coastal Development is set to be the first phase of the development of Tongaat Hulett Developments's land holdings in Tinley Manor, which is situated to the south and north of the Umhlali River.

The Tinley Manor Southbanks Coastal Development is based around the site's exquisite natural and physical attributes. These include a 2.5 km coastline with existing natural forest, 3.5 km river frontage on the Umhlali River, 1 km frontage to the N2 freeway, and gently rolling hills of land covered in both natural vegetation and large-scale agricultural lands, with expansive and uninterrupted views. These natural attributes lend themselves to special tourist, resort, leisure and recreational opportunities, together with upmarket and mixed densities of residential and commercial opportunities which will serve to add economic viability to the greater project whilst also serving as a draw card to further enhancement of the wider area.

The development will require new road infrastructure and service infrastructure, including electricity, sewer reticulation and water supply. The proximity of the site to the beach, as recreational and natural amenity, also requires appropriate and sensitively planned and designed beach access for both residents and tourists to utilise.

Tinley Manor Southbanks intends to address the need for economic development and tourism through the release of land for much needed commercial and residential development. Furthermore, the project offers significant opportunities to create new, well located employment opportunities close to new and existing housing. The scale of the project allows for the development of environmentally and financially sustainable innovations in service and housing delivery models. In addition, the project will facilitate new forms of urban development, choices and lifestyle options.

The report has been structured to comply with the format required by the EIA Regulations (2010) (as amended). The contents are as follows:

Chapter	Content
Chapter 1 Introduction	Introduction and overview of the proposed project and details of the proponent and EAP
Chapter 2 Environmental Legal Requirements	Provides the environmental legal framework and the approach to the integrated regulatory process
Chapter 3 Project Context	Contextualises the study area, outlines the need for and motivation of the proposed project, provides the spatial informants and framework and introduces the social sustainability and innovation programme
Chapter 4 Description of the Receiving Environment	A description of the biophysical and social environment
Chapter 5 Project Description	Includes a description of the proposed activities and engineering services proposed
Chapter 6 Project Alternatives	Consideration of alternatives (design/layout, site and do-nothing) for the project
Chapter 7 Findings of the Specialist Assessments	An overview of the findings of the various specialist reports undertaken for this project
Chapter 8 Public Participation Process	Overview of the public participation process conducted to date
Chapter 9 Environmental Impact Assessment	Methodology used in the assessment of significant impacts and a description of the environmental impacts on the biophysical and social environment and a rating of these impacts

Chapter	Content
Chapter 10 **Environmental Impact Statement**	A comparative assessment of the positive and negative impact of each alternative and a statement as to the significance of the environmental impacts assessment
Chapter 11 **Conclusion and Conditions of Authorisation**	Conclusions and recommendations of the Environmental Impact Study

Regulatory Environmental Requirements

The KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs, is the lead authority and any Environmental Impact Assessment process in KwaZulu-Natal needs to be authorised by this Department in accordance with the National Environmental Management Act (NEMA) (No 107 of 1998) (as amended).

The Environmental Impact Assessment Regulations (2010) under NEMA consist of three categories of activities namely: Listing Notice 1 Activities (GNR. 544 of 2010) which require a Basic Assessment study, Listing Notice 2 Activities (GNR. 545 of 2010) which require both a Scoping and an EIA study for authorisation and Listing Notice 3 Activities (GNR 546 of 2010) which require a Basic Assessment study to be undertaken in specific geographical areas.

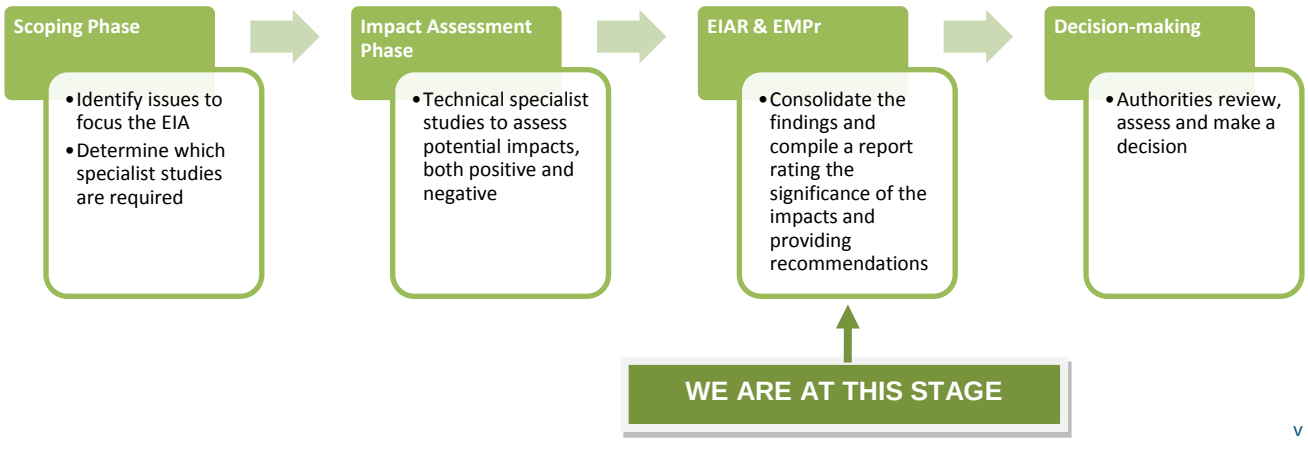
The activities associated with the proposed project, amongst others, triggered activities contained in GNR 545 and as such a Scoping and EIA process will be undertaken for the development.

Public Participation Process

Royal HaskoningDHV (previously known as SSI Engineers and Environmental Consultants) are conducting the Public Participation Process for this project. In recent years Tongaat Hulett Developments has actively promoted a participatory approach to their property development projects, with the understanding that the socio-political and economic context as well as environmental legislation requires this public engagement and consultation. Interested and affected parties are invited to "*inform and be informed*" about developments in order to achieve the widest possible participation. It is also noted that engaging stakeholders even before developments are built can be seen as best environmental practice. It is for this reason that the Public Participation Process which forms part of the EIA becomes the basis of a long-term stakeholder engagement process.

Environmental Impact Assessment Report and Purpose of the Report

In line with the requirements of the National Environmental Management Act (No 107 of 1998) (as amended) Environmental Impact Assessment Regulations, this Environmental Impact Assessment Report provides a detailed description of the pre-development environment, specifically in terms of the biophysical and socio-economic environment of the study area. Furthermore, the report provides a comprehensive description of the activities as well as numerous specialist studies undertaken for the Environmental Impact Assessment Phase and Public Participation Process, as well as the way forward in the form of conclusions, recommendations and a draft Environmental Management Programme.



To ensure the completeness of the Environmental Impact Assessment and draft Environmental Management Programme, specialists surveyed the area to identify the potential impacts of the project on the area. The following specialist studies were conducted for the Tinley Manor Southbanks Coastal Development and are included within the Appendices of this Environmental Impact Assessment Report:

Specialist Study	Organisation
Agricultural Potential Assessment	John Phipson
Geotechnical Investigation	Drennan, Maud & Partners
Heritage Assessments	eThembeni Cultural Heritage
Vegetation Assessment	SiVEST
Wetland Assessment	SiVEST
Estuarine Assessment	Royal HaskoningDHV and peer-reviewed by Source to Sea
Coastal Assessment	Royal HaskoningDHV and peer-reviewed by Source to Sea
Socio-economic Study	Urban Econ
Traffic Impact Assessment	Aurecon

In addition to the above specialist studies, the following reports have been prepared in support of the EIA study:

Specialist Study	Organisation
Urban Planning Report	Royal HaskoningDHV
Engineering Services Report	SMEC South Africa
Electrical Services Report	Bosch

Alternatives

No off-site or other site-specific alternatives have been investigated due to the natural features of this site which lend themselves to a tourist resort of this nature. Moreover, the land use type proposal has been developed to fit the land morphology, rather than a pre-determined land use type being considered in terms of a site. It should furthermore be noted that Tongaat Hulett is the sole owner of this land and acquiring another parcel of land of this magnitude, within close proximity to the coast (the primary control required to meet the development's objectives) is unlikely.

A Concept Plan has been produced for the development providing an indication of land use intention on the site as constrained, informed and modified to consider the existing and potential parameters under which such a development could function, with the intention of a sustainable and resilient development proposal. The Concept Plan should not be seen as the definitive detailed design layout or the final approved plan in terms of the town planning process for the development, but should only and has only been used to create an understanding of the conceptual framework for the ultimate development of Tinley Manor Southbanks.

The concept as informed by the specialist studies generated and presented in this document, sets the controls for the final detailed design, including architectural and structural design features of buildings and all infrastructure. The non-negotiable items are thus put in place and approved as part of this process, whilst allowing innovative best practice options (as considered appropriate at the time of each portion of the site goes active) to be developed without being restrained or throttled by approved but now "old hat" patterns methodology. The controls / parameters are set within which individual developers purchasing each land portion forming part of the greater site, which will allow these developers to apply their minds, but with firm thresholds, sustainable parameters, and types / classes of mechanisms that must be included within each land parcel, and, finally "no-go" items that are not open to negotiation. This will allow sustainable solutions to be innovative, and over time continue to set the bar at a higher level. Such sustainable controls are presented in the document at hand, and are taken forward into the Environmental Management Programme as enabling controls. Such controls will be enforced by being underwritten as part of the township development controls per land parcel, along with the controls relating to transfer of applicable controls from the Environmental Management Programme per land parcel in any purchase agreements.

This EIA will confirm whether or not there are any fundamental issues to preclude the proposed development from proceeding along the broad, conceptual basis as outlined in the Concept Plan and will also deal with the assessment of the detailed, specific issues and impacts on a micro level.

There has equally been no investigation into land use alternatives given the nature of the development as a mixed-use, leisure tourist development.

The Concept Plan has been based upon a number of, in essence, existing constraints including wetlands, estuary, coastal dune forests, sensitive pockets of vegetation, roads and topography. As such there is limited scope for layout alternatives related to the primary structure of the Concept Plan. The development proposal and planning has taken cognisance of the position of the property's environmental asset base. The estuary itself is a known highly sensitive environment, and the proposed development has added value to this asset through rehabilitation and enhancement considerations (including buffering), and is in keeping with the coastal sense of place and aesthetics.

It is further emphasised that rigorous scientific assessments have informed the Tinley Manor Southbanks Coastal Development Concept Plan which has been through several iterations, considering and applying the recommendations of the scientific specialists at each juncture. As a result, there is limited scope for alternatives related to the primary components of the Tinley Manor Southbanks Coastal Development Concept Plan. Through many meetings between the Developer, engineers, urban planners, various technical specialists and scientists and various service authorities, the Tinley Manor Southbanks Coastal Development Concept Plan was developed which has been refined to its present state. Several land use alternatives were considered by the design team in consultation with the service authorities. However, whilst many alternatives were considered, only the most feasible alternatives have been integrated into the current proposed Concept Plan.

Access was a key alternative which required consideration and resulted in several revisions to the Concept Plan. The initial development concept showed the establishment of four resorts at intervals inland of, but setback from, the vegetated dune cordon and located landward of the identified coastal risk and slippage in such a way as to not infringe on identified environmental assets. The sustainability of this approach from an environmental perspective is commendable; but the fact that the development of resorts in this area has the potential to negatively impact on access to the coast (not access along the coast) is undeniable. A separate study was conducted responding specifically to this restriction of access and considered the prevailing legislative and policy context.

As a result of this assessment as well as on-going discussions held with the KwaDukuza Municipality, Tongaat Hulett Developments resolved to amend their planned gated-estate development concept to a now publically accessible resort centred, lifestyle and mixed-use village theme which includes a mix of residential and leisure development supported by a range of commercial and social facilities. Residential and leisure oriented neighbourhoods are proposed to be integrated around village nodes and a high quality, well managed network of public spaces featuring leisure and recreation areas, along with major new beach resort developments and conservation zones.

Access to the coast with this phase of the development is now limited to pedestrian access via paths and elevated wooden boardwalks. Parking is provided at the centrally located low impact mixed-use zone. It is further noted that a significantly sized medium impact mixed-use zone is proposed to be provided to the north of the existing Tinley Manor providing for the establishment of additional recreational, amenity and beach access at the Tinley Manor Launch Site.

The No-Go option involves retaining the existing land use i.e. agriculture. The property would remain under sugarcane cultivation, and would continue to operate as a working sugarcane farm. The result of the detailed Agricultural Assessment Study conducted has indicated that there are significant constraints to long-term sugarcane farming in the area. These constraints include poor soil together with the lack of access to irrigation water. Therefore, the recreational, commercial or industrial development of the estate 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. The topography, presence of climax forest and estuary is the greatest long-term asset to the owners of the land than its sugarcane production potential and therefore the no-go alternative is not the most feasible option.

This is a mixed-use development that entails a huge component for housing; as such the no-go alternative will prevent all the positives that can be associated with housing developments as well as for economic growth. This option does not facilitate diversification and/or tourism.

Inclusion of a range of community related service amenities such as schools, clinics, fuel stations, community halls, along with shopping nodes, have been considered.

Shopping nodes have been integrated into the proposal, with both local and tourism related needs provided for.

Schools have not been specifically included in this development area as local schools in the area are currently below capacity and thus a school is not deemed to be an urgent priority at this time. Should the development as it is rolled-out attract a community with a significant school going age children group this will be addressed through the integration of school sites into the development as it is planned. Such schools would be a mix of private and public – dependent on interest from the KwaZulu-Natal Department of Education and their plans for the wider region.

Similarly, the provision of a dedicated and appropriately zoned Erf for a small community clinic can be considered during the detailed planning stage of town planning should this be a requirement. Note that this would most likely be placed in the commercial nodes, but could also be placed in a residential node. The opportunity could also be marketed for a small-scale private medical facility in the commercial zone that could have a community clinic sharing a portion of its site. These are however considered to be detailed town planning considerations.

The presence of a fuel station within the estate needs to be considered with great care. It would need to be contextualised in terms of the wider area's needs, the direct requirements from the development as a whole, and of course, the existing facilities already present in the region. It is noted that due to the high level of uncertainty with respect to the incorporation of such a facility, that if a need is indicated during detailed town planning design, an Erf could then be set aside with appropriate zoning for such a site. The positioning of such an entity within the commercial node would need to consider the proximity to watercourses and wetlands are thus placing it as far as possible from such. All other considerations for such an entity would need to be validated as a balance of the risk of potential groundwater contamination due to the presence of hazardous substances / dangerous goods.

Space is available within the commercial nodes for a range of support facilities, however, these will have to be detailed in the final town planning process to match the final number of units allowed for, the FAR of the commercial area allowed, the parking requirements, etc. The importance of such and their input to a functional and sustainable compact development is noted and will be taken forward into the detailed town planning process.

It is emphasised that should any top-structure developments such as a health facility require any additional authorisations, these will be subject to separate, independent authorisation, licencing and/or permitting processes.

Two design and construction method alternatives have been considered and assessed during the Environmental Impact Assessment.

The original Stormwater Management Plan and Concept Plan allowed for the attenuation of stormwater to be done via dry attenuation facilities located within wetlands as current industry norms suggest the positioning of stormwater attenuation facilities within wetlands, as wetlands are situated in valleys (i.e. the natural drainage line), and therefore provide a suitable environment, from an engineering point of view, to intercept the increased surface run-off using an attenuation facility. However, the scientific assessment did not support the installation of stormwater attenuation structures within wetlands as these results in a change to the hydrological patterns. In light of this, the Stormwater Management Plan was revised to relocate all stormwater attenuation facilities outside of wetland areas but within the 30 m wetland buffers.

Furthermore, significant quantities of surplus fill material are expected to be produced during construction activities due to a number of factors including *inter alia* the topography and poor soil quality (for construction purposes) within the area. The challenge within the context of the development lies in how to ensure the amount of surplus fill material can be minimised through re-use, reduction and/or recycling, so as to make it

easier and more cost effective for the Developers to deal with it whilst taking cognisance of the natural environment and environmental legislation in South Africa.

Environmental Impact Assessment

The impact of the project activities was determined by identifying the environmental aspects and then undertaking an environmental risk assessment to determine the significant environmental aspects. The environmental impact assessment has considered all phases of the project namely, construction phase and operational phase. It is not anticipated that the proposed infrastructure will be developed in the short-medium term and the date of decommissioning is unknown. Therefore, the decommissioning impacts have not been considered.

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. During the Environmental Impact Assessment, the impact of the Tinley Manor Southbanks Coastal Development on the biophysical and socio-economic environments was assessed. It was this assessment that enabled the Environmental Assessment Practitioner to make an informed analysis and provide an opinion of the proposed development.

Key Findings

A considerable amount of planning has gone into the formulation of the Tinley Manor Southbanks Concept Plan which has been informed by rigorous scientific assessments and strategic discussions with many stakeholders. The most notable potential impacts as a result of the proposed development are on the Umhlali Estuary and the Coastal Zone, both of which required careful consideration.

The proposed development concept has adopted a proactive approach in identifying environmental assets and sensitive areas upfront, by means of the environmental asset layers that were derived from the rigorous scientific and feasibility assessments. A risk aversive approach also characterises the proposed development concept, through the identification and incorporation of coastal risk into the proposed location of the development. Such an approach is crucial to ensuring sustainability of the settlement in a sensitive, dynamic and potentially hazardous natural environment such as the coastal zone. The Concept Plan proposes a development footprint that is not in conflict with identified natural hazards such as slippages, or, sensitive features such as wetlands or the vegetated dune cordon and takes cognisance of predicted sea level rise and other impacts of global climate change.

Furthermore, despite the high significance of some of the predicated impacts resulting from the proposed the development on the Umhlali Estuary, all of the identified potential impacts can be reduced to low disturbance and/or avoided, if the mitigation measures detailed are implemented.

Given the national conservation importance of the Umhlali Estuary, a strong opportunity exists to reverse, to some degree, the past maltreatments of the surrounding landscape (sugarcane plantations, salt weir, etc.) and current impacts on the system. This would contribute to the improved ecological state of the Umhlali Estuary. Furthermore, the design concept of the proposed development accommodates the preservation of the estuary and its supporting habitats. This essentially denotes the first step to achieving some form of conservancy / stewardship status, with the greater goal of achieving formal protected area status in future. In light of the above, the proposed development can be beneficial for the ecological functioning and conservation status of the Umhlali Estuary.

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. The abundance of alien invasive vegetation has resulted in the reduction in indigenous cover and thus the overall value of the remaining vegetation and its contribution to the goals of conserving conservation worthy areas. 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.

Three areas of significance exist on the site in terms of vegetation, and these are (i) the Umhlali River and associated Estuary area, (ii) the Primary Dune and Coastal Dune Scrub / Forest, and (iii) 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. Furthermore, through the development, the formalised protection of these areas can be assured.

Given the responsible planning that has been undertaken, and the associated reduction in biophysical impacts through the realignment and removal of infrastructure from wetland areas and the coastal zone, the proposed development of the Tinley Manor Southbanks should have minimal negative impacts on the biophysical environment.

It is presented that the proposed layout will lead to a significant positive impact for the wetlands on site through the rehabilitation of systems that have previously been heavily degraded. Furthermore, the connectivity of the wetlands has been retained, and will be further enhanced through the removal of unnecessary sugarcane tracks, and thus their functionality will be greatly improved. Where wetland areas cannot be avoided and a minimal loss of wetland will be required, this will be negotiated with the Department of Water and Sanitation via the Water Use Licence Application process and a suitable off-set plan will be developed.

A crucial issue that this assessment attempts to illuminate is the ecological and social carrying capacity of coastal assets linked to the facilitation of and provision of coastal access. If the mitigation measures described above are adequately implemented the coastal area adjacent to the proposed development (which incorporates the dune cordon, beach, shoreline and estuarine environment) will be able to support the kinds and intensities of uses and users implied by the proposed development concept. Beach recreation within the shoreline abutting the proposed development will be limited to low impact activities due to inherent biophysical constraints and sensitive environments. However, the close proximity of beach areas with significantly better opportunities for higher intensity recreation activity represents an opportunity, not only for proposed resort residents/visitors, but for the broader community to enjoy the benefits of the KwaDukuza coastal area, should the proposed public-private partnership be implemented at Tinley Manor Beach.

Stormwater management and attenuation also remains a high priority for a development of this nature. The specialist studies have shown that mitigation of the potentially negative effects of the proposed development with regard to storm events can be successfully mitigated through the implementation of the policy, regulations and guidelines contained in the Stormwater Management Plan, as well as the specific recommendations given in the specialist reports.

The case for the placement of stormwater attenuation measures within wetlands or within the wetland buffers have been assessed. Whilst the location of stormwater attenuation facilities within wetland units are more viable in terms of reduced earth-works and lower capital costs, it has been found that this option would result in a loss of wetland area. Therefore, in aligning with the recent stance of the Department of Water and Sanitation, the Concept Plan presented and SMP have allowed for the location of stormwater attenuation facilities to be located outside of wetland areas, but within the 30 m wetland buffers.

An additional challenge for the project will be the re-use and recycling of surplus fill material. In an effort to address the matter in a strategic and practical manner, the Developer, together with their specialist team, have embarked on the formulation of a management plan for the surplus fill material. Whilst the level of detail required for such a plan is not available at the pre-construction phase, the formulation of the Soil Management Framework Strategy presented in this EIA is a positive step towards this. Whilst many options have been presented in the Strategy, to ensure the beneficial end-use of surplus fill material, surplus fill material sites are required and cannot be avoided due to the nature of the soils and topography of the site.

Two occurrences of unmarked ancestral graves are recorded on the Tongaat Hulett Estates' database and are located within non-development zones of the current proposal due to steepness of slope and the underlying lithography. All graves are to be accorded the highest level of protection and may not be disturbed without both family consent and a permit from Amafa. Having assessed the site, it is found that the potential impact to heritage resources through implementation of the proposed Tinley Manor Southbanks is very low.

Conclusion

In line with the requirements of the National Environmental Management Act (No 107 of 1998)(as amended) Environmental Impact Assessment Regulations, this Environmental Impact Assessment Report has provided a description of the Tinley Manor Southbanks Coastal Development and its associated activities including a the presentation of a detailed Concept Plan. In addition, an explanation of the activities undertaken during the Environmental Impact Assessment Phase and Public Participation Process was also provided. Importantly the report addresses the impacts identified during the scoping phase that were anticipated for the development, as well as providing mitigation measures to ensure for the environmentally sustainable development of the site.

It must be noted that the Concept Plan has evolved over several iterations after lengthy discussions and negotiations between the specialist teams. Given the responsible planning that has been undertaken, and the associated reduction in biophysical impacts through the realignment and removal of infrastructure from wetland areas and the coastal zone, the proposed development of the Tinley Manor Southbanks Coastal Development should have minimal negative impacts on the biophysical environment. It is presented that the proposed layout will lead to a significant positive impact for the biophysical environment on site through the rehabilitation of systems that have previously been heavily degraded. The green open space plays an important role within the development. Careful planning has created value by incorporating the open space within the design conceived in a manner that serves as a lattice that allows for continuity for habitat and for recreational purposes.

Whilst the development will see some ‘negative’ impacts on environmental resources, many of these are to be expected as part of any construction activity, the development will enable the rehabilitation and management of a substantial amount of open space, providing such space is an integral component of the development and instituted in a manner that allows appropriate utilisation by the resident community.

The Developer should be commended for a proposed development layout that has gone to great lengths to reduce encroachment and placement of services within sensitive wetland environments, and the promotion of these contiguous landscape features with rehabilitation will see a significant increase in the delivery of ecosystem goods and services.

As a point of departure, it should be stressed that whilst there are some unavoidable impacts to the receiving environment as with any development of this nature, the option to proceed with Tinley Manor Southbanks as proposed in the Tinley Manor Southbanks Concept Plan outweighs the ‘no-go’ option which would prevent diversification and economic growth.

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Glossary

Activity (Development)	An action either planned or existing that may result in environmental impacts through pollution or resource use. For the purpose of this report, the terms 'activity' and 'development' are freely interchanged.
Alternatives	Different means of meeting the general purpose and requirements of the activity, which may include site or location alternatives; alternatives to the type of activity being undertaken; the design or layout of the activity; the technology to be used in the activity and the operational aspects of the activity.
Applicant	The project proponent or developer responsible for submitting an environmental application to the relevant environmental authority for environmental authorisation.
Biodiversity	The diversity of animals, plants and other organisms found within and between ecosystems, habitats, and the ecological complexes.
Buffer	A buffer is seen as an area that protects adjacent communities from unfavourable conditions. A buffer is usually an artificially imposed zone included in a management plan.
Construction	The building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity but excludes any modification, alteration or expansion of such a facility, structure or infrastructure and excluding the reconstruction of the same facility in the same location, with the same capacity and footprint.
Cumulative Impact	The impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.
Decommissioning	The demolition of a building, facility, structure or infrastructure.
Direct Impact	Impacts that are caused directly by the activity and generally occur at the same time and at the same place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally quantifiable.
Ecological Reserve	The water that is necessary to protect the water ecosystems of the water resource. It must be safeguarded and not used for other purposes. The Ecological Reserve specifies both the quantity and quality of water that must be left in the national water resource. The Ecological Reserve is determined for all major water resources in the different water management areas to ensure sustainable development.
Ecosystem	A dynamic system of plant, animal (including humans) and micro-organism communities and their non-living physical environment interacting as a functional unit. The basic structural unit of the biosphere, ecosystems are characterised by interdependent interaction between the component species and their physical surroundings. Each ecosystem occupies a space in which macro-scale conditions and interactions are relatively homogenous.
Environment	In terms of the National Environmental Management Act (NEMA) (No 107 of 1998) (as amended), "Environment" means the surroundings within which humans exist and that are made up of: i. the land, water and atmosphere of the earth; ii. micro-organisms, plants and animal life; iii. any part or combination of (i) of (ii) and the interrelationships among and between them; and iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

Environmental Assessment	The generic term for all forms of environmental assessment for projects, plans, programmes or policies and includes methodologies or tools such as environmental impact assessments, strategic environmental assessments and risk assessments.
Environmental Authorisation	An authorisation issued by the competent authority in respect of a listed activity, or an activity which takes place within a sensitive environment.
Environmental Assessment Practitioner (EAP)	The individual responsible for planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental instrument introduced through the EIA Regulations.
Environmental Control Officer (ECO)	An individual nominated through the Client to be present on site to act on behalf of the Client in matters concerning the implementation and day to day monitoring of the EMPr and conditions stipulated by the authorities.
Environmental Impact	Change to the environment (biophysical, social and/ or economic), whether adverse or beneficial, wholly or partially, resulting from an organisation's activities, products or services.
Environmental Impact Assessment (EIA)	In relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application as defined in NEMA.
Environmental Issue	A concern raised by a stakeholder, interested or affected parties about an existing or perceived environmental impact of an activity.
Environmental Management	Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.
Environmental Management Programme (EMPr)	A detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive impacts and limiting or preventing negative environmental impacts are implemented during the life cycle of a project. This EMPr focuses on the construction phase, operation (maintenance) phase and decommissioning phase of the proposed project.
Estuary	A body of water formed where freshwater from rivers flows into the ocean, mixing with the seawater. Estuaries and the lands surrounding them are places of transition from land to sea, and from freshwater to saltwater. Although influenced by the tides, estuaries are protected from the full force of ocean waves, winds, and storms by the reefs, barrier islands, or fingers of land, mud, or sand that surround them.
Fatal Flaw	An event or condition that could cause an unanticipated problem and/or conflict which will could result in a development being rejected or stopped.
Groundwater	Water in the ground that is in the zone of saturation from which wells, springs, and groundwater run-off are supplied.
Hazardous Waste	Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles as outlined in the National Environmental Management: Waste Amendment Act (No 26 of 2014).Schedule 3: Category A – Hazardous Waste.
Hydrology	The science encompassing the behaviour of water as it occurs in the atmosphere, on the surface of the ground, and underground.
Indirect Impacts	Indirect or induced changes that may occur as a result of the activity. These types if impacts include all of the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Integrated Environmental Management	A philosophy that prescribes a code of practice for ensuring that environmental considerations are fully integrated into all stages of the development and decision-making process. The IEM philosophy (and principles) is interpreted as applying to the planning, assessment, implementation and management of any proposal (project, plan, programme or policy) or activity - at local, national and international level – that has a potentially significant effect on the environment. Implementation of this philosophy relies on the selection and application of appropriate tools for a particular proposal or activity. These may include environmental assessment tools (such as strategic environmental assessment and risk assessment), environmental management tools (such as monitoring, auditing and reporting) and decision-making tools (such as multi-criteria decision support systems or advisory councils).
Interested and Affected Party (I&AP)	Any person, group of persons or organisation interested in or affected by an activity; and any organ of state that may have jurisdiction over any aspect of the activity.
Method Statement	A method statement is a written submission by the Contractor to the Engineer in response to the specification or a request by the Engineer, setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Engineer when requesting a Method Statement. It contains sufficient detail to enable the Engineer to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.
Mitigate	The implementation of practical measures designed to avoid, reduce or remedy adverse impacts or enhance beneficial impacts of an action.
No-Go Option	In this instance the proposed activity would not take place, and the resulting environmental effects from taking no action are compared with the effects of permitting the proposed activity to go forward.
Pollution	The National Environmental Management Act, No. 107 of 1998 defines pollution to mean any change in the environment caused by – substances; radioactive or other waves; or noise, odours, dust or heat emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.
Public Participation Process	A process in which potential interested and affected parties are given an opportunity to comment on, or raise issues relevant to, specific matters.
Re-use	To utilise articles from the waste stream again for a similar or a different purpose without changing the form of properties of the articles.
Rehabilitation	A measure aimed at reinstating an ecosystem to its original function and state (or as close as possible to its original function and state) following activities that have disrupted those functions.
Scoping	The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addresses in an environmental assessment. The main purpose of scoping is to focus the environmental assessment on a manageable number of important questions. Scoping should also ensure that only significant issues and reasonable alternatives are examined.
Sensitive Environments	Any environment identified as being sensitive to the impacts of the development.
Setback Line	Coastal setback lines are used as a means to control and prevent insensitive, inappropriate and non-sustainable development in sensitive coastal environments. These are also used to ensure public safety and public interests and to reduce the risk posed by climate change and/or the dynamic coastal processes on urban, rural or agricultural land.
Significance	Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. magnitude, intensity, duration

	and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgements and science-based criteria (i.e. biophysical, social and economic).
Stakeholder Engagement	The process of engagement between stakeholders (the proponent, authorities and I&APs) during the planning, assessment, implementation and/or management of proposals or activities.
Surplus Fill Material	Layers of topsoil and subsoil obtained through earth-works which is in excess and cannot be accommodated an engineering fill due to the excess and/or geological content.
Sustainable Development	Development which meets the needs of current generations without hindering future generations from meeting their own needs.
Watercourse	Defined as: i. a river or spring; ii. a natural channel or depression in which water flows regularly or intermittently; iii. a wetland, lake or dam into which, or from which, water flows; and iv. any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998) and a reference to a watercourse includes, where relevant, its bed and banks.
Water Pollution	The National Water Act, 36 of 1998 defined water pollution to be the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it – less fit for any beneficial purpose for which it may reasonably be expected to be used; or harmful or potentially harmful (aa) to the welfare, health or safety of human beings; (bb) to any aquatic or non-aquatic organisms; (cc) to the resource quality; or (dd) to property”.
Wetland	Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

Acronyms

ADD	Average Daily Demand
AMSL	Above Mean Sea Level
CMA	Catchment Management Agency
CMP	Coastal Management Plan
CV	Curriculum Vitae
CvB	Channelled Valley Bottom
DAFF	Department of Agriculture, Fisheries and Forestry
DEDTEA	KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs
DMR	Department of Mineral Resources
DSEDS	District Spatial Economic Development Strategy
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EHI	Estuarine Health Index
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EMS	Environmental Management System
EO	Environmental Officer
ESR	Environmental Scoping Report
FAR	Floor Area Ratio
GDP	Gross Domestic Product
GIS	Geographic Information System
HGM	Hydrogeomorphic Unit
HS	Hillslope Seep
I&AP	Interested and Affected Party
ICB	Interim Certification Board
IDP	Integrated Development Plan
IWULA	Integrated Water Use Licence Application
KSIA	King Shaka International Airport
KZN	KwaZulu-Natal
LIDP	Local Integrated Development Plan
LOS	Level of Service
LUM	Land Use Management
MAR	Mean Annual Run-off
mast	Meter Above Sea Level
MSL	Mean Sea Level
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act (No 107 of 1998)
NEM:ICMA	National Environmental Management Integrated Coastal Management Act (No. 24 of 2008)
NEM:WA	National Environmental Management – Waste Act (No 59 of 2008)
NFA	National Forests Act (Act No. 84 of 1998)
NWA	National Water Act (No 36 of 1998)
PES	Present Ecological State
PGDS	Provincial Growth and Development Strategy
POS	Plan of Study

PPE	Personnel Protective Equipment
PPP	Public Participation Process
PRV	Pressure Reducing Valve
RMU	Ring Main Unit
ROW	Right of Way
SACNASP	South African Council of Natural Science Professionals
SANRAL	South African National Roads Agency Limited
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SEMA	Suite of Environmental Management Acts
SFMS	Surplus Fill Material Site
SMP	Stormwater Management Plan
SSW	Sembcorp Siza Water
SUDS	Sustainable Urban Drainage System
THD	Tongaat Hulett Developments
TIA	Traffic Impact Assessment
UCvB	Unchannelled Valley Bottom
WML	Waste Management Licence
WUL	Water Use Licence
WWTW	Waste Water Treatment Works

1 INTRODUCTION

1.1 Background

Tongaat Hulett Developments (THD) proposes to develop the **Tinley Manor Southbanks Coastal Development**, hereafter referred to as the **Tinley Manor Southbanks**, into a **mixed-use coastal development including a large residential component**.

Tinley Manor Southbanks is an approximately 480 ha site, located between the coastal towns of Tinley Manor and Sheffield Beach within the KwaDukuza Municipality, KwaZulu-Natal (***Figure 1-1***).

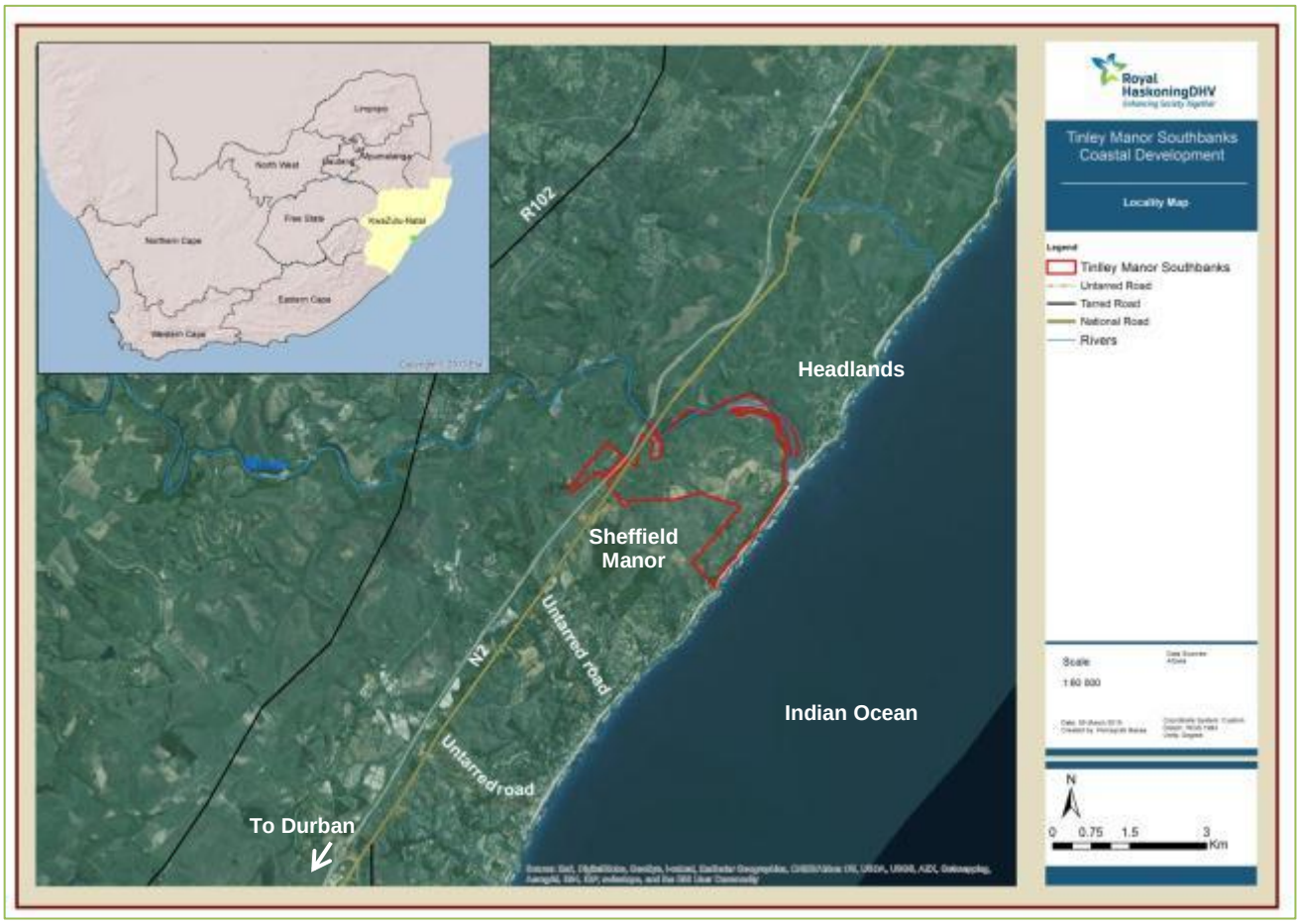

Figure 1-1: Location of the proposed Tinley Manor Southbanks Coastal Development

Royal HaskoningDHV have been appointed by THD to act as an **independent Environmental Assessment Practitioner** (EAP) for the Application for Environmental Authorisation (EA) for the proposed Tinley Manor Southbanks.

The proposed Tinley Manor Southbanks is set to be the first phase of the development of THD's land holdings in Tinley Manor, which is situated to the south and north of the Umhlali River (***Figure 1-2***).

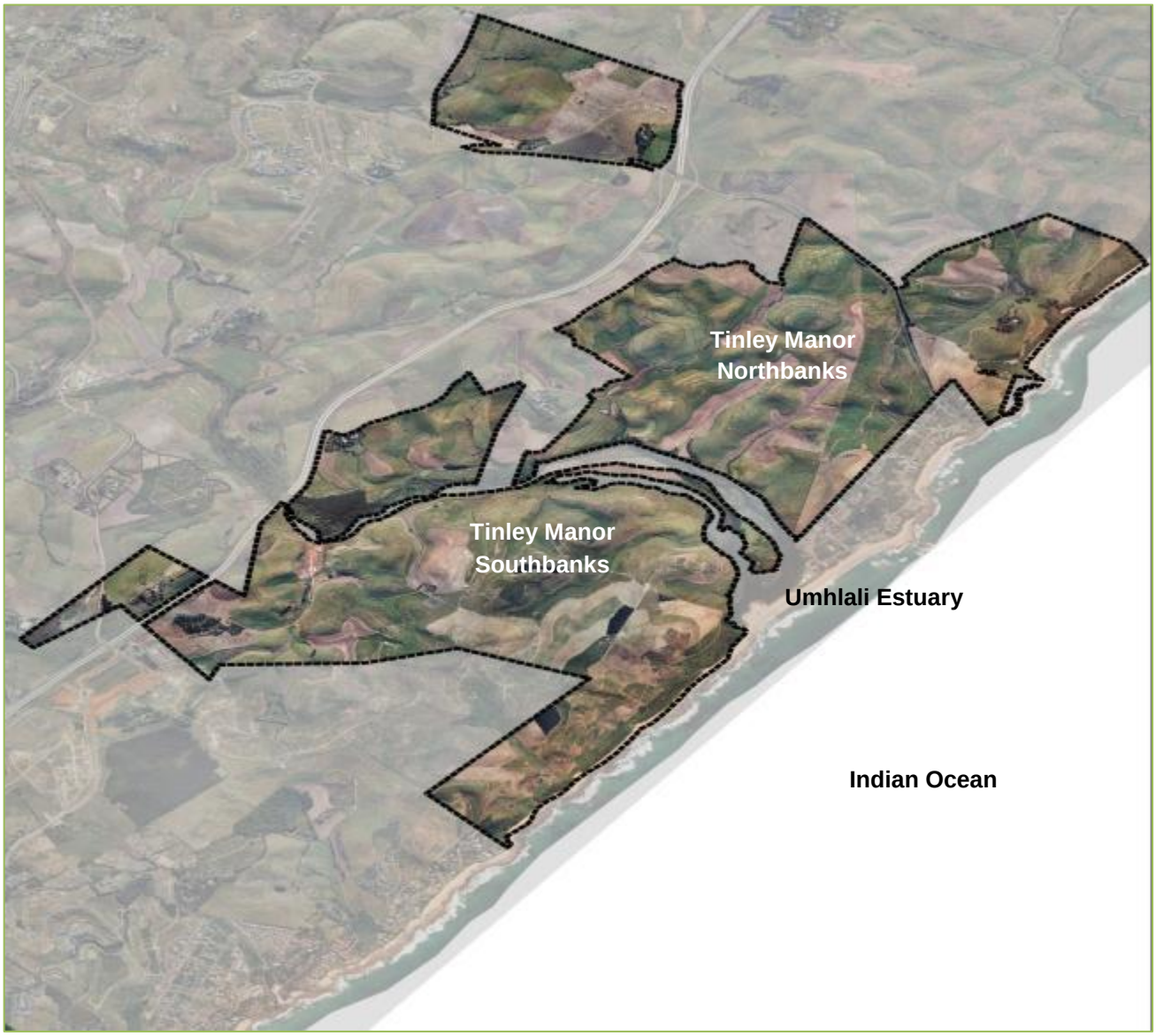

Figure 1-2: THD's proposed Northbanks and Southbanks landholdings

THD's Tinley Manor Estates have substantial potential for development emanating predominantly from the location of KwaDukuza along the provincial development corridor, abutting the eThekwini Municipality, which is also likely to generate significant economic development potential, particularly in the southern part of the area.

There is further potential for the development of economic and social nodal development in the area due to the R102 development corridor which links all inland towns and developments to each other. The location of the North Coast Rail link 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 the KwaDukuza Municipality 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. That is, the existing agricultural sector needs to be enhanced with the provision of linked service industries such that secondary processing and product production is carried out closer to the source and thus benefits the community that is most affected by the presence of the agricultural activities, and on the converse side is the one that most often benefits the least. It is widely agreed that the natural and cultural assets of KwaDukuza, linked to present and future improved accessibility, can and need to be developed further.

As a result of the development potential in the region, THD propose to undertake Tinley Manor Southbanks which is based around the site's exquisite natural and physical attributes. These include a 2.5 km coastline

with existing natural forest, 3.5 km river frontage on the Umhlali River, 1 km frontage to the N2 freeway, and gently rolling hills of land covered in both natural vegetation and large-scale agricultural lands, with expansive and uninterrupted views (***Figure 1-3***).

These natural attributes lend themselves to special tourist, resort, leisure and recreational opportunities, together with upmarket and mixed densities of residential and commercial opportunities which will serve to add economic viability to the greater project whilst also serving as a draw card to further enhancement of the wider area.

The development will require new road infrastructure and service infrastructure, including electricity, sewer reticulation and water supply. The proximity of the site to the beach, as recreational and natural amenity, also requires appropriate and sensitively planned and designed beach access for both residents and tourists to utilise.

Figure 1-3: Aerial photographs of the site

1.2 Approach to the EIA Studies

The required environmental studies for this project entail the undertaking of an Environmental Impact Assessment (EIA) process.

This process is being undertaken in two phases (***Figure 1-4***):

- Phase 1 – Compilation of an **Environmental Scoping Report** (ESR) including **Plan of Study** (PoS) for EIA – *complete*; and
- Phase 2 – Compilation of an **Environmental Impact Assessment Report** (EIAR) and **Environmental Management Programme** (EMPr) – *currently underway.*

These reports must be submitted to the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (KZN EDTEA) (previously referred to as the KwaZulu-Natal Department of Agriculture, Environmental Affairs and Rural Development) and other relevant stakeholder authorities for review, comment, and authorisation – *current*.

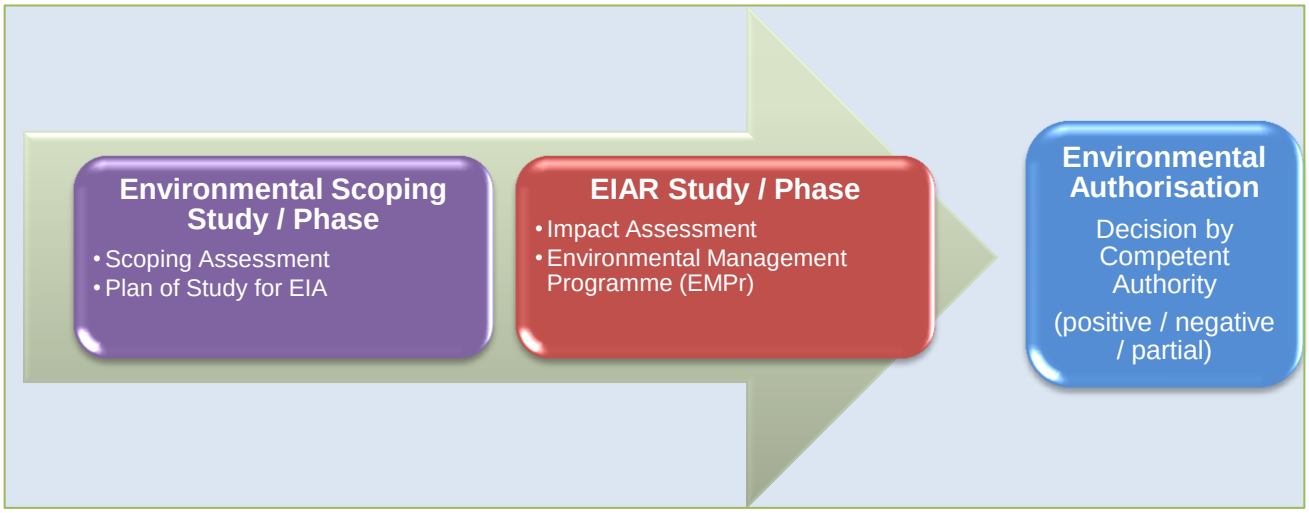

Figure 1-4: Environmental studies flow chart

1.2.1 Environmental Scoping Study

Scoping is the process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an environmental assessment. The main purpose of scoping is to focus the environmental assessment on a manageable number of important questions. Scoping should also ensure that only significant issues and reasonable alternatives are examined.

The ESR provided a description of the receiving environment and how the environment may be affected by the existing development. Desktop studies involving the use of existing information, and ground-truthing through site visits, were used to highlight and assist in the identification of potential significant impacts (both social and biophysical) associated with the project. Additional issues for consideration were extracted from feedback from the public participation process (PPP), which commenced at the beginning of the Scoping phase, and will continue throughout the duration of the EIA.

All issues identified during this phase of the study have been documented within the final ESR which was submitted to the KZN EDTEA EIA Branch for decision-making.

The KZN EDTEA EIA Branch accepted the **final ESR** on **24 January 2012** (***Appendix A***).

A number of extensions to the required submission date (i.e. 6 months after the approval of the ESR), were requested and approved, namely, 09 April 2013 (granted same day), 06 November 2013 (granted same day), 12 March 2014 (granted same day), and, 01 August 2014 (granted same day). Finally, a meeting was held with the EDTEA on 03 November 2014, following which a final extension was requested (05 November 2014) which was acknowledged and granted the same day. The extension of the process by over 18 months related to the need to undertake suitable detailed specialist investigations, to allow for detailed planning of the site so as to respond to market demands, response to and integration of changing regional planning policies and, finally to enable the specialists time to generate amended specialist reports in response to the policy changes.

1.2.2 Environmental Impact Study

This draft EIAR aims to achieve the following:

- to provide an overall assessment of the social and biophysical environments of the affected area by the proposed project;
- to undertake a detailed assessment of the preferred site/alternatives in terms of environmental criteria including the rating of significant impacts;
- to identify and recommend appropriate mitigation measures (to be included in an EMPr) for potentially significant environmental impacts; and

- to undertake a fully inclusive PPP to ensure that interested and affected party (I&AP) issues and concerns are recorded and commented on and addressed in the EIA process.

1.2.3 Environmental Impact Assessment Report

This draft EIAR has been compiled in accordance with the accepted Plan of Study (PoS) for the EIA, and incorporates the findings and recommendations from the Scoping Study, as well as specialist studies conducted for the project during this second phase of the EIA process.

In addition, this draft EIAR has been compiled according to the guidelines provided in Government Notice R.543 of the EIA Regulations (2010) and contains the following:

Table 1-1: EIAR requirements according to Section 31 of GN. R.543

EIAR Requirements according to Section 31 of GN. R. 543	Section in report
31(2)(a) Details of – (i) the EAP who compiled the report; and (ii) the expertise of the EAP to carry out an environmental impact assessment	**1.4**
31(2)(b) A detailed description of the proposed activity	**5**
31(2)(c) A description of the property on which the activity is to be undertaken and the location of the activity on the property	**3.1 & 3.2**
31(2)(d) A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity	**4**
31(2)(e) Details of the public participation process conducted	**8**
31(2)(f) A description of the need and desirability of the proposed activity	**3.3**
31(2)(g) A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity	**6 & 10**
31(2)(h) An indication of the methodology used in determining the significance of potential environmental impacts	**9**
31(2)(i) A description and comparative assessment of all alternatives identified during the environmental impact assessment process	**10**
31(2)(j) A summary of the findings and recommendations of any specialist report or report on a specialised process	**7**
31(2)(k) A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures	**9**
31(2)(l) An assessment of each identified potentially significant impact, including – (i) cumulative impacts; (ii) the nature of the impact; (iii) the extent and duration of the impact; (iv) the probability of the impact occurring; (v) the degree to which the impact can be reversed; (vi) the degree to which the impact may cause irreplaceable loss of resources; and (vii) the degree to which the impact can be mitigated	**9**
31(2)(m) A description of any assumptions, uncertainties and gaps in knowledge	**11**
31(2)(n) A reasoned opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation	**10**
31(2)(o) An environmental impact statement which contains – (i) a summary of the key findings of the environmental impact assessment; and (ii) a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives	**10**
31(2)(p) A draft environmental management programme containing the aspects contemplated in regulation 33	**Appendix B**

EIAR Requirements according to Section 31 of GN. R. 543	Section in report
31(2)(q) Copies of any specialist reports and reports on specialised processes complying with regulation 32	**Appendix C**
31(2)(s) Any other matters required in terms of sections 24(4)(a) and (b) of the Act	**Not applicable**

1.2.4 Environmental Management Programme

A draft EMPr (***Appendix B***) has been compiled for the construction and rehabilitation phases for Tinley Manor Southbanks.

The draft EMPr has been compiled as a stand-alone document from the EIA Report and will be submitted to the KZN EDTEA along with the EIAR documentation. The draft EMPr has been compiled in accordance with the EIA Regulations (2010). The draft EMPr provides the actions for the management of identified environmental impacts emanating from the project and a detailed outline of the implementation programme to minimise and/or eliminate any anticipated negative environmental impacts and to enhance positive impacts. The draft EMPr provides strategies to be used to address the roles and responsibilities of environmental management personnel on site, and a framework for environmental compliance and monitoring.

The EMPr includes the following:

- Details of the person who prepared the EMPr and the expertise of the person to prepare an EMPr;
- Information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in the EIAR, including environmental impacts or objectives in respect of operation or undertaking of the activities, rehabilitation of the environment and closure where relevant;
- A detailed description of the aspects of the activity that are covered by the draft EMPr;
- An identification of the persons who will be responsible for the implementation of the measures;
- Where appropriate, time periods within which the measures contemplated in the draft EMPr must be implemented;
- Proposed mechanisms for monitoring compliance with the EMPr and reporting thereon;
- An environmental awareness plan; and
- Procedures for managing incidents which have occurred as a result of undertaking the activity and rehabilitation measures.

The following plans have been prepared in support of the EMPr (***Table 1-2***):

Table 1-2: List of supporting plans

Specialist Study	Organisation	Appendix
Stormwater Management Plan	SMEC South Africa	***Appendix B 2***
Soil Management Framework Strategy	Royal HaskoningDHV	**Appendix B 3**

1.2.5 Specialist Studies

To ensure the scientific vigour of the EIA process, as well as a robust assessment of impacts, Royal HaskoningDHV was assisted by various specialists in order to comprehensively identify both potentially positive and negative environmental impacts (social and biophysical), associated with the project, and where possible to provide mitigation measures to reduce the potentially negative impacts and enhance the positive impacts.

The following specialist studies have been conducted for Tinley Manor Southbanks (***Table 1-3***):

Table 1-3: List of specialist studies

Specialist Study	Organisation	Appendix
Agricultural Potential Assessment	John Phipson	***Appendix C 1***
Geotechnical Investigation	Drennan, Maud & Partners	***Appendix C 2***
Heritage Assessment	eThembeni Cultural Heritage	***Appendix C 3***
Vegetation Assessment	SiVEST	***Appendix C 4***
Wetland Assessment	SiVEST	***Appendix C 5***
Estuarine Assessment	Royal HaskoningDHV[1]	***Appendix C 6***
Coastal Assessment	Royal HaskoningDHV[2]	***Appendix C 7***
Socio-economic Study	Urban Econ	***Appendix C 8***
Traffic Impact Assessment	Aurecon	***Appendix C 9***

In addition to the above specialist studies, the following reports have been prepared in support of the EIA study (***Table 1-4***):

Table 1-4: List of supporting reports

Specialist Study	Organisation	Appendix
Urban Planning Report	Royal HaskoningDHV	***Appendix C 10***
Engineering Services Report	SMEC South Africa	***Appendix C 11***
Electrical Services Report	Bosch	***Appendix C 12***

1.3 Details of the Project Proponents

THD are the Applicant's and primary developer for Tinley Manor Southbanks. The details of the responsible person from THD are presented in ***Table 1-5***.

Table 1-5: Project applicants contact details

Applicant	Tongaat Hulett Developments
Representative	Bheki Shongwe
Physical Address	305 Umhlanga Rocks Drive La Lucia 4015
Postal Address	PO Box 22319 Glenashley 4022
Telephone	031 560 1900
Facsimile	086 679 9243
E-mail	Bheki.Shongwe@tongaat.com

1.4 Details of the Environmental Assessment Practitioner

The environmental team of Royal HaskoningDHV have been appointed as an independent EAP by THD to undertake the appropriate environmental studies for this proposed project.

The professional team of Royal HaskoningDHV has considerable experience in the environmental management field. Royal HaskoningDHV been involved in and/or managed several of the largest EIAs undertaken in South Africa to date. A specialist area of focus is on the assessment of multi-faceted projects, including the establishment of linear developments (national and provincial roads, and power lines), mixed-use developments, bulk infrastructure and supply (e.g. wastewater treatment works, pipelines, landfills), electricity generation and transmission, the mining industry, urban, rural and township developments,

[1] *As the specialist is from the same organisation as the EAP, the specialist report has been independently peer-reviewed by Source to Sea.*

[2] *As the specialist is from the same organisation as the EAP, the specialist report has been independently peer-reviewed by Source to Sea.*

environmental aspects of Local Integrated Development Plans (LIDPs), as well as general environmental planning, development and management.

It must be noted that as of 21 August 2012, **SSI Engineers and Environmental Consultants (Pty) Ltd** has adopted a new brand, changing its trading name from SSI to **Royal HaskoningDHV (Pty) Ltd**. It should be noted that the EAP functionality remains unchanged.

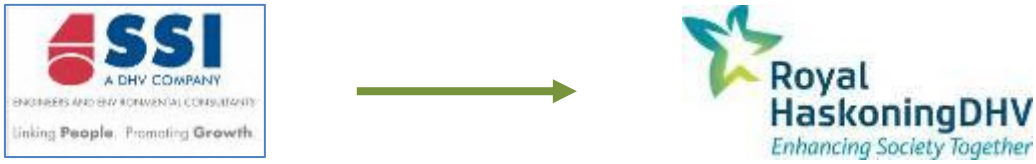

Table 1-6: Details of the EAP

Consultant	Royal HaskoningDHV	Royal HaskoningDHV	Royal HaskoningDHV
Contact Persons	Humayrah Bassa	Bronwen Griffiths	Malcolm Roods
Postal Address	PO Box 55 Pinetown 3610	c/o PO Box 55 Pinetown 3610	c/o PO Box 55 Pinetown 3610
Telephone	031 719 5551	021 936 7714	011 798 6442
Facsimile	031 719 5505	031 719 5505	031 719 5505
E-mail	humayrah.bassa@rhdhv.com	bronwen.griffiths@rhdhv.com	malcolm.roods@rhdhv.com
Qualification	MSc Environmental Science	MSc Conservation Biology (Ecology)	BA (Hons) Geography and Environmental Management
Expertise	Humayrah Bassa is an Associate with approximately 5 years of experience in various facets of environmental management. These include conducting environmental impact assessments and the public participation process (PPP); compiling environmental impact reports; developing environmental management programmes; compiling water use licence applications; conducting environmental control officer duties; and conducting legal compliance audits. She is a Professional Natural Scientist (400032/15) with the South African Council for Natural Scientific Professions.	Bronwen Griffiths is an Associate at RHDHV with extensive experience stretching across 16 years of experience in various environmental fields including: EIAs, EMPrs, PPP, ECO functionality, environmental monitoring and audits. She has also worked as an Environmental Manager for the City of Johannesburg. She is a Professional Natural Scientist (400169/11) with the South African Council for Natural Scientific Professions.	Malcolm Roods is the Service Line Head for the Environmental Management and Compliance Service Line within RHDHV and has approximately 12 years of experience in environmental legislation and processes. He also has extensive experience in the compilation and review of environmental reports. He is certified as an Environmental Assessment Practitioner (EAP) with the Interim Certification Board (ICB) for EAPs of South Africa.

The Environmental Management and Compliance Service Line Profile for Royal HaskoningDHV and the Curriculum Vitae (CV) of the respective EAPs can be found in ***Appendix D***.

2 ENVIRONMENTAL LEGAL REQUIREMENTS

The following key legislation is pertinent to the proposed Tinley Manor Southbanks:

- National Environmental Management Act (Act No. 107 of 1998) (as amended) (NEMA)[3];
- National Environmental Management: Waste Act (Act No. 59 of 2008) (as amended) (NEM:WA);
- National Environmental Management Biodiversity Act (Act No. 10 of 2004) (NEM:BA);
- National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008) (NEM:ICMA);
- National Environmental Management: Protected Areas Act (Act No. 57 of 2003) (NEM:PAA);
- National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM:AQA);
- National Water Act (Act No. 36 of 1998) (as amended) (NWA);
- National Forests Act (Act No. 84 of 1998);
- KZN Nature Conservation Ordinance (Ordinance No. 15 of 1974);
- National Heritage Resources Act (Act No. 25 of 1999) (NHRA);
- Conservation of Agricultural Resources Act (Act No.43 of 1983) (CARA);
- National Veld and Forest Act (Act No. 101 of 1998);
- Hazardous Substance Act (Act No. 15 of 1973) and Regulations;
- National Building Regulations and Building Standards Act (Act No. 103 of 1997); and
- Occupational Health and Safety Act (No 85 of 1993) (OSHA) and Regulations.

In order to obtain the necessary authorisations, permits or licences from the relevant authorities, a number of regulatory processes need to be followed. A parallel integrated approach to conducting these processes is currently being undertaken.

The following regulatory processes are underway.

2.1 National Environmental Management Act (No 107 of 1998) (as amended)

The National Environmental Management Act (NEMA) provides environmental governance by providing principles for decision-making on matters that affect the environment and defines the principles that apply to the organs of state involved in that decision-making.

The Act sets out the legal and procedural requirements for environmental compliance. Regulations under the Act define activities that may not commence without prior approval from the competent authority.

The KZN EDTEA is the competent authority for this EIA process and the development needs to be authorised by this Department in accordance with the NEMA (as amended).

The activities associated with this development, for which environmental authorisation is required are detailed in ***Table 2-1***.

It is noted that the applicable activities presented in ***Table 2-1*** are as per GNR. 544 – GNR. 546 of the EIA Regulations (2010) (as amended) as the Application for EA for Tinley Manor Southbanks was lodged in 2011, prior to the enactment of the EIA Regulations (2014).

This 'Arrangements for Pending applications' (NEMA), as provided for in regulation 53(3), states:

> *"Where an application submitted in terms of the previous NEMA regulations, is pending in relation to an activity of which a component of the same activity was not identified under the previous NEMA notices, but is now identified in terms of section 24(2) of the Act, the competent authority must dispense of such application in terms of the previous NEMA regulations and may authorise the activity identified in terms of section 24(2) as if it was applied for, on condition that all impacts of the newly*

[3] *Note that NEMA, NEM:WA, NEM:BA, NEM:ICMA, NEM:PAA, NEM:AQA and NWA are grouped together as the Suite of Environmental Management Acts (SEMA).*

identified activity and requirements of these Regulations have also been considered and adequately assessed."

Therefore, should environmental authorisation be granted, it would be granted in terms of the previous 2010 EIA Regulations, but still needs to cover all relevant new listed activities (2014) in order that the activity may proceed without being deemed to be in contravention of the new regulations.

To ensure that no gaps exist, please a full comparison of the 2010 and 2014 EIA Regulations in ***Appendix E***.

It is thus contended that the EIA documentation as submitted to date addresses all relevant EIA listed activities both in terms of the 2010 and 2014 iteration of the regulations.

Table 2-1: Listed activities triggered according to Listing Notices 1, 2 and 3 of the EIA Regulations (2010)

Listed Activities		
Listing Notice 1 (GNR. 544)		
Activity 9	The construction of facilities or infrastructure exceeding 1,000 m in length for the bulk transportation of water, sewage or stormwater – i. with an internal diameter of 0.36 m or more; or ii. with a peak throughput of 129 ℓ/s or more, excluding where: a) such facilities or infrastructure are for bulk transportation of water, sewage, or stormwater drainage inside a road reserve; or b) where such construction will occur within urban areas but further than 32 m from a watercourse, measured from the edge of a watercourse.	The proposed project includes the construction of water pipelines (linking to the surrounding reticulation), sewer line reticulation within the development, and stormwater attenuation / bulk stormwater controls. It is anticipated that the various pipelines combined will exceed 1,000 m in length and some thereof will be within 32 m of a watercourse (e.g. wetlands and/or the Umhlali River and Estuary). Furthermore, pipelines will need to be installed for the irrigation network for open space areas.
Activity 10	The construction of facilities or infrastructure for the transmission and distribution of electricity – i. outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kV; or ii. inside urban areas or industrial complexes with a capacity of 275 kV or more.	The proposed project includes the construction of facilities and/or infrastructure for the transmission and distribution of electricity inside an urban area with a capacity of 275 kV or more. This includes both sub-stations and distribution cables linking to the development and within the development.
Activity 11	The construction of: iii. bridges; iv. dams; xi. bulk stormwater outlet structures; xii. marinas; xiii. jetties exceeding 50 m^2 in size; v. buildings exceeding 50 m^2 in size; or vi. infrastructure or structures covering 50 m^2 or more, where such construction occurs within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	The proposed project will see construction of service infrastructure such as sewer lines, pipelines, electrical cabling, and/or road infrastructure within 32 m of a watercourse (wetlands and/or the Umhlali River and Estuary). Furthermore, the project will involve the construction of earth-worked platforms (for emplacements for infrastructure and buildings), portions of which will occur over watercourse buffer areas including potentially within wetlands. It is also specifically proposed that some road alignments will traverse wetland area. The intent is to limit this as far as possible, but given the size of the development and the topography, total avoidance is not feasible. In addition, it is proposed that stormwater will be attenuated *via* attenuation facilities located within 32 m of wetlands and/or watercourses. Stormwater attenuation facilities may take the form of artificial wetlands, rehabilitated watercourse floodplain areas, or re-use of old stormwater control mechanisms. Therefore this activity is applicable for the following infrastructure located within a watercourse or within 32 m of a watercourse: • Earth-worked platforms; • Water pipelines; • Sewer lines; • Irrigation infrastructure (e.g. pump stations, pipelines and storage

Listed Activities		
		facilities); • Electrical cabling (underground or the pylon footprints for aboveground cabling); • Stormwater attenuation facilities; • Potential Reservoirs; and • Roads and bridges.
Activity 12	The construction of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 m^3 or more, unless such storage falls within the ambit of activity 19 of Notice 545 of 2010.	The proposed project will see the construction of stormwater attenuation facilities off-stream. The combined capacity of these facilities may exceed 50 000 m^3.
Activity 13	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 m^3.	The proposed project may involve the storage of dangerous goods above these thresholds during the construction and/or operational phase. Such hazardous substances are counted cumulatively for the entire site and may include transformer oil, fuel, agricultural substances (e.g. pesticides and herbicides), etc.
Activity 14	The construction of structures in the coastal public property where the development footprint is bigger than 50 m^2, excluding i. the construction of structures within existing ports or harbours that will not increase the development footprint or throughput capacity of the port or harbour; ii. the construction of a port or harbour, in which case activity 24 of Notice 545 of 2010 applies; iii. the construction of temporary structures within the beach zone where such structures will be demolished or disassembled after a period not exceeding 6 weeks.	The proposed project may see the construction of structures in the coastal public property with an area exceeding 50 m^2.
Activity 16	Construction or earth moving activities in the sea, an estuary, or within the littoral zone or a distance of 100 m 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 m^2 or more; or vi. infrastructure covering 50 m^2 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	The proposed project will see construction of service infrastructure such as sewer lines, pipelines, electrical cabling and/or road infrastructure as well as buildings and other such infrastructure within 100 m of the sea and/or Umhlali Estuary. The reasoning behind caution being applied in this zone is due to dunes and their associated vegetation, as well as the intertidal zone with its highly sensitive ecology and functionality.

Listed Activities		
	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 Notice 545 of 2010 applies.	
Activity 17	The planting of vegetation or placing of any material on dunes and exposed sand surfaces, within the littoral active zone for the purpose of preventing the free movement of sand, erosion or accretion, excluding where the planting of vegetation or placement of material relates to restoration and maintenance of indigenous coastal vegetation or where such planting of vegetation or placing of material will occur behind a development setback line.	The proposed project may see the planting of vegetation or erosion control measures within the littoral active zone as part of the coastal dune rehabilitation proposed.
Activity 18	The infilling or depositing of any material of more than 5 m^3 into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock or more than 5 m^3 from: i. a watercourse; excluding where such infilling, depositing, dredging, excavation, removal or moving; a) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or b) occurs behind the development setback line.	The proposed project will require the infilling of wetlands and/or the removal of material from wetlands for the following: • Earth-worked platforms; • Water pipelines; • Sewer lines; • Irrigation infrastructure (e.g. pump stations, pipelines and storage facilities); • Electrical cabling; • Stormwater attenuation facilities; • Potential Reservoirs; and • Roads and bridges.
Activity 22	The construction of a road, outside urban areas, i. with a reserve wide than 13.5 m or; ii. where no reserve exists where the road is wider than 8 m; or iii. for which an environmental authorisation was obtained for the route determination in terms of activity 18 in Notice 545 of 2010.	The proposed project includes the construction of new roads in regions where there is no road reserve. The road reserve is expected to be greater than 13.5 m as the roads will be a minimum of 1 lane per direction.
Activity 26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	Applicable for the removal of protected trees which may require a DAFF Permit.

Listed Activities		
Activity 28	The expansion of or changes to existing facilities for any process or activity where such expansion or changes to will result in the need for a permit or licence in terms of national or provincial legislation governing the release of emissions or pollution, excluding where the facility, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.	This activity is specified as the need for a Water Use Licence acts as a trigger.
Activity 39	The expansion of iii. bridges; iv. weirs; x. bulk storm water outlet structures; within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint but excluding where such expansion will occur behind the development setback line.	Applicable for the expansion of existing infrastructure, stormwater outlet structures and/or bridges greater than 50 m^2 in size within 32 m to a watercourse.
Activity 45	The expansion of facilities in the sea, an estuary, or within the littoral active zone or distance of 100 m 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 m^2; vi. infrastructure by more than 50 m^2; 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	The proposed project will see expansion construction of service infrastructure such as sewer lines, pipelines, electrical cabling and/or road infrastructure as well as buildings and other such infrastructure within 100 m of the sea and/or Umhlali Estuary.
Activity 47	The widening of a road by more than 6 m, or the lengthening of a road by more than 1 km – i. where the existing reserve is wider than 13.5 m; or ii. where no reserve exists, where the existing road is wider than 8 m – Excluding widening or lengthening occurring inside urban areas.	The proposed project may include upgrades to existing road networks.
Activity 56	Phased activities for all activities listed in this Schedule, which commenced on or after the effective date of this Schedule, where any	THD's Tinley Manor landholdings (Northbanks and Southbanks) are being undertaken in a phased manner, with the Southbanks being the first phase

Listed Activities		
	one phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold; – Excluding the following activities listed in this Schedule: 2; 11(i)-(vii); 16(i)-(iv); 17; 19; 20; 22(i) & 22(iii); 25; 26; 27(iii) & (iv); 28; 39; 45(i)-(iv) & (vii)-(xv); 50; 51; 53; and 54.	of the Tinley Manor developments. Furthermore, if authorised, the construction of the Tinley Manor Southbanks Coastal Development would most likely be done in a phased manner over a number of years.
Listing Notice 2 (GNR. 545)		
Activity 3	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 m^3.	The proposed project may involve the storage of dangerous goods above these thresholds during the construction and/or underground and/or aboveground storage tanks during the operational phase.
Activity 5	The construction of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.	Potentially applicable for the Water Use Licence – if however the activity is deemed to fall within GNR 544, then this activity is not deemed applicable.
Activity 8	The construction of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex.	The proposed project includes the construction of facilities and/or infrastructure for the transmission and distribution of electricity with a capacity of 275 kV or more outside urban areas. This includes both sub-stations and distribution cables linking to the development and within the development.
Activity 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 ha or more; i. except where such physical alteration takes place for: ii. linear development activities; or iii. agriculture or afforestation where activity 16 in this Schedule will apply.	The project proposes to develop approximately 480 ha of land at the Tinley Manor Southbanks estate. The proposed site is currently a site under sugarcane cultivation. Proposed infrastructure within the Tinley Manor Southbanks site includes:: • Earth-worked platforms for top-structures including, but not limited to houses, retail and commercial complexes, schools, clinics, police stations and other such social facilities, play grounds, sports fields, sites for surplus fill material, service infrastructure, and parking lots.
Activity 18	The route determination of roads and design of associated physical infrastructure, including roads that have not yet been built for which routes have been determined before 03 July 2006 and which have not been authorised by a competent authority in terms of Environmental Impact Assessment Regulations, 2006 or 2009, made under section 24(5) of the Act and published in Government Notice No. R. 385 of 2006 – i. it is a national road as defined in section 40 of the South African Roads Agency Limited and National Roads Act, 1998 (Act No. 7 of	The proposed project includes the construction of new roads and limited upgrading to existing road networks. The road infrastructure will be wider than 30 m, may involve upgrades to roads administered by a national or provincial authority and will cater to more than one lane of traffic in both directions, particularly with regard to access interchanges proposed.

Listed Activities		
	1998); ii. it is a road administrated by a provincial authority; iii. the road reserve is wider than 30 m; or iv. the road will cater for more than one lane of traffic in both directions.	
Listing Notice 3 (GNR. 546)		
Activity 6	The construction of resorts, lodges or other tourism accommodation facilities that sleep 15 people or more, (a) in KwaZulu-Natal: ii. Outside urban areas in: (ii) Areas on the watercourse side of the development setback line or within 100 metres from the edge of a watercourse where no such setback line has been determined.	As a formal development setback line has not been defined by the Municipality, this activity is potentially applicable for the construction of tourism accommodation that sleep 15 people or more outside urban areas within 100 m from the edge of a watercourse.
Activity 12	The clearance of an area of 300 m^2 or more of vegetation where 75% or more of vegetation cover constitutes indigenous vegetation, a) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; b) Within critical biodiversity areas identified in bioregional plans; c) Within the littoral active zone or 100 m inland from high water mark of the sea or an estuary, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas.	As a formal development setback line has not been defined by the Municipality, this activity is potentially applicable for the clearance of an area of 300 m^2 or more of vegetation where 75% or more of the vegetation cover is indigenous within 100 m inland from the high water mark of the sea of an estuary.
Activity 13	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetation cover constitutes indigenous vegetation, except where such removal of vegetation is required for: 1) the undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), in which case the activity is regarded to be excluded from this list. 2) the undertaking of a linear activity falling below the thresholds mentioned in Listing Notice 1 in terms of GN No. 544 of 2010, (c) In KwaZulu-Natal: i. In an estuary ii. Outside urban areas in: (gg) Areas seawards of the development setback line or within 1	As a formal development setback line has not been defined by the Municipality, this activity is potentially applicable for the clearance of an area of 1 ha or more of vegetation where 75% or more of the vegetation cover is indigenous for a linear activity in KwaZulu-Natal in an estuary or within 1 km from the high-water mark.

Listed Activities		
	km from the high-water mark of the sea if no such development setback line is determined.	
Activity 26	Phased activities for all activities listed in this Schedule and as it applies to a specific geographical area, which commenced on or after the effective date of this Schedule, where any phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold.	Applicable for Phased Activities in KwaZulu-Natal.

2.2 National Environmental Management: Waste Act (Act No. 59 of 2008) (as amended)

The National Environmental Management: Waste Act (NEM:WA) has been considered, however, no activities have been identified for the proposed earth-works. It is noted that should an end-use Developer trigger any activities in terms of the NEM:WA, the end-use Developer will be required to apply for a Waste Management Licence (WML) in terms of the Act. This also applies to clinics and other health care facilities.

Furthermore, the project team have engaged with the KZN EDTEA regarding the proposed surplus fill material sites. KZN EDTEA has affirmed that provided there is a beneficial end-use for the material and/or the site, a WML will not be required for this material which would otherwise be considered to be "spoil" and has therefore, not been applied for.

2.3 National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008)

The National Environmental Management: Integrated Coastal Management Act (NEM:ICMA) of 2008 (Act No. 24 of 2008) and linked Integrated Coastal Management Amendment Act of 2014 (Act No. 36 of 2014) (NEM:ICMAA) emanate from the White Paper for Sustainable Coastal Development in South Africa and propose 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 sustainable as well as 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 NEM:ICMA aims to facilitate the implementation of the principles and guidelines presented by the White Paper and has a number of objectives including:

- The provision of a legal and administrative framework to promote cooperative, co-ordinated 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 requires that activities that are potentially harmful to the coastal zone are considered as part of the NEMA EIA processes (***Section 2.1***) including potential cumulative impacts.

2.4 National Water Act (Act. No 36 of 1998) (as amended)

The National Water Act (NWA) is a legal framework for the effective and sustainable management of water resources in South Africa. Central to the NWA is recognition that water is a scarce resource in the country which belongs to all the people of South Africa and needs to be managed in a sustainable manner to benefit all members of society. The NWA places a strong emphasis on the protection of water resources in South Africa, especially against its exploitation, and the insurance that there is water for social and economic development in the country for present and future generations.

Water use in South Africa is managed through a water use authorisation process, which requires that every water use is authorised by the Department of Water and Sanitation (DWS, previously known as the Department of Water Affairs) or an established Catchment Management Agency (CMA, if applicable for that region), once the water requirements for the Reserve have been determined.

A water use must be licensed unless it (a) is listed in Schedule 1, (b) is an existing lawful use, (c) is permissible under a general authorisation (GA), or (d) if a responsible authority waives the need for a licence. If none of these are relevant a so-called water use licence (WUL) must be applied for and obtained prior to the

commencement of such listed activity. In terms of such a WUL the Minister may choose to limit the amount of water which a responsible authority (e.g. CMA, water board, municipality) may allocate. In making regulations and determining items such as GAs, the Minister may differentiate between different water resources, classes of water resources, and geographical areas.

As a result of the nature of the proposed development and the requirement for extensive platforming, portions of vegetation and portions of degraded wetland are required to be in-filled. As such a Section 21 *(c)* and *(i)* WUL will be required for the infilling of these wetlands. Additionally, other water uses according to Section 21 of the Act have also been identified.

The NWA, as applicable to the proposed development (see comment in brackets after each item), defines the identified water uses which are potentially applicable under Section 21 as follows:

(a) *abstraction of water from a watercourse* (potentially applicable for the abstraction of water from the Umhlali River for irrigation)*;*

(b) *storing of water* (applicable for the construction of stormwater attenuation facilities);

(c) *impeding or diverting the flow of water in a watercourse* (applicable for wetland and/or watercourse crossings); *and*

(i) *altering the bed, banks, course or characteristics of a watercourse* (applicable for wetland and/or watercourse crossings).

The NWA defines a water resource to be a watercourse, surface water, estuary, or groundwater (aquifer). Included under surface water are manmade water channels, estuaries and watercourses.

Due to the large number of water uses applicable for this project, an integrated WUL Application (IWULA) for the Tinley Manor Southbanks Coastal Development will be conducted and the final version thereof will be submitted to the DWS in the coming months. The project team will engage with DWS on the requirements of this submission through a pre-application meeting which is in the process of being initiated.

2.5 National Forests 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'.*

In essence the National Forests Act (NFA) prohibits the destruction of indigenous trees in any natural forest without a licence.

In terms of the NFA 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 licence. In the case of the current assessment a Department of Agriculture, Forestry and Fisheries (DAFF) licence may be required for the proposed removal of forest area.

2.6 KZN Nature Conservation Ordinance (Ordinance No. 15 of 1974)

Protected indigenous plants in general are controlled under the relevant provincial Ordinances or Acts dealing with nature conservation.

In KwaZulu-Natal 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. A permit may be required to remove/relocate indigenous plants within the site.

SiVEST, the Vegetation specialists appointed for this project, are pursuing the necessary permit/licensing requirements from DAFF and Ezemvelo KZN Wildlife on behalf of the Applicants.

3 PROJECT PLANNING CONTEXT

3.1 Site locality

The proposed Tinley Manor Southbanks site is located on the eastern seaboard of KwaZulu-Natal, in the KwaDukuza Municipality, approximately 10 km north of the greater Ballito area (also referred to as the Dolphin Coast), 25 km from the King Shaka International Airport (KSIA) and 50 km north of Durban (***Figure 3-1***). Current access to the site is via the N2 which forms the backbone of the eThekwini-uMhlatuze Provincial development corridor that connects the ports of Durban and Richards Bay.

The site is bounded by two significant natural features of the Umhlali River Estuary to the north and the Christmas Bay beach and Indian Ocean to the east. The regional N2 freeway traverses a small part of the western portion of the site with the partly developed low density residential estate of Seaton Delaval forming the southern boundary.

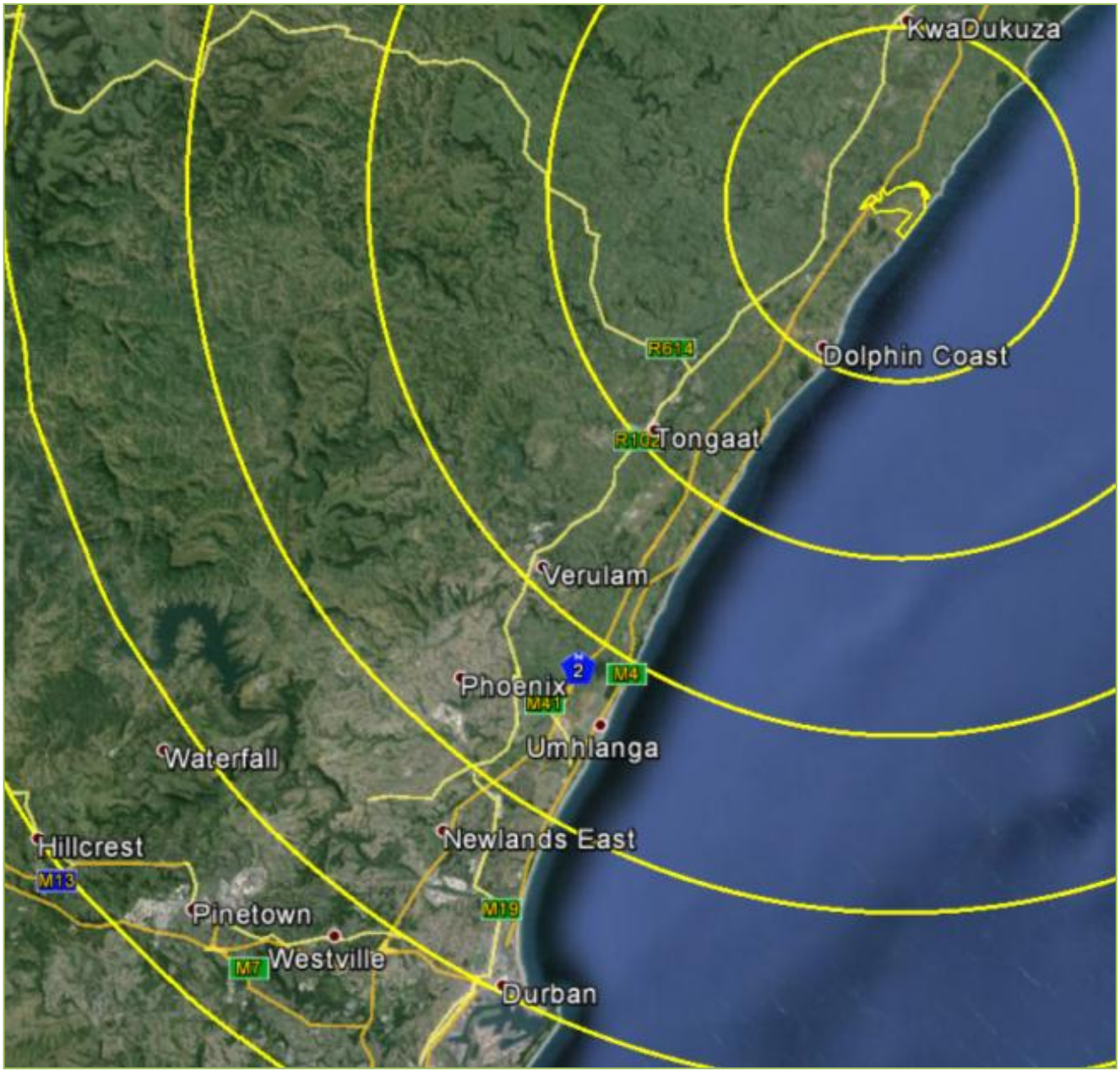

Figure 3-1: Tinley Manor Southbanks regional context

3.2 Zoning and Ownership

The site is zoned as agriculture and is currently under sugarcane cultivation. Tinley Manor Southbanks is located within the KwaDukuza Local Municipality situated within the Ilembe District Municipality and consists of numerous subdivisions or land parcels (***Figure 3-2***).

Figure 3-2: Site boundary

All five properties which make up the Tinley Manor Southbanks estate are owned by Tongaat Hulett (***Table 3-1***).

Table 3-1: List of properties and landowners

Property Description	Ownership	SG 21 Digit Code
Sub 22 of Lot 61 No. 1521	Tongaat Hulett	N0FU03330015210000022
Rem of Sub 44 of Lot 69 No. 917	Tongaat Hulett	N0FU03330009170000044
Rem of 10 of Lot 69 No. 917	Tongaat Hulett	N0FU03330009170000010
Sub 11 of Lot 69 No. 917	Tongaat Hulett	N0FU03330009170000011
Rem of Portion 83 of the Farm Lot 69 No. 917	Tongaat Hulett	N0FU03330009170000083

3.3 Need and Desirability

The location of Tinley Manor Southbanks is ideally positioned for the proposed development by THD.

The KwaDukuza Municipality, in which the site for this development is located, is favourably positioned for tourism as it contains approximately 50 km of coastline in close proximity to the eThekwini Municipality. Additionally, the site is easily accessible from the N2 and is located in close proximity to the King Shaka International Airport.

The Spatial Development Framework (SDF) for the KwaDukuza Municipality identifies particular existing and potential future tourism nodes along the coast. The SDF notes the importance of appropriate coastal development in the region by suggesting 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, according to the SDF, should 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 and enhancement of the facilities linked thereto. Amenities along the beach therefore need to be upgraded appropriately.

Furthermore, 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. It has been established that pressure on land at present used for agricultural activities, mostly in the form of sugarcane cultivation, may require a more efficient land utilisation as well as a greater diversification. 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.

Tinley Manor Southbanks intends to address the need for economic development through tourism through the release of land for much needed commercial and residential development. Furthermore, the project offers significant opportunities to create new, well located employment opportunities close to new and existing housing. The scale of the project allows for the development of environmentally and financially sustainable innovations in service and housing delivery models. In addition, the project will facilitate new forms of urban development, choices and lifestyle options.

It is expected that the proposed Tinley Manor Southbanks will contribute significantly to the economy of the KwaDukuza Municipality by reducing unemployment in the region through the injection of over R12 billion in capital costs. Furthermore, the proposed development is expected to contribute significantly to the rates base of the KwaDukuza Municipality. The proposed developments' accumulated contribution to municipal rates are estimated to be around R75 million by 2020 and this is expected to increase toR2.9 billion by 2030. This is based in the assumption that rates will not be collected during the first two years due to rebates offered.

The positive economic impact of the capital expenditure that will be injected into the provincial economy during the construction of the proposed development is anticipated to be as follows:

- A total of R14 billion of new business sales will be created directly and indirectly in the regional economy;
- This will translate to a total value addition of R4,8 billion to Gross Geographic Product;
- The households benefitting from economic activity created by the capital expenditure will see their income increase by R2.5 billion;

- The capital expenditure phase will create a total of 40 602 job opportunities throughout the total value chain over the lifetime of the development's construction.

Bulk infrastructure is estimated at R291 670 000, which will be injected into the provincial economy during the construction of the bulk infrastructure. The multiplier impact of such an injection is displayed below:

- A total of R323 million of new business sales will be created directly and indirectly in the regional economy;
- This will translate to a total value addition of R220 million to Gross Geographic Product;
- The households benefitting from economic activity created by the capital expenditure will see their income increase by R74 million; and
- The capital expenditure phase will create a total of 200 job opportunities throughout the total value chain over the lifetime of the development's construction.

This is noted as being a summation of the direct impacts to the economic status of the greater regional area. It should be noted that some of the harder to predict cascade or knock-on impacts cannot be predicated with any high level of reliability at this time, but should obviously be considered as real, if not fully quantified, added value.

3.3.1 Planning Vision, Objectives and Principles

The development framework of the site has been developed taking into account current social and economic conditions which THD seeks to influence positively, informed by the need to ensure that the development contributes to the integration and effectiveness of the KwaDukuza Municipality's objectives that 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. Therefore, the Tinley Manor Southbanks has the potential to deliver on a range of development objectives given its strategic location.

3.3.1.1 Development Vision

The following principles have informed the Vision for Tinley Manor Southbanks site:

- Responding to the imperative of environmental sustainability and the need for settlements to be resilient to impacts of climate change;
- Provision of an integrated "living working and playing" environment that is characterised around the key coastal environmental attributes of the site and its location in the regional spatial economy;
- Creation of a development that responds to emerging lifestyle needs driven by globally responsible development; and
- Concept that provides for access to the beach and an 'open' mixed-use development with secured resort and residential precincts.

Tinley Manor Southbanks is intended to be an integrated, mixed-use coastal development with a mix of lifestyle options, including food production zones (i.e. including beneficiation of agricultural resources), integrated through a well-designed, high quality, safe and secure network of public spaces and commercial and social facilities. It will have a human scaled settlement form that is discernible and that promotes the use of non-motorised and "public" forms of transportation, social engagement and community cohesion, beach access, promoting care for the environment, and the sustainable use of natural resources.

3.3.1.2 Development Objectives

Overarching objectives that will need to be adhered to in the development of the site and that underpin the development concepts include the following:

- Regenerate, rehabilitate and enhance the ecological functioning of the site to provide a supportive and robust base for settlement and development;
- Create a diversity of land use and settlement forms and intensities integrated into a cohesive, efficient and productive whole;

- Integrate, as far as is possible, the proposed new development with the existing and emerging regional ecological, spatial development and transportation systems;
- Encourage and promote, as far as is possible, the increased use of, and integration of, non-motorised and "public" transportation with existing conventional transportation systems;
- Provide for the development of viable agricultural activities and businesses that contribute to the character, attraction and value of the estate;
- Accommodate demand for exclusive forms of development but provide opportunities for integration through well designed public spaces and places; and
- Facilitate appropriate and managed access to the sensitive coastal environment.

3.3.1.3 Development Principles

Therefore, informed by the policy framework as well as the development vision and objectives, the following are considered the key principles and development philosophy for the Tinley Manor Southbanks include:

- ***Consolidation / enhancement of the coastal tourism corridor:*** At a district level, the beaches have been identified as key economic strengths of the district, and, the coastal corridor from Ballito to north of the Tugela River mouth has been identified as the primary tourism corridor in the district. The objectives at the district level are to promote the development of the tourism sector with a primary focus along the coast and promoting greater diversity in tourism. The ratios of land use types and the inter-relationships between these different land uses and the existing open space functionality of the beach area and its buffer thus all become crucial considerations with these patterning thereof needing to ensure that tourism related to the coast is consolidated (i.e. functions as an interlinked entity with adjacent areas, supports tourism) and further enhances existing tourism initiatives and presents opportunities for on-going development of tourism opportunities in the greater area. All of these must obviously be considered within the context of ensuring that the ecological functionality of the coastal zone (i.e. beach, inter-tidal zone, dunes, estuary, and buffering ecosystem areas) is maintained.
- ***Protection of the fragile / vulnerable coastal assets:*** The significant development pressures on the coastal strip detailed in the policies reinforce the need for any future development along this coastline to be in line with ecologically sound and sustainable principles and must lead to resilient settlement making. A key implication for the Tinley Manor Southbanks is the emphasis on environmental rehabilitation and protection, and the need for infrastructure to be setback from the limited development and coastal setback line. That is, the pattern of development should allow for open space to be an interlinked network with the existing open space areas, enhancing and increasing these as viable, enhancing connectivity, and making use of buffering land uses to limit impacts on the more sensitive areas with more 'damaging' land uses placed at a remove from the sensitive areas.
- ***Responsiveness to coastal erosion managed through the coastal setback line***: The development proposals at Tinley Manor Southbanks should ensure that only appropriate and sensitive infrastructure is placed within this zone, this may include sacrificial light weight structures or pathways that do not require significant investment and are easily replaceable and that would not impact on the objectives of the setback line.
- ***Protection of high potential agricultural land:*** The development of Tinley Manor Southbanks should not compromise opportunities to protect high potential agricultural land for commercial production of high value perishable produce destined for export through the airport (Umhlanga to Ballito). This is intrinsic to the development with protection of the more valuable agricultural land, with linkages to on-site agricultural beneficiation opportunities.
- ***Integrated development response to recreation and residential needs:*** The Development Strategy identifies the variety of development interests and population pressures along the northern KwaZulu-Natal coastline, and emphasises the need to conserve coastal resources. The development of Tinley Manor Southbanks should protect and enhance valuable coastal resources while promoting an integrated planning approach that ensures effective economic development that meets social needs.

3.3.2 Policy Informants

A plethora of legislation, policies and strategies from national, provincial and local government govern and influence spatial planning and development.

The Tinley Manor Southbanks Coastal Development Urban Planning Report (2015) draws specific attention to those policies and documents which provide strategic direction to the future development potential of the Tinley Manor Southbank area.

The key policy informants for the Tinley Manor Block Concept Spatial Development Plan include the following:

- National Policy:
  - The National Environmental Management: Integrated Coastal Management Act
- Provincial Policy:
  - The KwaZulu-Natal Provincial Growth and Development Strategy and Plan (2030)
  - The KwaZulu-Natal Tourism Strategy (2008-2012)
- District Policy:
  - The Ilembe Integrated Development Plan (2012-2017), including the Ilembe Spatial Development Framework
  - The Ilembe District Spatial Economic Development Strategy (2012)
  - The Ilembe draft Environmental Management Framework (2013)
- Municipal Policy:
  - The KwaDukuza Integrated Development Plan (2012-2017)
  - The KwaDukuza Spatial Development Framework (2008; 2009, 2011 and 2012 Reviews)
- Local Policy:
  - The KwaDukuza Coastal Zone Recreational Use Plan (2003)
  - Towards a Coastal Management Plan for KwaDukuza (2008)
  - Policy Approach to Coastal Development (2008)
  - The KwaDukuza Coastal Management Programme: Development Management Tool (2011)

3.3.2.1 Integrated Coastal Management Act

The NEM:ICMA (No. 24 of 2008) is the prevailing body of legislation which must be considered when reviewing any development application within 100 km of the coast.

The NEM:ICMA thus promotes sustainability of coastal settlement and growth, underpinned by a number of guiding principles. These are as follows:

- Coastal development must at no stage be considered inappropriate;
- The maintenance of the natural attributes of coastal landscapes and seascapes are to be promoted at all times;
- The promotion of ecologically, socially and economically sustainable development and resource use is of primary importance; and
- Public access to the coastal zone is to be protected and promoted.

Tinley Manor Southbanks responds to these guiding principles my promoting public access to the coastal zone and ensuring and ecologically, socially and economically viable development that prioritises the protection of the coastal zone.

3.3.2.2 KZN Provincial Growth and Development Strategy and Plan

The KwaZulu-Natal Provincial Growth and Development Strategy (PGDS) (2030) identifies a number of nodes and corridors throughout the Province.

Tinley Manor Southbanks is located on the so-called eThekwini / uMhlatuze corridor. The corridor is defined as a Primary Corridor, the main focus of which is to focus on the development opportunities being presented as part of the King Shaka / Dube TradePort initiative and with a dominant aim being to create opportunities for linking and strengthening the Province's first and second economies.

KwaDukuza Municipality has been identified as one of a number of coastal Tertiary Nodes.

The following priorities have been set for this corridor:

- Agriculture and Land Reform:
  - Protect high potential agricultural land for commercial production of high value perishable produce destined for export through the airport (Umhlanga to Ballito)
  - Develop agricultural potential in low income peri-urban fringe (i.e. Ndwedwe) to benefit from opportunities created by Dube TradePort
- Tourism:
  - Development of cultural tourism in low income peri-urban fringe (i.e. Ndwedwe)
- Industry:
  - Fast track the development of Dube TradePort
  - Ensure the sustainable management of industrial and residential land development between eThekwini and KwaDukuza municipalities
- Services:
  - Address land tenure issues and housing backlog
  - Improve catchment management and secure water resources
  - Provide adequate affordable housing and related services

The PGDS notes the importance of the coast in terms of high levels of biodiversity value and the growing pressure on coastal resources due to population pressures and a variety of, sometimes competing, development interests along the coast.

The PGDS thus highlights the need to conserve coastal resources, while at the same time ensuring that they contribute most effectively to economic development and social needs. The Tinley Manor Southbanks responds to the PGDS by promoting the protection of coastal resources.

3.3.2.3 KZN Tourism Strategy

The key challenge as outlined in the KwaZulu-Natal Tourism Strategy (2008-2012) is to ensure tourism makes a significant contribution to economic development in KwaZulu-Natal. It emphasises the need to respond responsibly and strategically to the changing environment ensuring an appropriate integrated planning approach. Tinley Manor Southbanks responds to the need for leisure tourism facilities on the KwaZulu-Natal north coast and the preliminary socio-economic studies indicate the economic value-add for the development.

3.3.2.4 Ilembe Integrated Development Plan and Ilembe Spatial Development Framework

The Ilembe Integrated Development Plan (IDP) (2012-2017) and SDF highlight tourism as one of the dominant economic sectors and a key driver of the district's economic development and note that tourism facilities are concentrated along the coast, although there is potential to extend and diversify the tourism sector inland of the coast.

It is a strategic thrust of the IDP/SDF to stimulate the competitive advantage of tourism and the other dominant sectors. The IDP identifies a baseline in 2012 of 2.5 million tourists currently visiting the District with a 5 year planning target of 3 million tourists by 2017 (growth rate of 2%). Agriculture is another important sector and the IDP and SDF recognise opportunities to diversify the agricultural economy to take advantage of the Districts proximity to the airport.

The IDP, 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) while promoting other types of development (e.g. light footprint ecotourism development).

The land use for the Tinley Manor Southbank area is designated agriculture (***Figure 3-3***).

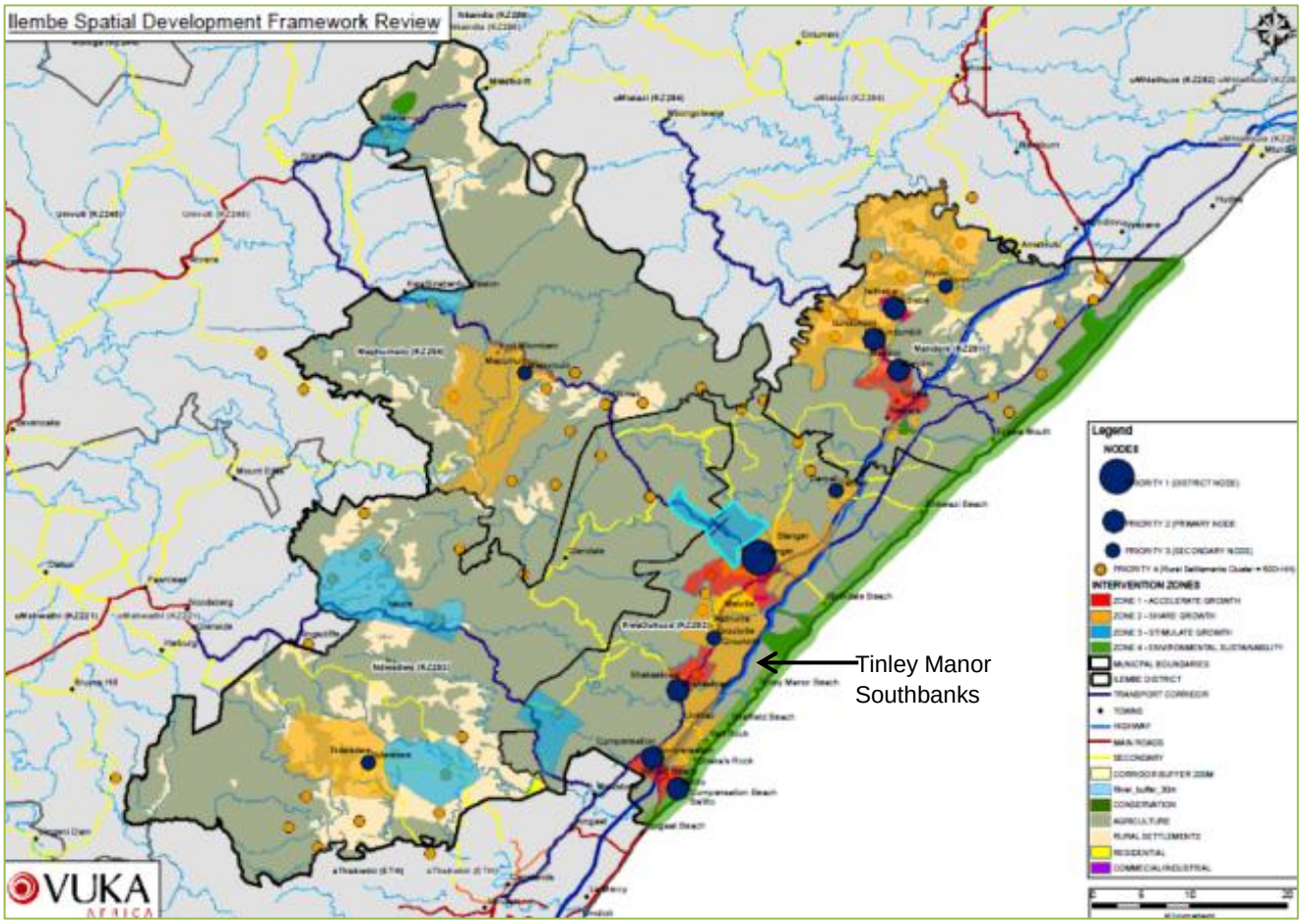

Figure 3-3: Ilembe Spatial Development Framework Plan

3.3.2.5 Ilembe District Spatial Economic Development Strategy

The Ilembe District Spatial Economic Development Strategy (DSEDS) (2012) provides a spatial strategy for the economic development of the Ilembe District. The Strategy highlights the importance of the tourism sector to the economic development of the District (***Figure 3-4***).

The DSEDS notes that the tourism sector is consistently growing and offers cultural, heritage, beach and nature based tourism. According to the DSEDS, the coastal tourism industry is not only booming but also evolving to meet specific markets. This includes the integration of 3 star and 5 star developments, mass tourism, sporting tourism, eco-tourism, and medical tourism which all appeal to, and draw on, different market segments and help to avoid competing with one another and saturating the market.

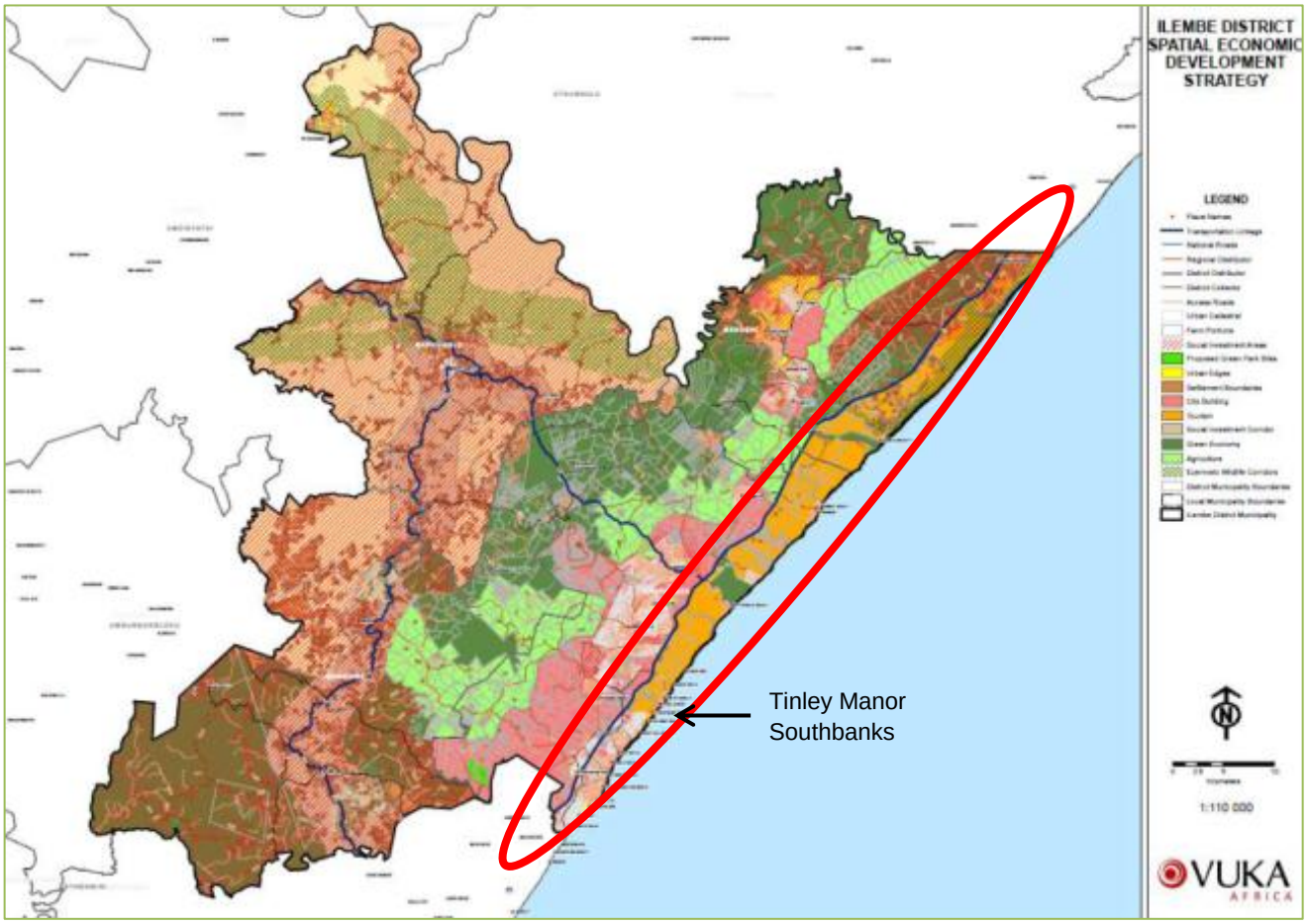

Figure 3-4: Primary tourism corridor according to the DSEDS (2012)

3.3.2.6 KwaDukuza Integrated Development Plan

According to the KwaDukuza IDP (2012-2017), KwaDukuza is the economic hub of the Ilembe District and because of this most people from other parts of the Ilembe District find it to their advantage to settle in KwaDukuza in pursuit of both housing and job opportunities.

The KwaDukuza Housing Demand Database suggests that the total housing backlog in KwaDukuza is sitting at 68 000. The natural growth in the area is in the region of 4%, together with relatively small average household sizes. This leads to a situation where demand for new low to middle income housing units is ever increasing.

The KwaDukuza Municipality has resolved to adopt economic development and infrastructure development as the drivers of its 2012-2017 IDP. Agriculture is the dominant economic sector in KwaDukuza contributing 23% of the total gross domestic product. Commercial local level activities are located in all urban and peri-urban areas; the major commercial development is located in the KwaDukuza and Ballito areas.

3.3.2.7 KwaDukuza Spatial Development Framework

The KwaDukuza SDF (2008; 2009; 2011 and 2012) presented in ***Figure 3-5*** below provides a spatial framework for establishing an appropriate land use, movement and environmental structure and identifies a number of nodes and corridors as key structuring elements within this framework.

The SDF identifies four economic growth nodes within KwaDukuza one of which, the Ballito Node, includes the areas of Driefontein, Shakaskraal, Salt Rock, Tinley Manor, Woodmead, and Shayamoya amongst others.

Land use recommendations for the Tinley Manor Southbanks node include recreation, conservation and medium- to long-term residential growth.

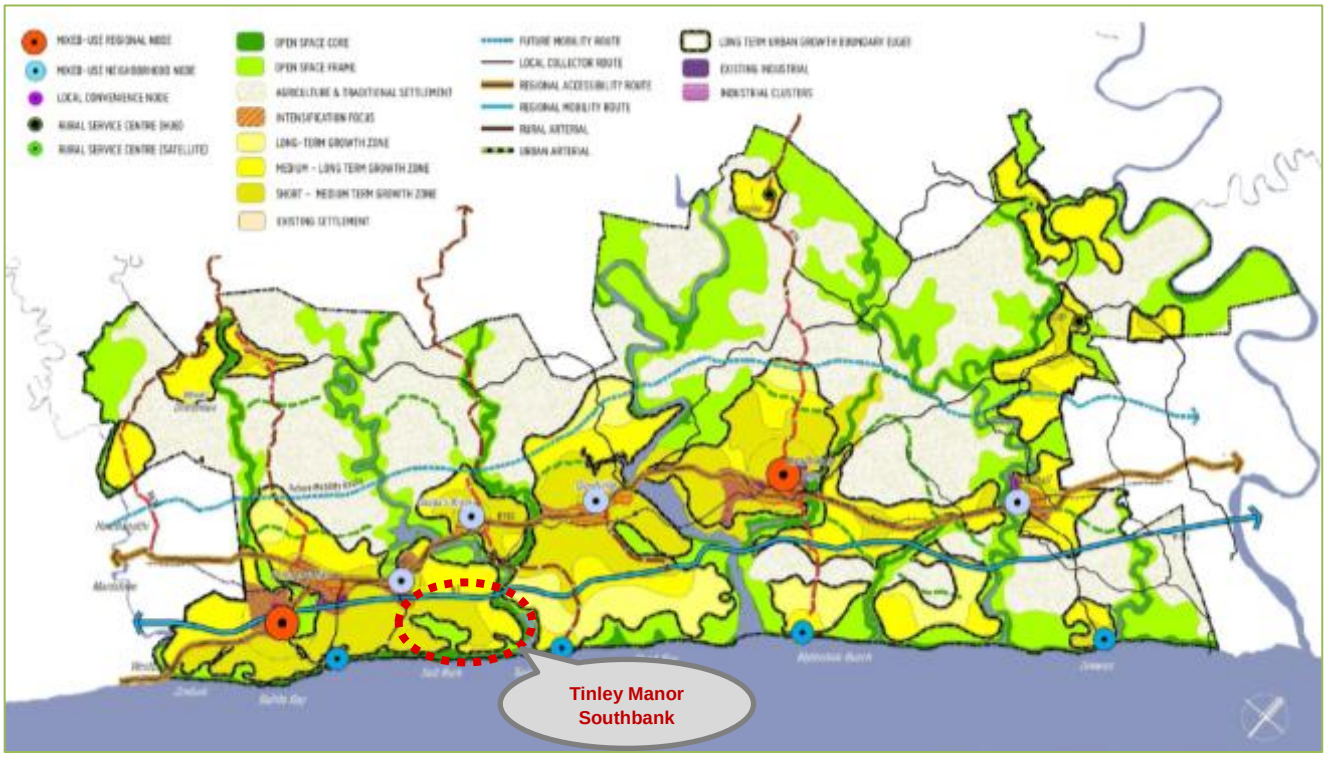

Figure 3-5: KwaDukuza Spatial Development Framework

3.3.2.8 KwaDukuza Coastal Management Plan and Programme

The Coastal Management Plan and Coastal Management Programme (CMP) for KwaDukuza were prepared in response to the need to manage coastal resources and development pressures and to comply with the requirements of the NEM:ICMA.

The key objectives of the CMP are the prevention of ribbon development along the coastal zone, and resultant removal of valuable coastal forests and ecological corridors. The CMP provides zonation of 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 CMP identifies the Coastal Protection Zone, assesses the various development precincts along the coast and provides guidance for managing land use and development within these areas to ensure the sustainable use of natural resources. The CMP is also intended to align with the KwaDukuza IDP, the SDF, and the Land Use Management System (LUMS).

3.3.3 Application to the Tinley Manor Southbanks Coastal Development

It is documented that the fast pace of development in KwaDukuza has placed unprecedented pressure on the receiving environment.

The findings of the KwaDukuza Strategic Environmental Assessment (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.

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 is 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.

Coastal development needs to adhere to more stringent environmental considerations (such as those provided for by the KwaDukuza Draft DMT) – these have been integrated as applicable into the proposal at hand.

The SDF and LUMS promote the creation of individual and unique clustered development, rather than linear development. 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. 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 following implications, which are a product of past and present development, were identified by the KwaDukuza SDF and draft LUMS:

- 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 (i.e. development of a compact urban area with mixed-use land-developments providing all amenities along with employment sites close to accommodation).
- 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 developments are likely to reduce its significance in the future. Pressure on land at present used for agricultural activities, mostly in the form of sugarcane cultivation, may therefore require in future a more efficient land utilisation, as well as a greater diversification in terms of cropping patterns and types.

- A significant number of land claims in a central band of the municipality may have a delaying effect on development in this region. This by default modifies the allowable development patterns and must be integrated into the development patterns proposed.
- 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.

The above guidelines and recommendations represent a substantial body of work, and as such have been taken into consideration during the development planning processes for the Tinley Manor Southbanks. The development recognises that:

- The Umhlali Estuary is a dominant high value structuring element that requires careful consideration and planning. In this regard it is recognised that an Estuarine Management Plan needs to be developed in order to ensure this sensitive environment is not disturbed significantly.
- A fragile but high value coastal frontage zone exits which also requires careful planning and consideration – both in terms of local and wider-scale access (tourism) and ecological functionality.
- An extensive network of streams and associated wetlands draining into the Umhlali River or directly into the sea exist – any open space network must take these into account and ensure suitable buffers around such features and allow interconnectivity to enhance ecological functionality and maintain / improve water quality and quantity therein.
- High value inland, site and sea views which will structure land value across the site through careful positioning of the land uses and ensure maximal value for all land parcels, including from a draw card point of view, thus leading to a development that is sustainable. Protection and enhancement of natural resources can only increase property values and thus help to ensure that the remainder of the development is also sustainable.
- Landscape is noted as being largely transformed and dominated by sugarcane with a spattering of small holdings and/or orchards, and with remnant linear coastal forests to the north and south of the Umhlali Estuary, and, then the Tinley Manor urban node. This allows for a development of a functional mixed land use which can through careful placement of various land uses ensure a function overall entity.
- The proposed limited development footprint, as well as determination of a “coastal hazard line” determined as part of the beach assessment already conducted and as per the agreed KwaZulu-Natal Provincial / NEM:ICMA procedure is noted as a controlling aspect of all development.

These challenges have been recognised and considered in the planning of the Tinley Manor Southbanks site.

4 DESCRIPTION OF THE RECEIVING ENVIRONMENT

BIOPHYSICAL

4.1 Climate

The Tinley Manor area experiences a coastal climate with a summer rainfall and a warm humid climate throughout the year. No frost occurs within the project area and is thus ideal for most crops including sub-tropical crops.

Table 4-1 indicates that the climate will permit good yields for a wide range of adapted crops throughout the year. However, climate is not the only factor in crop production. Soil and water are two other critical determinants of yield potential as will be discussed further in ***Section 4.4***.

Table 4-1: Climate data for the Tinley Manor area

	Maximum Temperature (°C)	Minimum Temperature (°C)	Rain (mm)	A-Pan Evaporation (mm)
January	26	19	118	180
February	27	19	104	159
March	27	19	103	160
April	26	16	56	126
May	24	13	31	106
June	23	10	17	88
July	22	10	14	99
August	23	11	25	118
September	24	14	53	129
October	24	15	82	163
November	25	17	97	165
December	26	18	107	185
Mean	**25**	**15**	**81.1**	**139.8**

4.2 Topography and Drainage

The site comprises moderately to steeply undulating topography with slopes varying from having a convex to concave conformation. The convex topography represents well elevated topographic spurs generally trending in a north-east – south-west (NE-SW) direction or alignment (i.e. effectively parallel with the coast), while the concave topography generally represents the heads of minor non-perennial stream valleys etched into the underlying unconsolidated sediments and bedrock.

4.3 Geology and Soils[4]

The bedrock underlying the area comprises sedimentary bedrock of the Vryheid Formation. Furthermore the sedimentary bedrock has been regionally intruded by Jurassic aged dolerite bodies of the Karoo Supergroup which present as dykes or sills.

The weathered sedimentary bedrock is exposed at the surface towards the north central and western portions of the area with intrusive dolerite limited towards the south central and western limit of the site. Where exposed the Vryheid Formation and dolerite bedrock are overlain by varying amounts of residual and colluvial material derived from in-situ weathering of the respective materials.

[4] *The following information has been extracted from the Geotechnical Assessment undertaken for the Tinley Manor Southbanks Coastal Development undertaken by Drennan, Maud and Partners (2012) and can be found in Appendix C 2.*

The coast line and elevated central portions of the site are underlain by unconsolidated sand and clayey sand of the Berea Formation which have been known to extend to depths in excess of 30 m below existing ground level overlying the weathered Vryheid Formation.

The Berea Formation sediment usually comprise reddish to orange brown sand to clayey sand increasing in clay content and consistency with depth. The sands and clayey sands are usually overlain on the mid to upper slopes by very loose to loose, fine to medium grained recent aeolian (wind-blown) dune sand, which can vary from less than a metre to several metres thick.

On the lower slopes and valley bottoms a number of drainage lines and streams occur which are likely to be underlain by alluvial or hillwash material, overlying the more clayey Berea Formation or residual bedrock on which ground water may become perched. Shallow water table conditions and groundwater seepage are thus likely in these areas and as such these areas are deemed wetland areas.

Furthermore, a small dolerite borrow pit was observed on site, where material was previously or is currently utilised for the assumed maintenance of farm roads. As such it is evident that some suitable materials occur within the area for use in construction.

4.4 Agricultural Potential[5]

The land is currently zoned as agriculture with much of the existing crops being sugarcane (***Figure 4-1***).

Figure 4-1: Existing sugarcane cultivation on site

[5] *Information extracted from Agricultural Potential Study of Tinley Manor Soutbanks undertaken by John Phipson (2010), provided in Appendix C 1.*

4.5 Vegetation and Fauna[6]

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. 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.

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:

- Incised Wetland Areas;
- Open Valley Bottom Wetlands;
- Umhlali River and Associated riparian vegetation;
- Fallow Lands re-colonised by indigenous and alien vegetation; and
- "Primary Dune" Areas.

4.5.1 Incised Wetland Areas

The incised wetland areas are restricted to the steepest portions of the site. These areas are represented in ***Figure 4-2***.

The plant species contained within these areas are predominantly woody in nature and well established. The typical structure of this vegetation type is comprised of numerous large woody species which create a closed canopy over the incised drainage lines, with limited indigenous plant species comprising the under-storey. The limited indigenous species result 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 (WWTW) and can be described as relatively intact. In addition, it should be noted that it includes three species of importance. *S. puniceus* and *D. maculata* are protected under the KwaZulu-Natal Nature Conservation Ordinance. The third species, *C. latifolia*, is Red-Listed and noted as declining in the wild as a result of bark harvesting for the *muthi* trade and also due to direct habitat destruction. Although deemed to be declining, this tree species is considered resilient and will persist within degraded drainage lines – but only if protected from bark harvesting and further habitat loss.

[6] *Information obtained from Tinley Manor Southbanks Vegetation Assessment (2015) prepared by SiVEST, provided in Appendix C 4.*

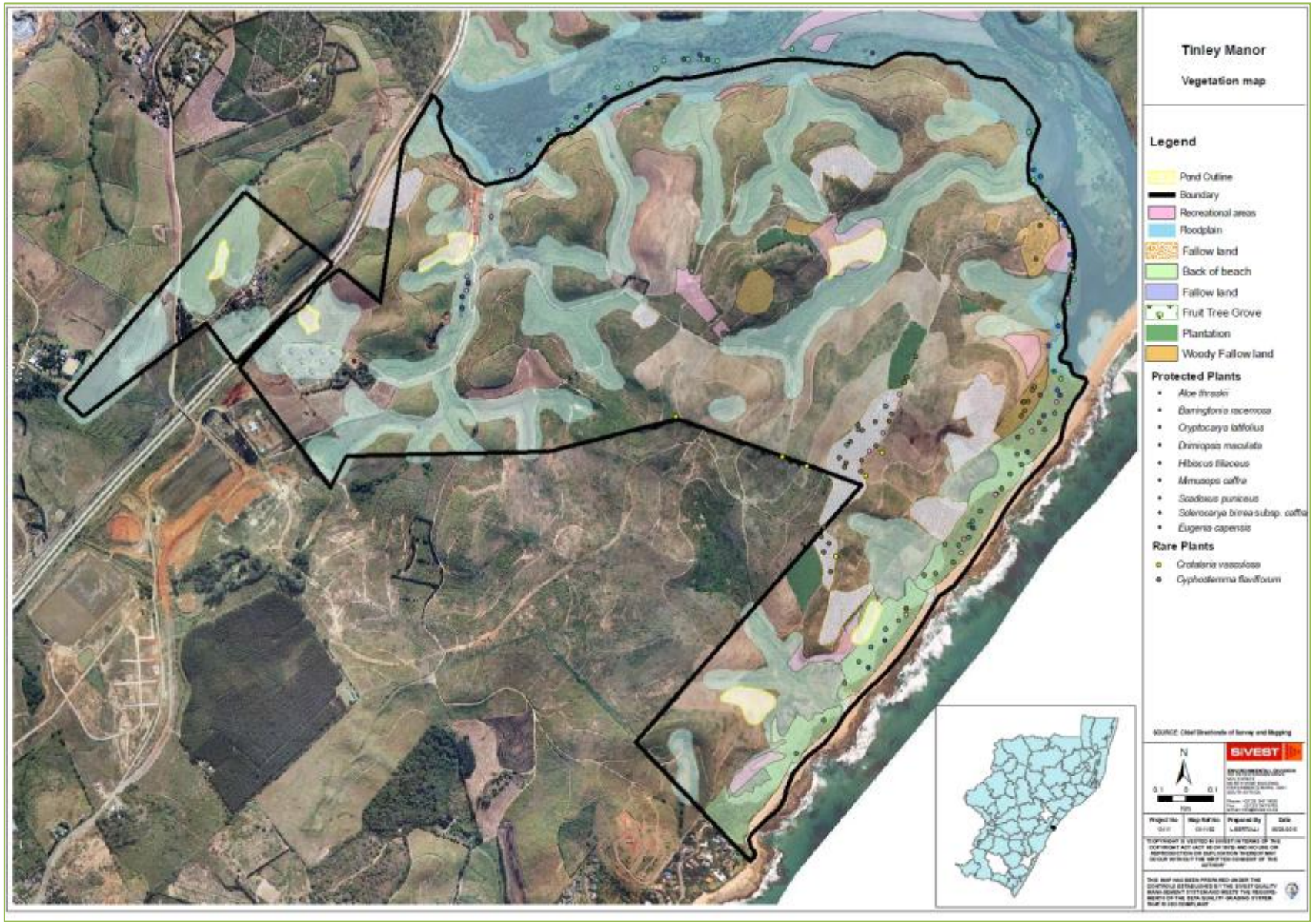

Figure 4-2: Vegetation map

4.5.2 Open Valley Bottom Wetlands

The Open Channel Valley Bottom Wetlands are characterised by an “open channel”, 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, whilst in other areas the presence of topographical features where the water does daylight are found. In addition, numerous portions of the wetlands have been canalised (drainage of the wetlands to reduce soil moisture) to facilitate historic 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, but 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 noted as being 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* occur.

Numerous alien invasive plant species are associated with the wetlands on site, as these areas were often historically deemed to be “waste” areas, as agricultural pursuits were not taking place within their boundaries. The most commonly occurring aliens therein 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*.

4.5.3 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 by *Phragmites australis*. 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*. It is assumed that the majority of these trees have been planted rather than merely naturally established. 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 / positioned on the lip of the channel, allowing for maximum utilisation of the adjoining floodplain for sugarcane cultivation. In amongst these planted indigenous species a range of exotic species have established, namely, *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 is dominated by *Hibiscus tiliaceus*, a protected tree species under the KwaZulu-Natal Nature 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 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*.

The consideration above has led to sensitive areas based on the presence of this riparian zone being designated. This area is denoted in ***Figure 4-2*** and will not be allowed to be developed as the vegetation in this area is deemed to be extremely sensitive and plays a significant role in protecting the banks of the Umhlali River and associated Estuary.

In addition, the floodplain area which sits adjacent to the riparian vegetation fringing the River (as indicated), is also not deemed suitable to receive development either.

4.5.4 Fallow Lands Non-Woody

Fallow lands are deemed to be agricultural lands that are no longer used for agricultural purposes – the time period varies. In this specific case these areas are those areas where sugarcane production has ceased. The fallow lands were split according to the colonising vegetation type.

The non-woody fallow lands area is characterised by vegetation dominated for the most part by herbaceous and woody herbaceous species. 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 are 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*. The last species is a ruderal species (i.e. primary colonising alien invasive species), however, it is not a commonly recorded species south of Richards Bay and thus makes this an interesting record.

4.5.5 Fallow Lands Woody

The woody fallow lands area relates to those areas dominated by woody colonising species.

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, namely, *M. caffra* is protected by the National Forests Act, and *E. capensis* by the KwaZulu-Natal Nature Conservation Ordinance. Should these areas be disturbed in anyway and the two protected species are required to be removed / destroyed 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 an expected high level of success.

Other species were also associated with this vegetation community, 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, were relatively sparsely distributed and were not contributing at a significant level in terms of biomass or conservation significance and thus are not specified in this consideration.

4.5.6 Primary Dune and Coastal Dune Scrub / Forest

In terms of size and value the primary dune and coastal dune schrub / forest 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 4-3*** below.

On the base of the secondary dune, agricultural practices for the most part have ceased and these are demarcated in ***Figure 4-2***. The vegetation contained within this area is as described in ***Section 4.5.5***.

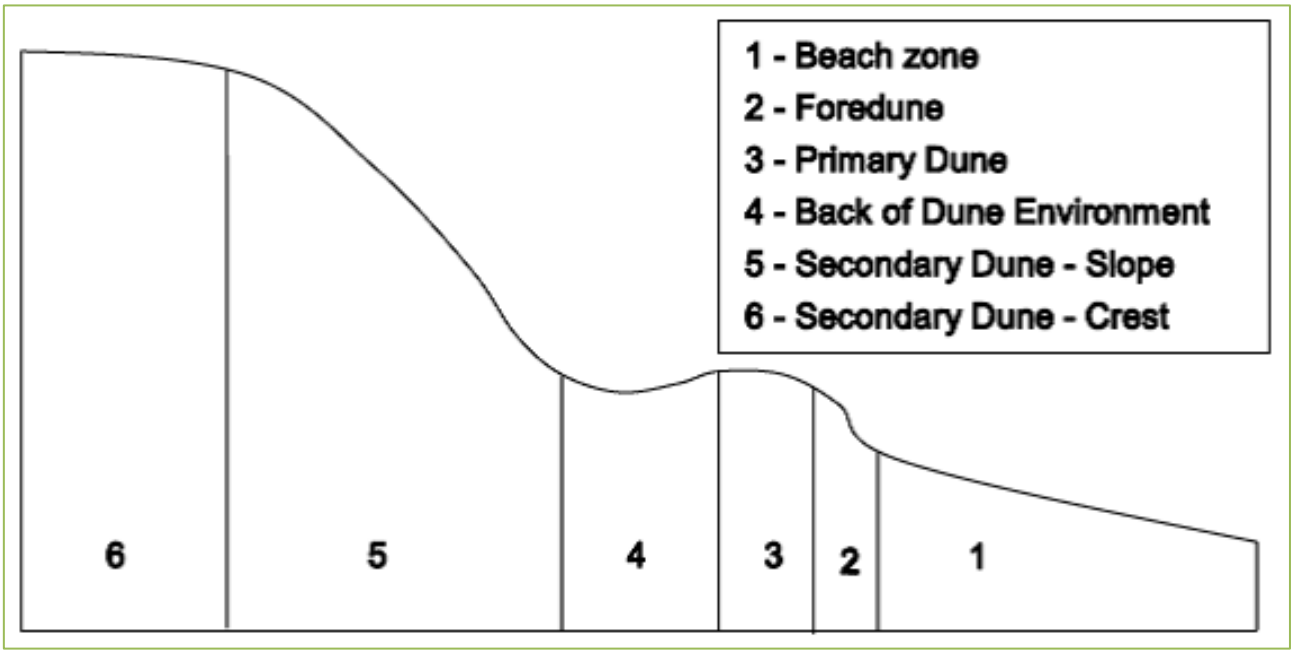

Figure 4-3: A schematic representation of the Primary Dune and Coastal Dune Scrub/Forest

4.5.6.1 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*. Within this are clumps of woody species usually centred on individuals of *Brachylaena discolor*.

Associated with these 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 clumps. was *Asystasia gangetica. Rhoicissus digitaria* and *Rhoicissus rhomboidea* were only found in the woody vegetation

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. It should be determined whether the intent is to manage to maintain at this early successional stage, or whether at least parts should be allowed to move onto natural higher succession stages.

4.5.6.2 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 area. 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, Isoglossa woodii, Carissa bispinosa, Rhoicissus digitaria, Secamone alpini* and Cynanchum obtusifolium.

This portion of the site plays an important role in dune stabilisation as well as preventing blowouts (i.e. collapse of the dune front in specific areas) 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.

4.5.6.3 Beach and 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, Ipomoea pes-caprae,* and *Chrysanthemoides monilifera.*

This vegetation will remain unaffected by the development layout and will continue to deliver valuable stabilisation and protection of the vegetation beyond. It will also remain as the characteristic vegetation associated with beaches in terms of the tourism aspect.

Any access to the beach (existing or new) will obviously have to consider this sensitive vegetation, especially in ways of minimising movement through the vegetation, as well as changes to aeolian sand deposition and dune morphology.

4.5.6.4 Areas adjoining the Road to Beach and where Sugarcane is still planted

The vegetation along the ecotone (i.e. disturbed edge impacted upon by anthropogenic influences) between the beach and the sugarcane, as separated by the access roads to the beach, 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 due to the open area created by the road 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*.

4.6 Water Resources[7]

4.6.1 Catchment Details

The study area falls within the Mkomazi Primary catchment. More specifically, the study area is situated in quaternary catchment U30E.

The study area / catchment is characterised by a series of undulating ridges and steep valleys. Drainage from the site is towards the Umhlali River.

4.6.2 Site Drainage

Two broad geologies dominate the site. The western portion of the property is underlain by shale and this has led to the development of generally narrow, steeply incised drainage features across this portion. The eastern portion of the site by contrast is characterised by deep sands and the valleys tend to be broader and shallower. The secondary dunes on site are very high and slope steeply down towards the coast. Seepage from the base of these features has formed a band of wetlands between the dunes and the sea.

The portion of the property to the north of the river also lies on shale derived soils, whilst the small fragment west of the N2 consists of both shale and sand derived elements. The Umhlali River Floodplain dominates much of the river frontage of the site and the meandering stream has over time created a series of channels and islands across the broad flat floodplain. This portion of the site is characterised by unconsolidated sediments deposited during flood events.

The majority of the site has a long history of sugar production with much of the property planted to sugarcane. Valleys have been drained to increase arable land availability. Indigenous vegetation on the site is limited to the riparian fringes, drains and channels through wetlands and portions of the coastal strip. Alien vegetation is limited to woodlots, sugarcane loading zones and isolated infestations centred on disturbances across the site.

Delineation of the wetlands across the site identified four broad wetland geomorphological classes into which the various watercourses could be grouped. These included systems on shale derived soils, sand derived soils, seepage systems on the fore dunes and a floodplain element. Current and historic land uses have left these systems moderately to highly disturbed and for the most part the functionality of these systems has been greatly reduced as a result of the systems being drained and due to significant modifications to the catchments.

4.6.3 Wetlands

The following wetland hydrogeomorphic units were identified in the study area (***Figure 4-4*** to ***Figure 4-7***):

- Six (6) channelled valley bottom wetlands;
- Seven (7) unchannelled valley bottom wetlands;
- Fifteen (15) hillslope seep wetlands; and
- One (1) floodplain wetland.

[7] *Information obtained from the Tinley Manor Southbanks Wetland Assessment (2015) prepared by SiVEST provided in Appendix C 5.*

A wetland catchment and area analysis was undertaken to delineate each wetlands catchment area as well as to determine the extent of the wetlands. The results are presented in ***Table 4-2***.

Table 4-2: Wetland areas and wetland catchment areas

Name	Wetland Area (ha)	Wetland Catchment Area (ha)
Channelled Valley Bottom Wetland 1	5.15	117.45
Channelled Valley Bottom Wetland 2	8.42	177.54
Channelled Valley Bottom Wetland 3	1.32	24.40
Channelled Valley Bottom Wetland 4	2.39	22.11
Channelled Valley Bottom Wetland 5	5.06	28.86
Channelled Valley Bottom Wetland 6	9.40	85.73
Hillslope Seep Wetland 1	1.62	4.84
Hillslope Seep Wetland 2	2.85	25.50
Hillslope Seep Wetland 3	1.19	7.01
Hillslope Seep Wetland 4	4.83	23.94
Hillslope Seep Wetland 5	4.47	13.91
Hillslope Seep Wetland 6	1.14	10.67
Hillslope Seep Wetland 7	0.34	3.43
Hillslope Seep Wetland 8	0.11	1.60
Hillslope Seep Wetland 9	0.13	2.90
Hillslope Seep Wetland 10	0.83	3.59
Hillslope Seep Wetland 11	2.13	15.66
Hillslope Seep Wetland 12*	0.22	-
Hillslope Seep Wetland 13	4.59	13.64
Hillslope Seep Wetland 14	0.59	8.09
Hillslope Seep Wetland 15	0.53	4.28
Unchannelled Valley Bottom Wetland 1	0.46	5.88
Unchannelled Valley Bottom Wetland 2	6.33	81.85
Unchannelled Valley Bottom Wetland 4	4.07	52.87
Unchannelled Valley Bottom Wetland 5	3.13	16.36
Unchannelled Valley Bottom Wetland 6	1.72	21.16
Unchannelled Valley Bottom Wetland 7	5.12	11.55
Unchannelled Valley Bottom Wetland 8	1.17	99.16
Umhlali Floodplain Wetland	93.260	24 914.22

* *Note – Wetland Catchment Area could not be calculated due to limited wetland extent and the level of contour detail available (5m) limitations.*

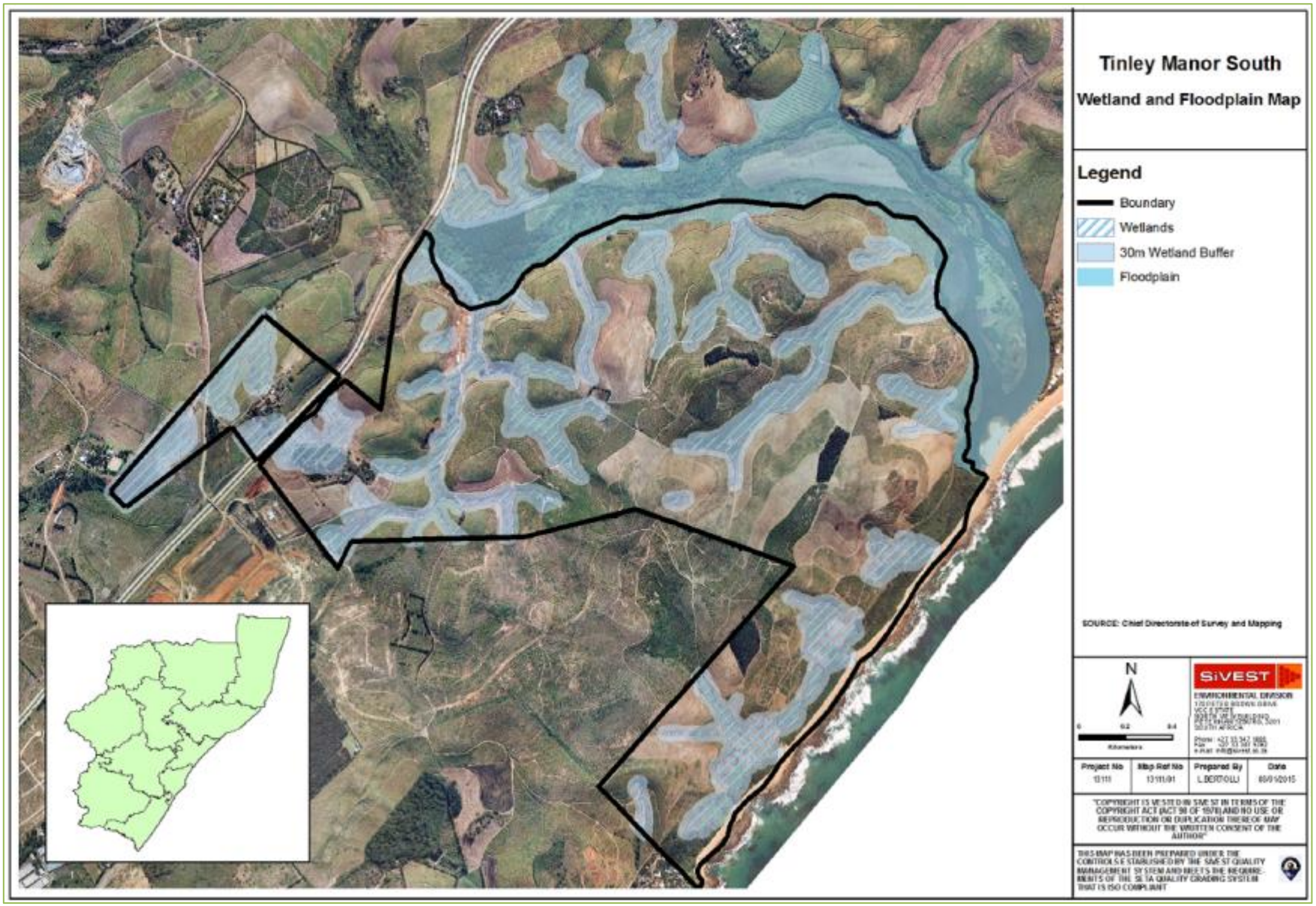

Figure 4-4: Wetland and floodplain map

Figure 4-5: Map of wetlands on the north of the site

Figure 4-6: Map of wetlands on the south of the site

Figure 4-7: Map of wetlands on the west of the site

The area allocation per type is as follows:

- The channelled valley bottom wetlands range in size from 1.32 ha to 9.40 ha. Wetland catchment size for the channelled valley bottom wetlands vary greatly from a minimum of 22.11 ha to a maximum of 177.54 ha.
- The unchannelled valley bottom wetlands are more limited in extent ranging from a minimum of 0.46 ha to 6.33 ha. Wetland catchment size is similarly limited in extent and range from 5.88 ha to 99.16 ha.
- The hillslope seep wetlands are very limited in extent by comparison to the other two wetland types with the smallest hillslope seep wetland measuring 0.11 ha whilst the biggest hillslope seep wetland measures 4.83 ha.
- Corresponding wetland catchment areas are equally limited by comparison to the other wetland types ranging from a minimum of 1.60 ha to a maximum of 25.50 ha.
- The floodplain wetland however is relatively extensive by comparison to the other wetland types measuring 93.26 ha in extent. The wetland catchment is therefore likewise quite large by comparison encompassing an area of approximately 1,112.00 ha.

Overall, it can be stated that the wetlands falling within the study area are generally not extensive systems with the exception of the Umhlali floodplain wetland. Most are quite small (<10 ha) in size, and have localised and limited catchment areas that are contained within the study area.

The topography is a strong factor dictating the wetland type and characteristics in the study area. Relatively steep hills and sandy / loamy substrate provide a suitable template for the development of seasonal hillslope seep wetlands on the mid slopes. This wetland type was also the most commonly occurring wetland.

Drainage into the valley bottom areas gives rise to the occurrence of the channelled and unchannelled valley bottom wetlands. The valley bottom wetlands are generally narrow and constrained by hilly topography. The wetlands are seasonal to permanently inundated.

The Umhlali River is the primary water input to the Umhlali floodplain wetland. Progressive development of the floodplain wetland as a result of yearly inland flows and flood events has resulted in scouring out of a wide valley bottom area, susceptible to the deposition of sediments in the valley bottom. The substrate of the floodplain wetland contains mainly unconsolidated sandy sediments along with fine grained clay particles giving rise to permanent, seasonal and temporarily inundated areas.

4.6.4 River and Estuary[8]

The Umhlali Estuary (29°27′36″S; 31°16′41″E) is situated approximately 68 km north-east of Durban and is classified as a subtropical, temporarily open/closed estuarine system. Estimations of the length of the Umhlali River range between 38 km and 55 km, draining a catchment area ranging between 256 km^2 and 331 km^2, and with a mean annual run-off between 49.85 and 59.76 x 106 m^3.

Historically, the catchment area, and most of the land surrounding the estuary, was under sugarcane cultivation, which persists today.

The boundaries of the Umhlali Estuary are defined by the estuarine functional zone (***Figure 4-8***), that is, the area extending from the estuary mouth upstream to where the 5 m amsl contour crosses the river course, which is approximately 750 m upstream of the N2 bridge and laterally up to the 5 m topographical contour. This area is 129 ha in extent and is 5 km long, The estuarine functional zone encompasses the natural features of an estuary, including the water body, the flood plain, estuarine habitats and vegetation, as well as the dynamic processes, such as backflooding and tidal fluctuations, which characterise an estuarine environment.

The estuary comprises two channels, namely a northern and southern arm, separated by a large central island, a part of which is still planted with sugarcane. Saline intrusion in the main northern arm channel is however, restricted by a weir, reducing the extent of the estuary to some 2.6 km upstream of the mouth. A maximum depth of 1.3 m in the northern channel was recorded in the literature, presumably during open

[8] *Information obtained from The Umhlali Estuary Assessment (2015) prepared by Royal HaskoningDHV provided in Appendix C 6.*

mouth conditions, while other literary sources recorded a maximum depth of ca. 2.3 m during closed conditions in the northern channel.

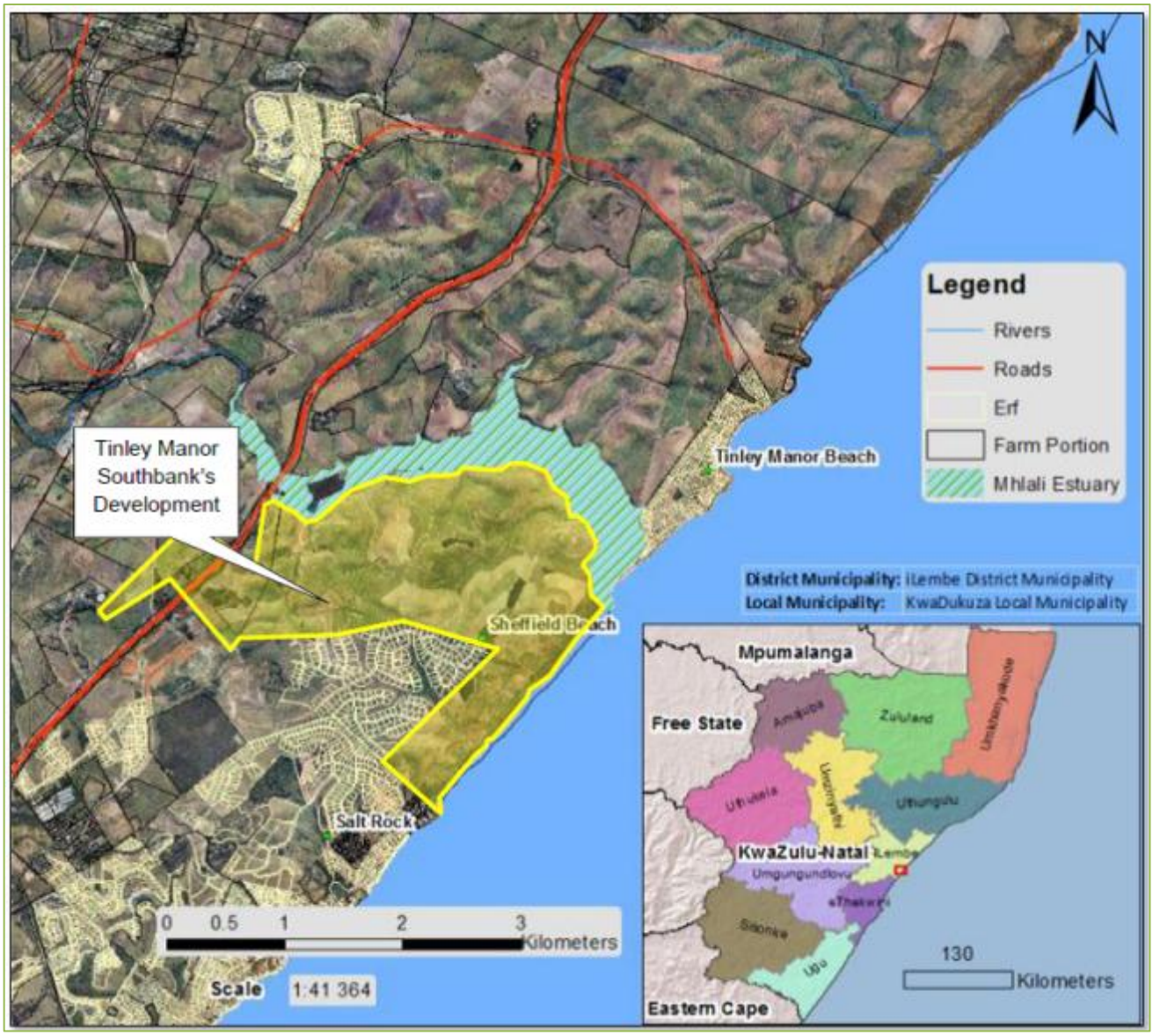

Figure 4-8: Location of the Umhlali Estuary

4.7 Coastal Zone

The coastal setback line and limited development line impose development constraints on the northern and eastern boundary of the site.

The coastal setback line demarcates an area within which development will be prohibited or controlled in order to achieve coastal management objectives, specifically protecting development from coastal processes.

The limited development line is required to maintain biodiversity of the coastal region, allow for heritage issues or in some cases to address other issues such as shading by buildings and public access or amenity.

Development proposals must ensure that only appropriate and sensitive infrastructure is placed within these constraint lines and this may include necessary, but limited investment and easily replaceable access and service infrastructure that would not impact on the objectives of the setback lines.

4.8 Sensitive Environments

Ezemvelo KZN Wildlife 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 in the C-plan is set at 2 x 2 km resolution. The relatively course resolution means that if even a small area of significance within the 2 x 2 km pixel area is noted, this will mean that the entire pixel area is then deemed to be “sensitive” even if the majority

The process involves settings targets, so-called ‘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.

Whilst it is understood 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 Tinley Manor landholdings.

Figure 4-9 shows the ‘completely irreplaceable’ pixels (at a scale of 2 x 2 km), denoting high biodiversity value and/or environmental sensitivity for the Tinley Manor landholdings.

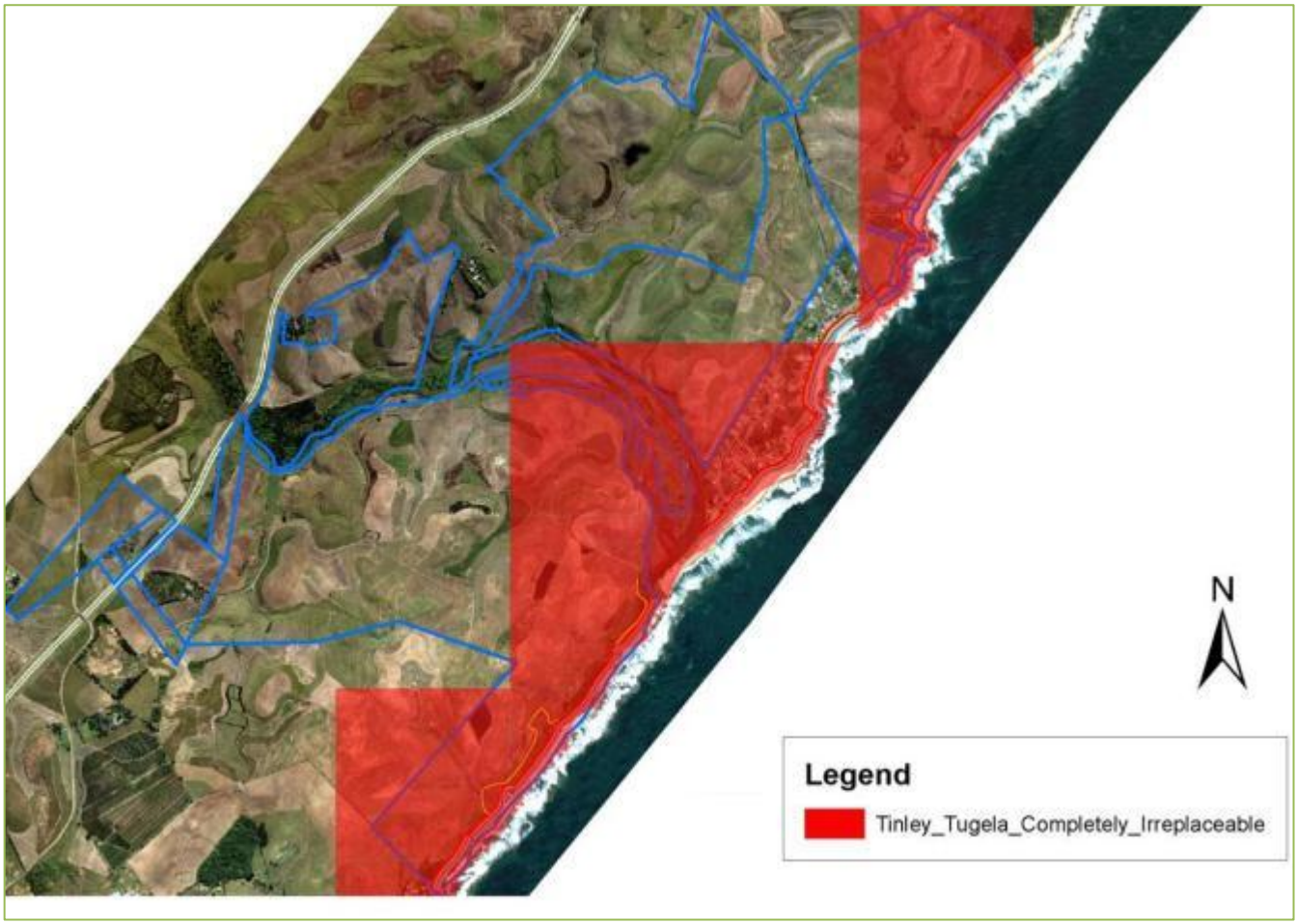

Figure 4-9: KwaZulu-Natal Biodiversity Conservation Plan for the site

Figure 4-9 illustrates 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 River and Estuary. As indicated above, this does need to be seen within the context of the coarse resolution of the pixel which requires site confirmation and detailed consideration. The specialist studies within this document took this high level consideration as a starting point to be refined through site specific consideration and review.

The environmental systems present on site are part of the larger riverine, estuarine and coastal systems that extend beyond the boundary of the site. The wider system is in part fragmented due to man-made barriers, such as the N2 highway and adjacent property developments.

The environmental systems present on site include:

- Umhlali River valley with the riverine and estuarine systems;
- Fragile coastal dune system and associated remnant fragmented coastal forests; and
- Degraded wetlands currently associated with sugarcane cultivation.

The rehabilitation and conservation of these systems provide an opportunity to restore the environmental role of the site significantly benefitting the wider system.

The key environmental systems (***Figure 4-10***) resolved through the specialist investigations leading from the initial statement as shown above (***Figure 4-10***), are a critical factor in restoring the environmental role of the site can be addressed through a considered and well planned development concept.

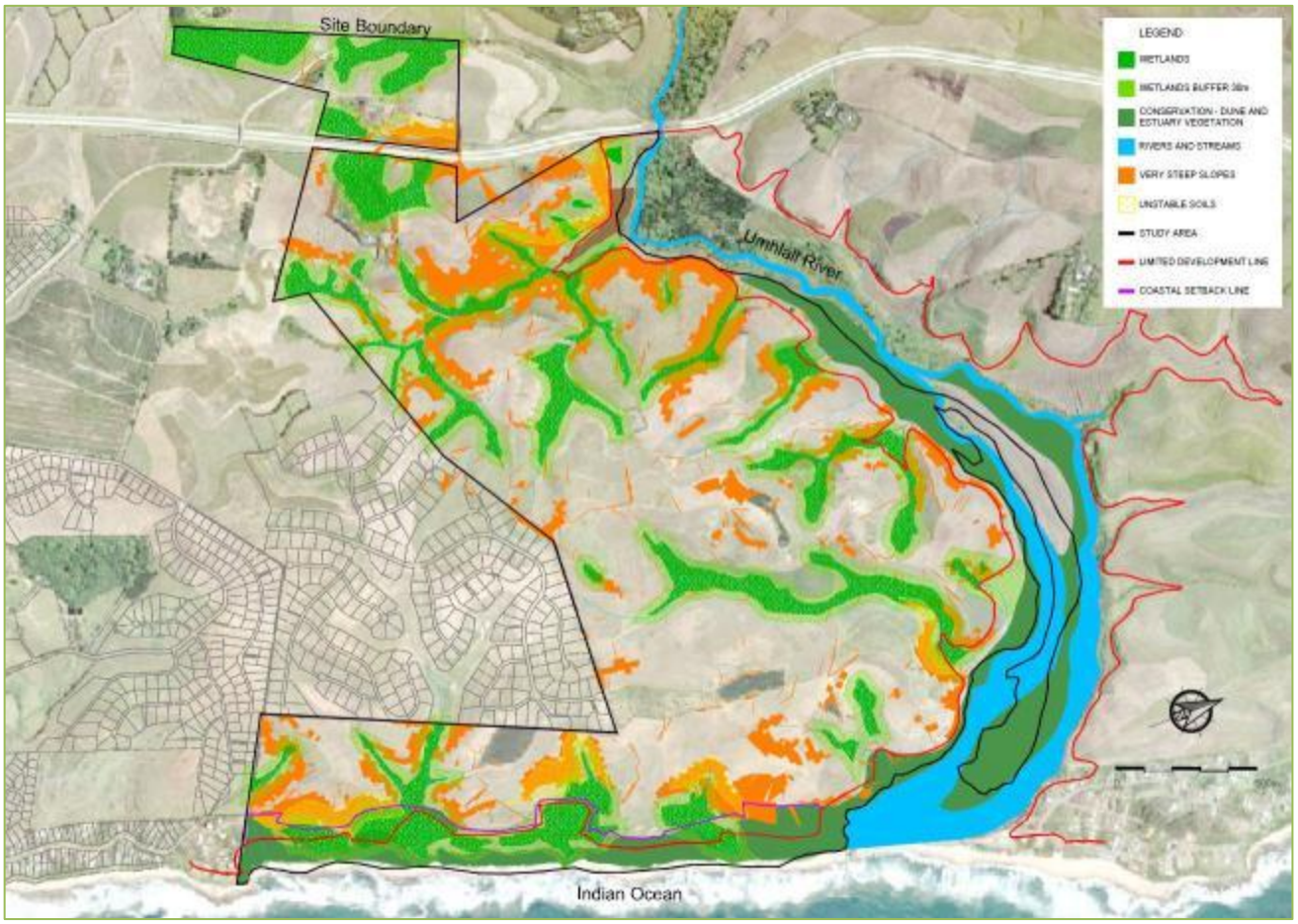

Figure 4-10: Key sensitive environments

The coastal, riverine, estuarine and wetland systems determine the primary environmental role of the site. The terrestrial systems process and infiltrate large quantities of water which support the complex river and estuary ecosystem, whilst the coastal systems are critical for protecting investment and human settlements from sea erosion.

The Umhlali River valley and estuarine system connects the site to the hinterland and the Indian Ocean.

The health of this complex estuarine ecological system is of critical importance to the broader ecological role, i.e. the fisheries nursery function.

The sedimentation and nutrient input resulting from sugarcane cultivation may be reversed with the reinstatement of wetlands and appropriate buffers, the removal of alien vegetation and the restoration of the reed beds as part of the proposed development. This will benefit the ecological functioning and conservation

status of the estuary promoting species protection and diversification along with added benefits for recreation and eco-education uses of the site.

The coastal dune system that runs the length of the eastern boundary of the site, although fragile, is fairly well preserved and intact. This system and in particular the natural dune vegetation is of critical importance in providing a buffer to sea surges and storms from the Indian Ocean. It is vital to protect, enhance and conserve the frontal dune and coastal vegetation and where possible it with other fragmented patches of coastal forest on the site.

SOCIAL

4.9 Visual Considerations

The site is located within an agricultural landscape, with some residential land uses occurring along the coast at the Tinley Manor Beach to the north and Sheffield Beach to the south. However, as illustrated in the KwaDukuza SDF, except for the environmentally sensitive areas associated with the estuary and the coastal forests, the site and its surroundings are designated to be developed, either for commercial, industrial or residential purposes.

The visual changes that will occur with the development of the site for residential and commercial purposes are envisaged to be minimal however; these need to be considered within the wider planning context within which the site is located.

4.10 Noise Considerations

In addition to aesthetic considerations, noise levels must also be considered.

The residential areas of Tinley Manor and Sheffield Beach are relatively peaceful towns with slow moving traffic and little disturbances with regard to noise.

Whilst it is not envisaged that there will be significant increases in noise during the operational phase of the proposed development, increases in noise levels during the construction phase will need to be considered.

4.11 Heritage Considerations[9]

Residual Iron Age cultural discard on the interface between the overlying aeolian sands and the Berea Formation hardpans have been observed on site. The latter comprise the base of the plough zone of sugarcane cultivation and the overlying strata have consequently been turned and churned-over for decades. Primary context sites and cultural material have consequently been incorporated into the plough zone.

Cultural residues have thus sifted down and reside on the Berea hardpans below (±40 cm), together with an assortment of Stone Age lithic debitage. Historical and modern discards, including mortar, brick, glass and plastic; and burnt sugarcane root-residues are also expected to be found at this level. The Berea hardpans thus constitute a cultural basal horizon of temporally mixed contents.

Iron Age farming community settlements are known to have occurred ubiquitously within the areas now given to cane fields on the higher-lying palaeo-dunes of the east coast littoral. However, despite recent sugarcane cutting and good surface visibility, no primary context archaeological material or archaeological sites of any significance were observed within the proposed area of development.

The adjacent rocky shoreline would suggest exploitation of marine resources in the past. Shell middens are known and recorded from the KwaZulu-Natal Dolphin Coast, and further to the south.

[9] *Information obtained from the Tinley Manor Southbanks Heritage Assessment (2015) prepared by eThembeni Cultural Heritage provided in Appendix C 3.*

Inspection of the tertiary dune edge at three access points to the foreshore between Christmas Bay and the Umhlali River mouth revealed no evidence of shell midden concentrations. It is however noted that the foreshore dunes are heavily vegetated which precluded closer investigation. However, this zone is included within the Coastal Setback and Limited Development Line of the proposed development and is subject to exclusion conditions of the NEM:ICMA (Act No.24 of 2008) and thus the potential for change thereto is deemed to be minimal. Consequently, the probability of disturbance of unrecorded *in situ* middens is considered low.

The SAHRIS Palaeontology Sensitivity Map places the development area within a yellow/green delimitation and thus of "moderate to high paleontological potential'. A desk top assessment has been commissioned which will determine if any further palaeontological mitigation is required. This will be loaded to the SAHRIS case file once completed.

During the field inspections to the study area no graves were observed. However, three unmarked ancestral graves are recorded on the Tongaat Hulett Estates' data base. These have previously been assessed by eThembeni Cultural Heritage. They are however noted as being located within non-development zones of the current proposal due to a combination of the steepness of slope and the underlying lithography of these specific locales.

4.12 Surrounding Environment

The dominant land use outside of urban areas within the area surrounding the landholdings is commercial agriculture, predominantly sugarcane 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.

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.

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 a patchwork of both indigenous vegetation and degraded rangelands.

Natural coastal vegetation in the area is best described as fragmented due to the clearing of land for existing 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.

4.13 Existing Infrastructure

4.13.1 Water

The Sheffield Reservoir (2 000 kℓ) and Tinley Manor Reservoir (250 kℓ) are the closest existing reservoirs to the proposed development.

There is an existing 250 mm water main which terminates near the gravel access road to the project area and a 110 mm diameter water main which traverses the project area (approximately 200 m parallel to the coastline) crossing the Umhlali River to supply the Tinley Manor reservoir.

4.13.2 Sewer

The existing Sheffield WWTW (***Figure 4-11***) is located within the project boundary.

The WWTW is sized to accommodate 6 Mℓ/day (which has been committed to other developments) but is operating far below capacity. Sembcorp Siza Water has a licence and the space available to upgrade the WWTW (up to 18 Mℓ/day).

Figure 4-11: The existing Sheffield WWTW

4.13.3 Roads

Access to the site is via the N2 freeway, Umhlali interchange (exit 214), Salt Rock Road, Sheffield Beach Road, and an existing gravel road.

The gravel road is used to access the existing farm and by Sembcorp Siza Water to access the WWTW. This access can also be utilised during the construction phase, but would need to be formalised as part of the overall development if it proceeds.

The Tinley Manor Southbanks site has limited sub regional access. The N2 Freeway runs through the most western portion of the site, however, there is no direct access off the N2. The South African National Roads Agency Limited (SANRAL) has indicated that there are plans to improve access to the sub-region by constructing an interchange adjacent to the development by upgrading the P228 Bridge over the N2 freeway.

The restricted access makes the site effectively a large “cul de sac” zone, confined by the Umhlali River and the Indian Ocean. At present, the only formal road access to the site is (a) via the N2 freeway via exit 214 – at Umhlali approximately 3 km away, (b) Sheffield Beach road, and (c) an existing gravel road.

According to the SMEC Engineering Services Report, the gravel access will need to be upgraded to service the development.

With undeveloped land parcels to the north of the Umhlali River, the opportunity exists to establish an access arterial route to serve as a continuous coastal route over the Umhlali River in the future.

The site will experience a significantly improved regional access should the N2 interchange be implemented along with a continuous coastal route over the Umhlali River thus being effected as part thereof.

4.14 Socio-Economic Profile of the Receiving Environment[10]

This section focusses on the socio-economic profile of the study area.

The socio-economic profile analysis fulfils an important role in the indication of development potential within the relevant area. The socio-economic characteristics of the local market population inform the local resident profile which in turn demonstrates the needs and desires of the market population with regard to residential development.

4.14.1 Demographics

The population dynamics of KwaDukuza Municipality is highly diverse due its multi-racial composition and rich settlement history.

KwaDukuza has a distinct eastern flavour and is linked to the earlier settlement of Indian families who were imported to work on the sugarcane farms of the big sugar barons such as Sir Liege Hulled.

The demographic data for the study area is summarised in ***Table 4-3***.

Table 4-3: Demographic data for the study area

Demographics	2011
Total population	231 187
Total households	70 283
Average household size	3.29
Household density (households per square km)	95.63

A total of 231 187 people and 70 283 households reside in the local market area. The average household size is 3.29 persons per household and the household density is 95.63 households per square kilometre. The age profile, which indicates the percentage of the population which falls within the different age categories, is illustrated in ***Figure 4-12***.

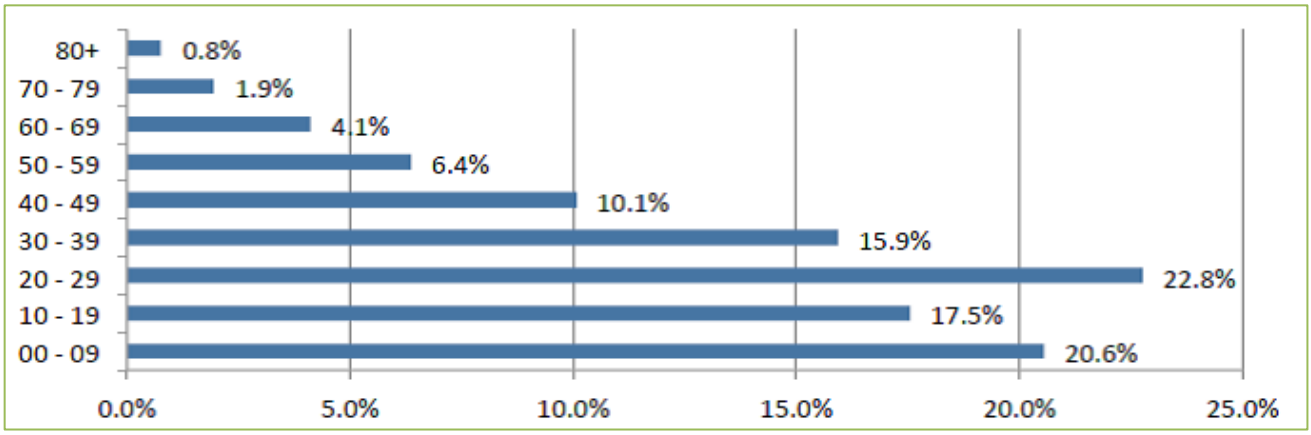

Figure 4-12: Age profile (2011)

The majority of the population (66.7%) falls within the working-age population (15–64 years old). Twenty-nine percent of the population is younger than 15 years old, while only 4.3% is older than 65 years old.

4.14.2 Education and Employment

The education levels of the market area are indicated below in ***Figure 4-13***.

[10] *Information obtained from the Tinley Manor Southbanks Socio-economic Study (2015) prepared by Urban Econ and provided in Appendix C 8.*

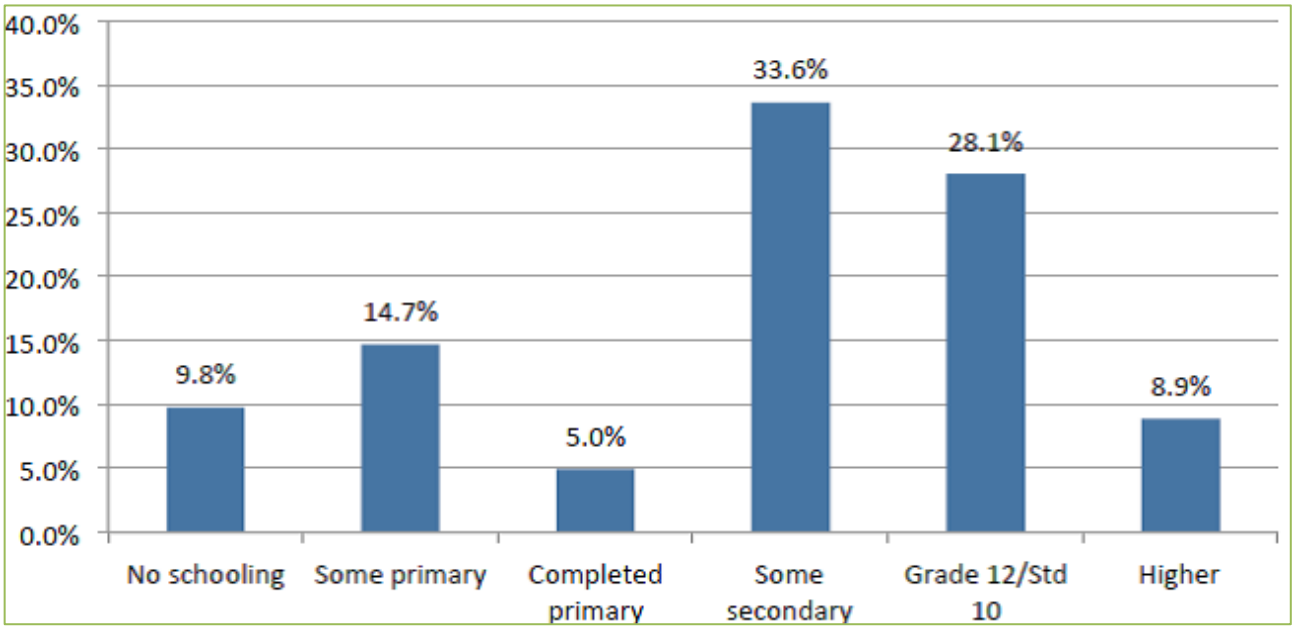

Figure 4-13: Education profile (2011)

From ***Figure 4-13*** it can be seen that 33.6% of the population completed Grade 12 or more, while 9.8% of the population does not have any schooling.

The employment profile is presented in ***Table 4-4***. It excludes the youth and the elderly and is based on the working-age population (portion of the population that are between the ages of 15 and 64).

Table 4-4: Employment profile (2011)

Concept		2011
Labour force	Employed	69.3%
	Unemployed	22.8%
	Discouraged work-seeker	7.9%
Labour force participation rate		64.5%
Labour absorption rate		44.7%

From the above table it is evident that the unemployment rate is at 22.8% for the KwaDukuza area, which is better than the 28.5% of the province.

The percentage of discouraged work-seekers makes out a total of 7.9% of the labour force, which is also less than the 13.8% of the province as a whole. A small percentage of persons are not economically active (full-time students, homemakers, etc.), as is evident from the labour force participation rate that is 64.5%.

Consequently, the labour absorption rate is fairly high (44.7%) meaning a relatively small portion of the population is dependent on those earning an income.

4.14.3 Household Income Analysis

The household income is analysed in order to determine the income per household per annum as well as the average monthly weighted household income. The household income is illustrated in ***Figure 4-14***.

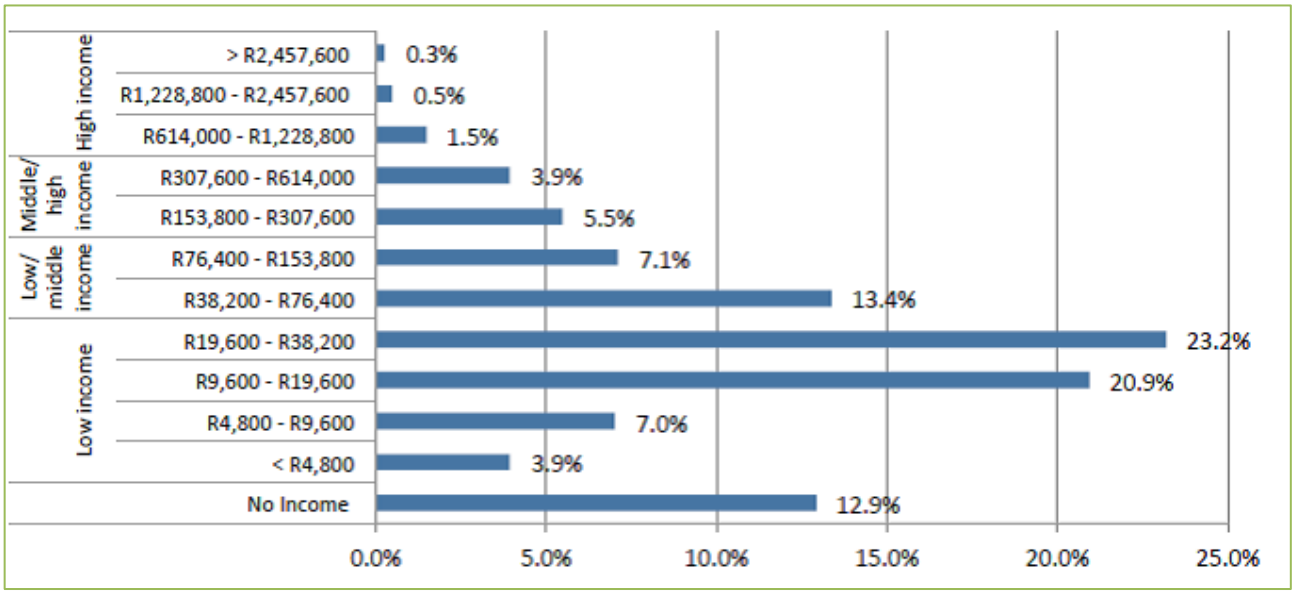

Figure 4-14: Average annual household income (2011)

The majority of households (55.5%) fall within the low income group earning between R 1 and R 38 200 per annum.

A total of 20.7% fall within the low/middle income group, 9.4% fall within the middle/high income group, 12.9% of households earn no income at all while 2.2% of households are high income earners earning more than R 614 000 per annum.

The weighted average monthly household income for the market area is R 7 124 per month.

4.14.4 Housing Profile

The dwelling type indicates the quality of housing which a household occupies. The dwelling types of the market area are illustrated in ***Figure 4-15***.

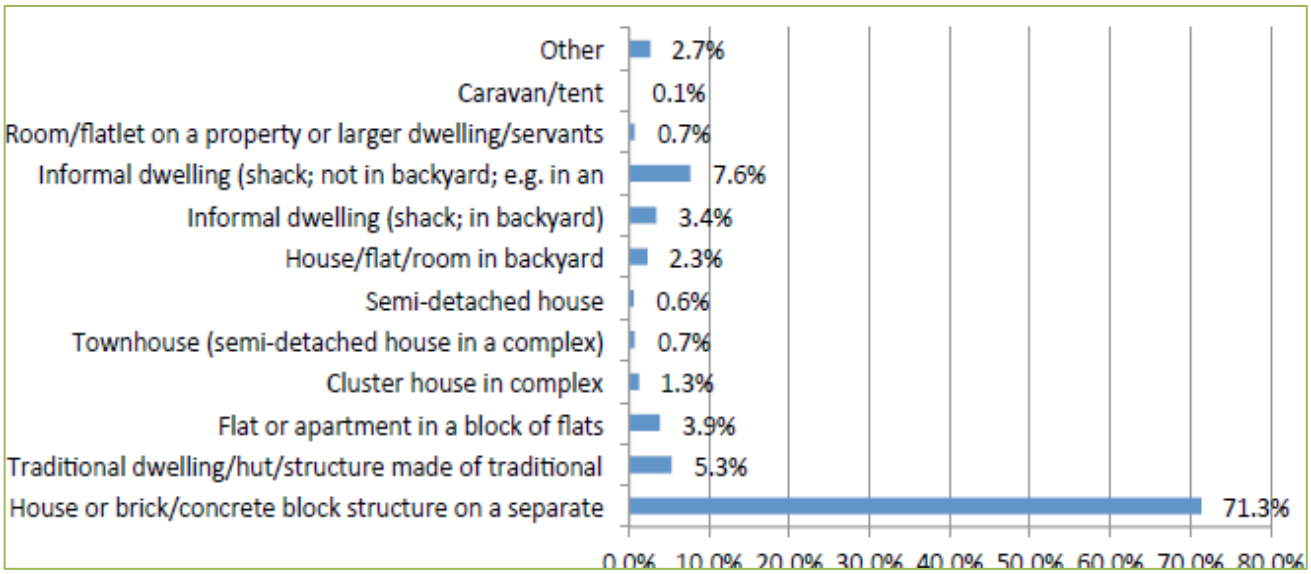

Figure 4-15: Dwelling type (2011)

Households predominantly live in a house of brick structure within the market area (71.3% of all households) while 11% of households live in some sort of informal dwelling. This relates to approximately 7 764 households. The tenure status of the households is presented in ***Figure 4-16***.

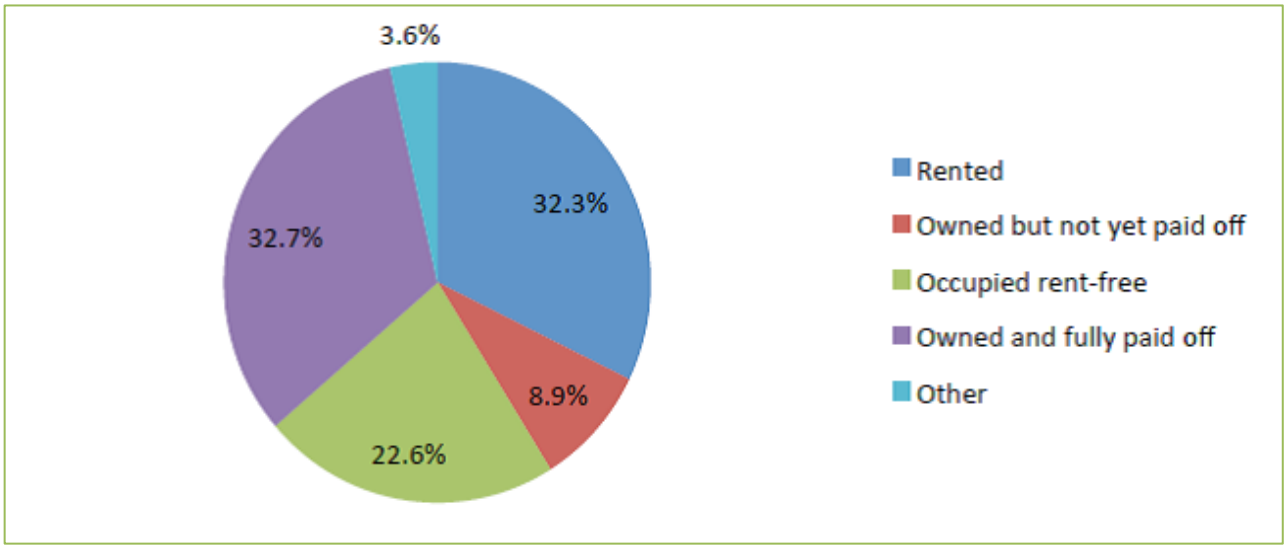

Figure 4-16: Tenure status (2011)

Almost a third of households (32.7%) have paid off their houses. A large percentage of house owners (32.3%) rent their dwelling, while 22.6% of home owners occupy their dwelling rent-free.

5 PROJECT DESCRIPTION

5.1 Development of the Tinley Manor Southbanks Concept Block Layout

5.1.1 Landscape Character Assessment

The undulating topography of the site as described in ***Section 4.2*** produces two distinct experiences, namely (i) vast open areas and (ii) intimate spaces. ***Figure 5-1*** highlights these key landscape characteristics and the defining features.

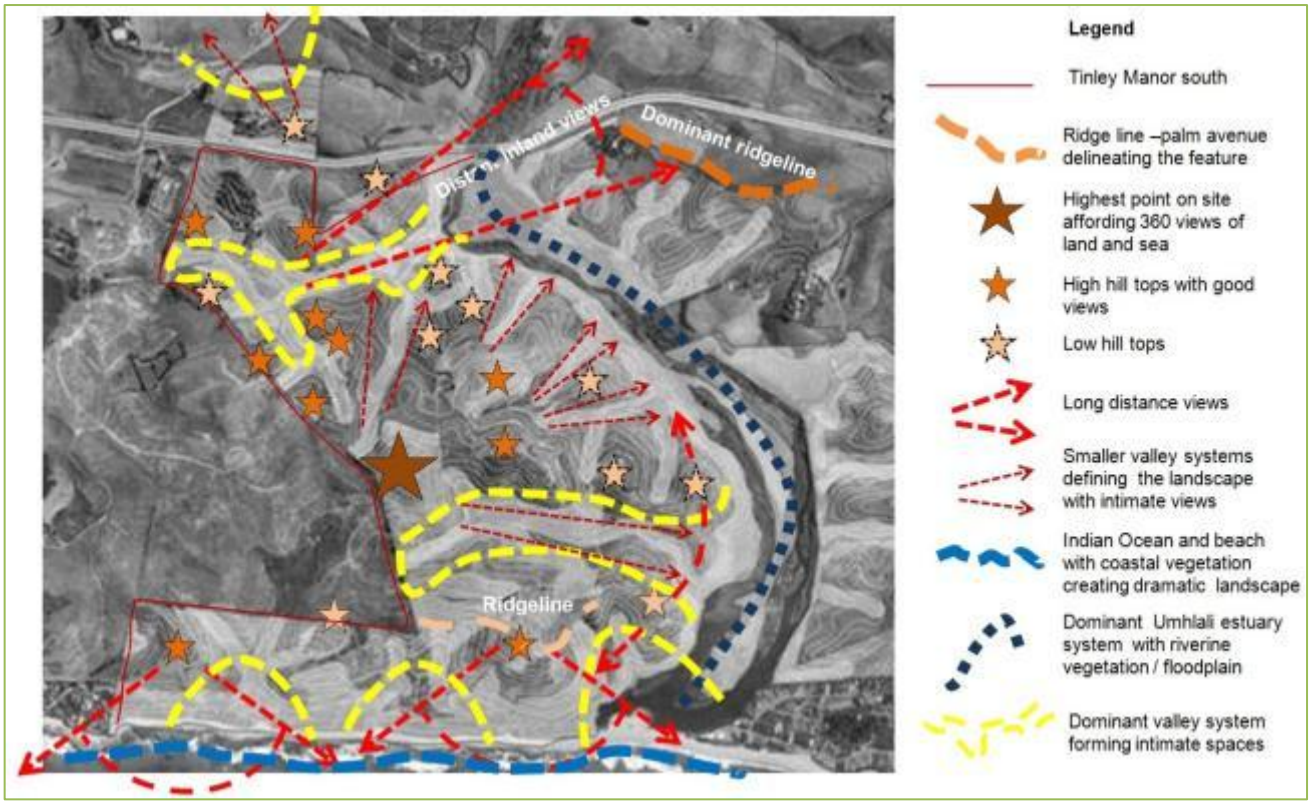

Figure 5-1: Tinley Manor Southbanks landscape assessment

In summary these include:

- Vast Open Areas with Views:
  - Elevated platform and edges with the highest points formed by dominant hilltops and ridgelines that define spaces within the landscape;
  - Open, expansive experience with magnificent long and medium distant views from a pivotal high point identified in ***Figure 5-1*** as well as high hill tops with good medium distance views and lower hill tops with pleasant more focused views; and
  - Vast expanse and open views such as the experience of the Christmas Bay beach and Indian Ocean.
- Intimate Spaces:
  - Enclosed and intimate spaces are formed by deeply incised valleys including the dominant estuarine system with associated riverine fauna and flora.
    - There are two dominant valley systems that clearly define the site into three distinct areas; these valleys are displayed in yellow dashed lines in ***Figure 5-1***.
    - A number of smaller valleys run toward the estuary in between the dominant valleys; and
  - Intimate spaces in the wetlands of the frontal dune form intimate spaces with lush vegetation.

These key visual qualities are experienced through several discernible landscape zones, each with different characteristics that contribute unique opportunities and challenges for the development of the site. These landscape zones are:

- ***Estuarine Zone*** – The northern part of the site is formed by the Umhlali River Estuary with invasive vegetation further up the estuary becomingly increasingly unspoilt toward the river mouth;
- ***Coastal Zone*** – On the eastern edge of the site a long sandy beach runs from the estuary mouth in the north to Christmas Bay in the south. The area is largely unspoilt with the long stretches of sandy beach edged with large portions of pristine frontal dune vegetation punctuated with small streams and wetland; and
- ***Hinterland Terrestrial Zone*** – This very hilly area is characterised by hilltops with sharply incised valleys with wetlands. Much of the area is disturbed and currently is under sugarcane cultivation. There are spectacular ocean and inland views. The N2 severs the western-most portions of the site.

5.1.2 *Implications of the Baseline Environment*

Some key implications of the baseline environment as presented in ***Section 4*** are listed below:

- The unstable soils and very steep slopes are significant factors informing location of access, development blocks and the open space functions. The most appropriate solution to these unstable areas will be to repair them where slippage has occurred, and stabilise with endemic grassland species.
- Development will need to be set well back from the coastal setback line, the limited development line, sensitive hydrological systems and protected vegetation. The majority of the wetlands and much of the Umhlali River estuary, especially upstream towards the N2 is compromised by massive invasive vegetation and will require significant rehabilitation.
- Development should not only recognise the critical ecological role of the site, but rehabilitate and improve the functioning of the system wherever possible. Any improvement in the local ecology will have significant benefits on the wider ecological system.
- The solution to improving the lack of access will need to be addressed on a sub-regional, district, and local level. The project at hand will deal with the local level and make inputs to a greater or lesser degree at the sub-regional and district levels.
- There could be significant advantages to the ‘experience’ of the overall development. This will be reliant on the access, block layout, and land uses, being carefully aligned with the attributes of the site. These attributes include factors such as sense of openness vs. enclosure, vast panoramas vs. framed views and vistas, all as highlighted in the landscape character assessment.

5.1.3 *Development Characteristics*

The vision for Tinley Manor Southbanks forms part of an overall development vision for all the land that spans the Umhlali River.

The overall draft concept for Tinley Manor Southbanks and Northbanks is presented in ***Figure 5-2***.

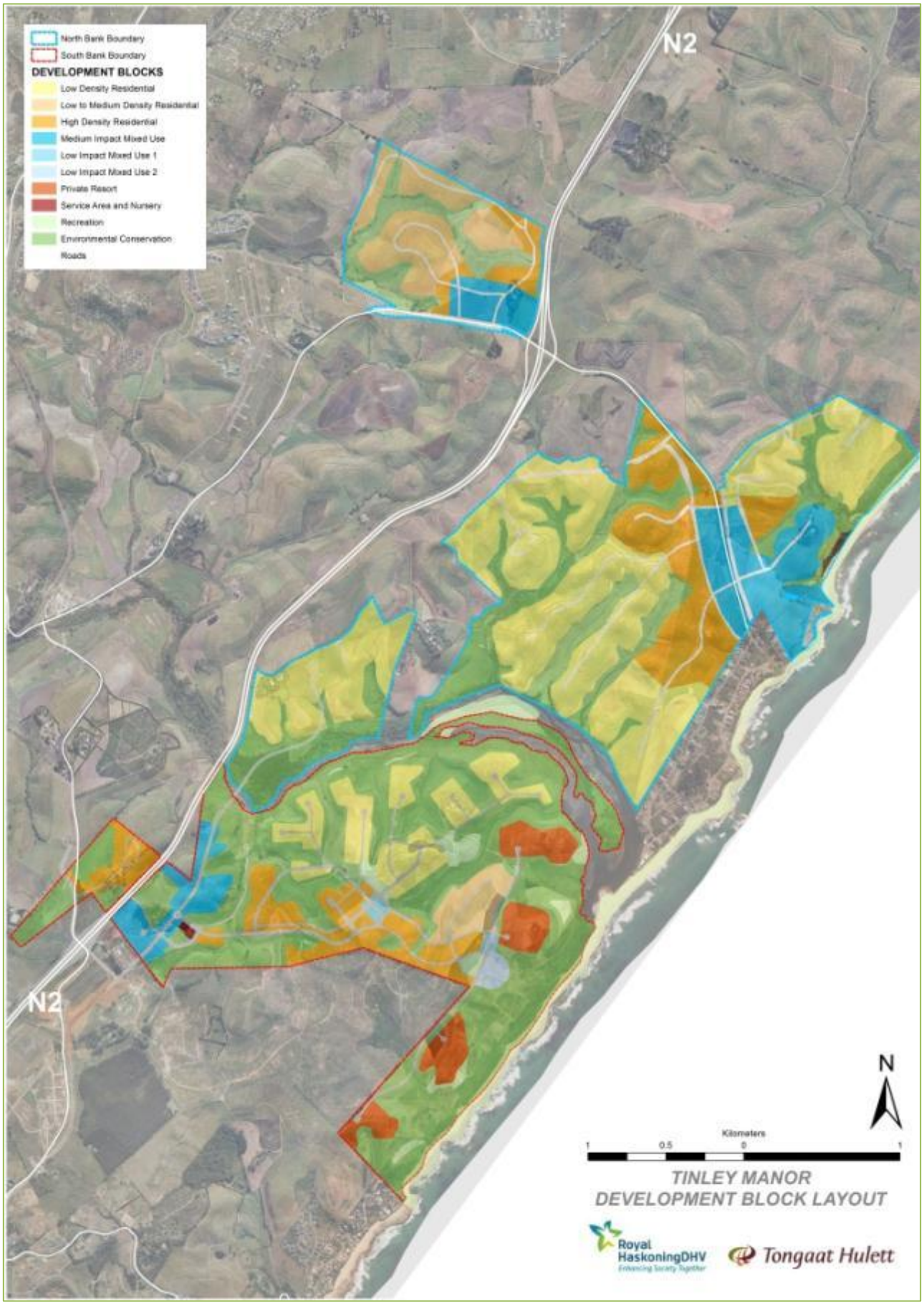

Figure 5-2: Tinley Manor draft concept plan

Defining characteristics of the Tinley Manor Southbanks concept plan include:

- ***Structure*** – integrated and permeable pedestrian and road networks and integrated network of soft and hard public spaces that integrates residential, leisure and mixed-use neighbourhoods and village nodes;
- ***Density*** – mix of density and intensity across the site;
- ***Form*** – mix of detached and attached low to medium rise single use and mixed-use building typologies; and
- ***Land use*** – residential, leisure, commercial, community, conservation, recreation, and agriculture.

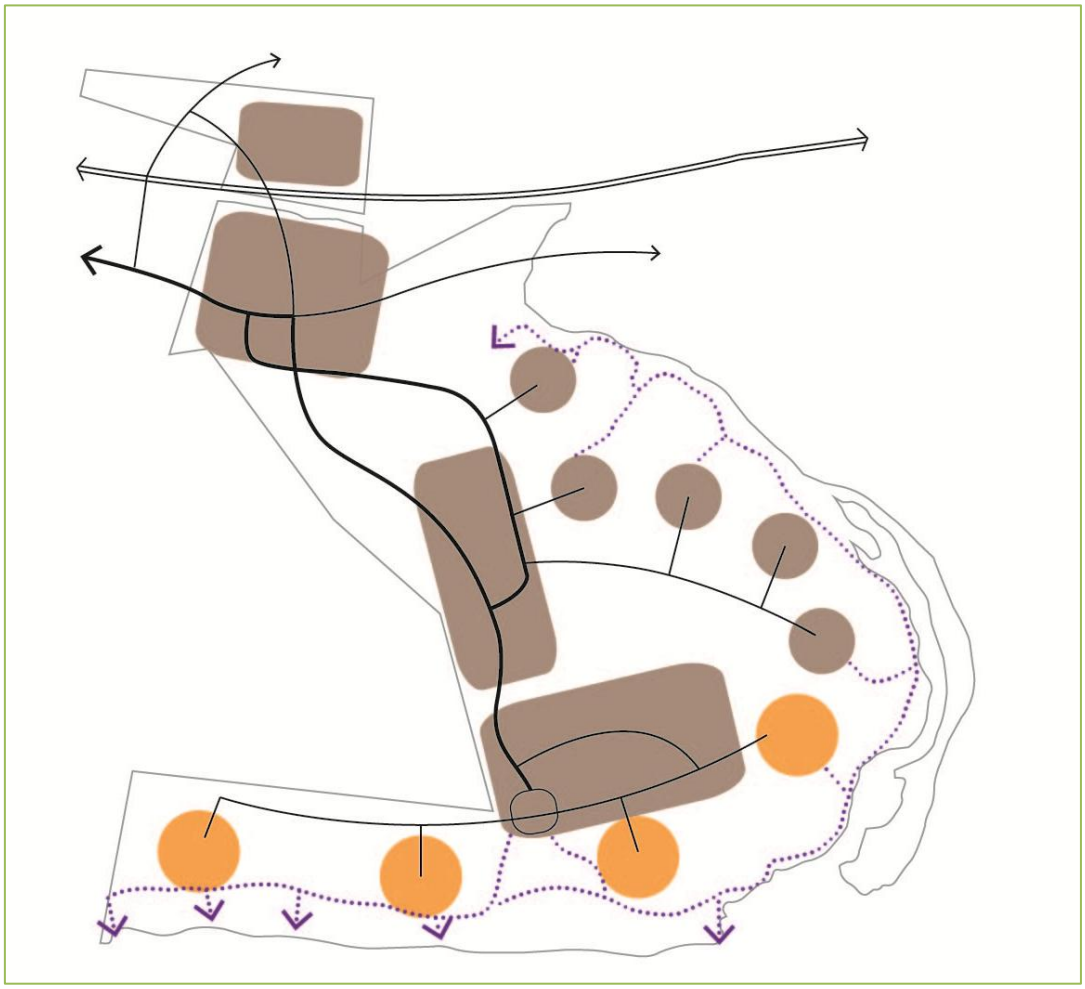

Figure 5-3: The Tinley Manor Southbanks concept plan

Figure 5-4: Example of a built-form concept

5.1.4 Site Structure and Block Layout

The site structure is pre-determined largely by the geophysical elements of the site (i.e. ecology, topography, geology, and hydrology). These have been integrated as part of the planning process into a plan which includes a robust open space network which, along with existing and proposed new movement corridors, creates developable pockets or “blocks” of land. The blocks of land are characterised by the various locational and amenity attributes of the site (i.e. regional accessibility and/or environmental amenity) and each derive their primary land use and value from these attributes.

The ocean, the Umhlali River, the boundary with adjacent Seaton Delaval Estate, and the N2, together form the main edges of the site; whilst the internal wetland systems and associated geophysical attributes dissect the land into discernible development blocks, each of which is situated astride and structured by a major or minor ridgeline.

The following sections describe the manner in which this primary block structure of the site has been used to articulate and translate the development concept into a set of spatial development frameworks, in order to guide the development of the block layout of the site.

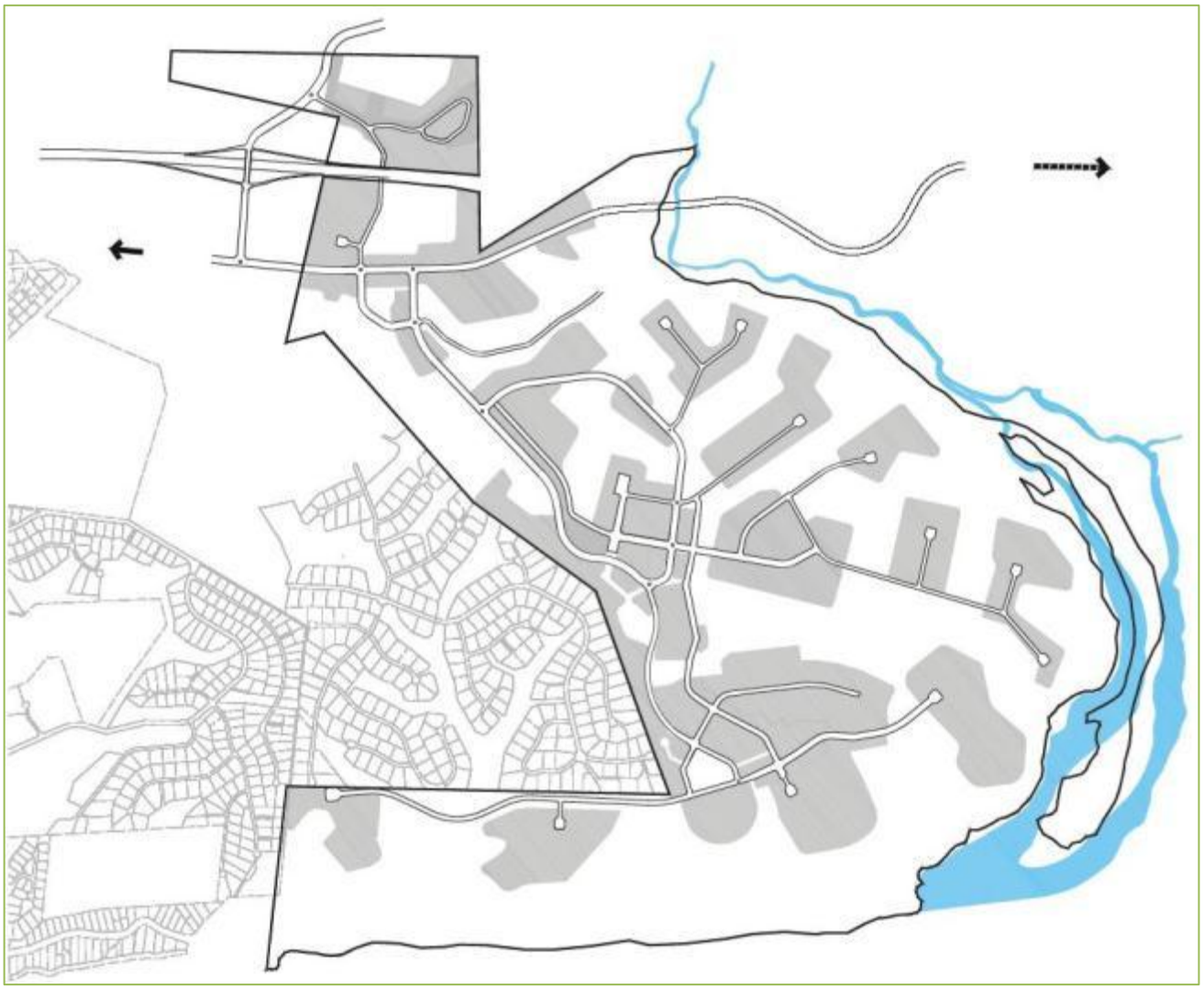

Figure 5-5: The Tinley Manor Southbanks block layout

5.1.5 Environmental Framework

The environmental framework formed the key basis of the site as presented in ***Figure 5-6***.

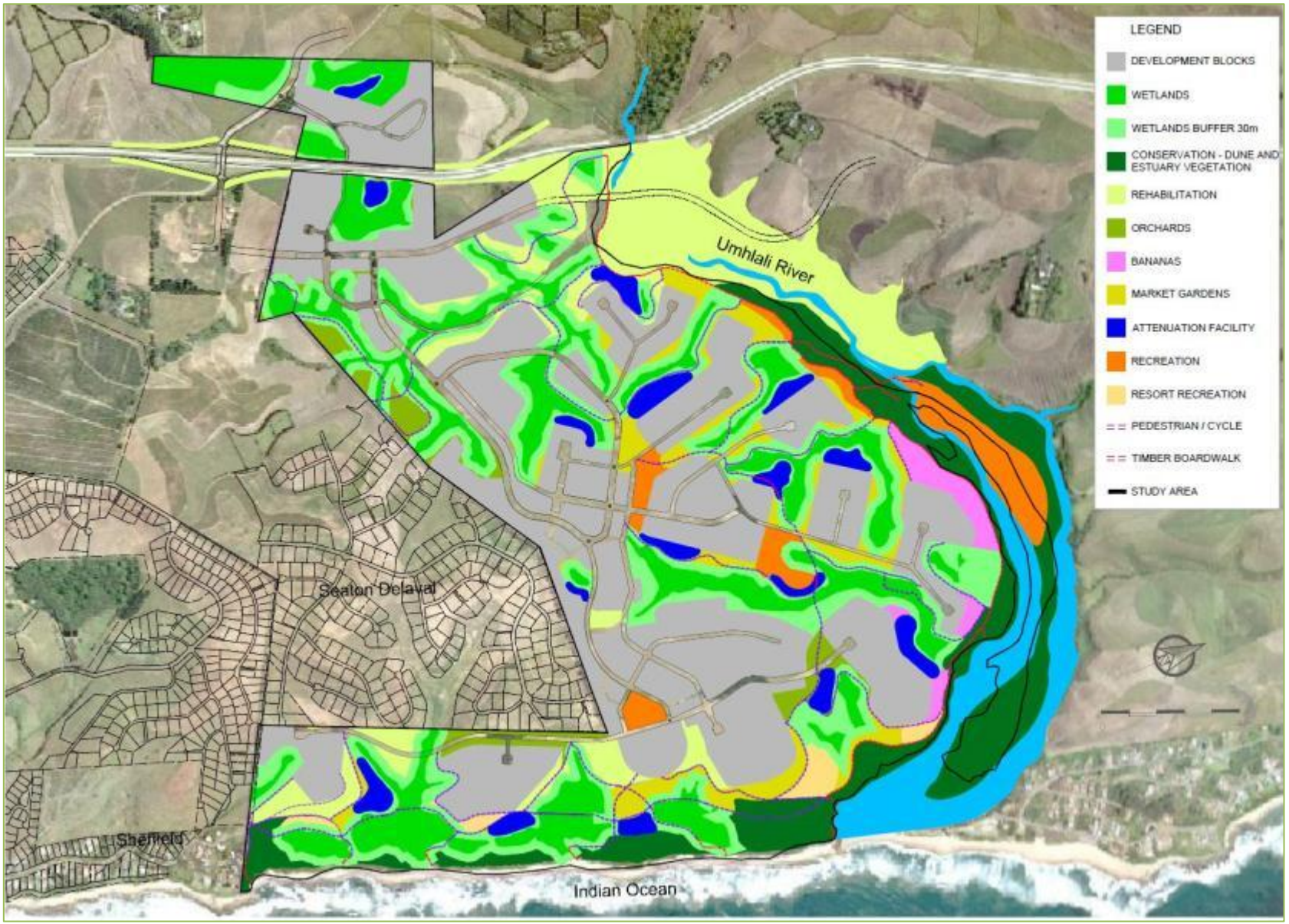

Figure 5-6: Environmental framework of the site

The objectives of the environmental framework thus derived are to:

- Protect and enhance ability of the ecological assets to produce ecosystem services and to regenerate ecological function of the site within the broader ecological system;
- Create an ecological and agricultural productive network of open space assets that provides a functional and attractive platform for coastal residential and resort development; and
- Create and open space system that provides for multi–purpose, active and passive, land and water based recreation opportunities and activities.

The elements of the system are as follows:

- ***Coastal Dune System*** – The fragility of this element of the system including the wetlands, coastal dune forest, rocky shores and beaches is to be strengthened through (a) protection of existing intact assets, (b) rehabilitation of transformed assets, and (c) integration of all assets into an expanded and enhanced coastal corridor system. This will serve to provide improved ecological functioning, including coastal erosion protection, as well as, land and water based recreation opportunities associated with the beaches and ocean.
- ***Riverine and Estuary System*** – This system is to be consolidated through the protection, rehabilitation, and enhancement of the flood plain the estuary and the associated wetland areas draining into the system from the site. This will provide improved ecological functioning including coastal erosion protection, as well as, water based recreation opportunities associated with the river and estuary.
- ***Regenerated and Enhanced wetland systems associated with major and minor wetlands*** – The wetland systems in the hinterland of the site are to be rehabilitated, expanded and enhanced, through the introduction of buffer areas. This will allow reestablishment of the wetland zones, as well as provide a protective buffer between the wetland and new development areas and new agricultural areas. These buffer areas are to provide for improved ecological functioning, as well as opportunities for recreation.
- ***Remnant Coastal Forests*** – The remaining small remnant coastal forests are to be protected and expanded where possible. They must be integrated with the broader open space system to increase the variety of landscape elements, as well as provide for plant and animal species diversity through habitat provision, and also allowing linkage of the system elements.
- ***Agricultural Areas associated with buffer areas and development blocks*** – These are specific areas located adjacent to, or within a portion, of the buffer areas and have been selected for their soil, slope and climatic attributes that can be used for agricultural production opportunities, including orchards, market gardens, and crops. These areas are intended to be productive areas that provide visual and activity attraction to the living environment;
- ***Recreational Areas*** – These areas provide opportunities for active and passive recreation and sporting activities. The activities are matched with each of the attributes of the site and the new development. The intent is to ensure that recreational function aside these areas must also perform an important linkage role between other open space elements located in different catchments (i.e. linking corridors or stepping-stone islands).
- ***Additional Linkage Corridors*** – These are areas that will provide opportunities for additional important linkages between all open space elements located in different catchments or in the coastal and riverine systems and are important for maintaining an integrated and complete network of open space. These areas will be of various low intensity uses – each set according to the nature of the land they cover and the nature of the open space areas they are linking (e.g. bridle paths, walking trails, linear parks, low density parking areas).
- ***Water Bodies*** – New bodies of water are to be established in carefully selected areas outside the existing wetland areas. The purpose of such waterbodies will be to dominantly provide water storage sources for agricultural purposes. The intent is that they should also provide variety across and interest into the landscape, whilst promoting increased plant and animal species diversity through niche habitat development. A further function will be to form part of the overall stormwater and flood risk management system – that is, being sized appropriately to allow for use as stormwater attenuation mechanisms.

5.1.6 Access and Circulation Network

The access and circulation network is presented in ***Figure 5-7***.

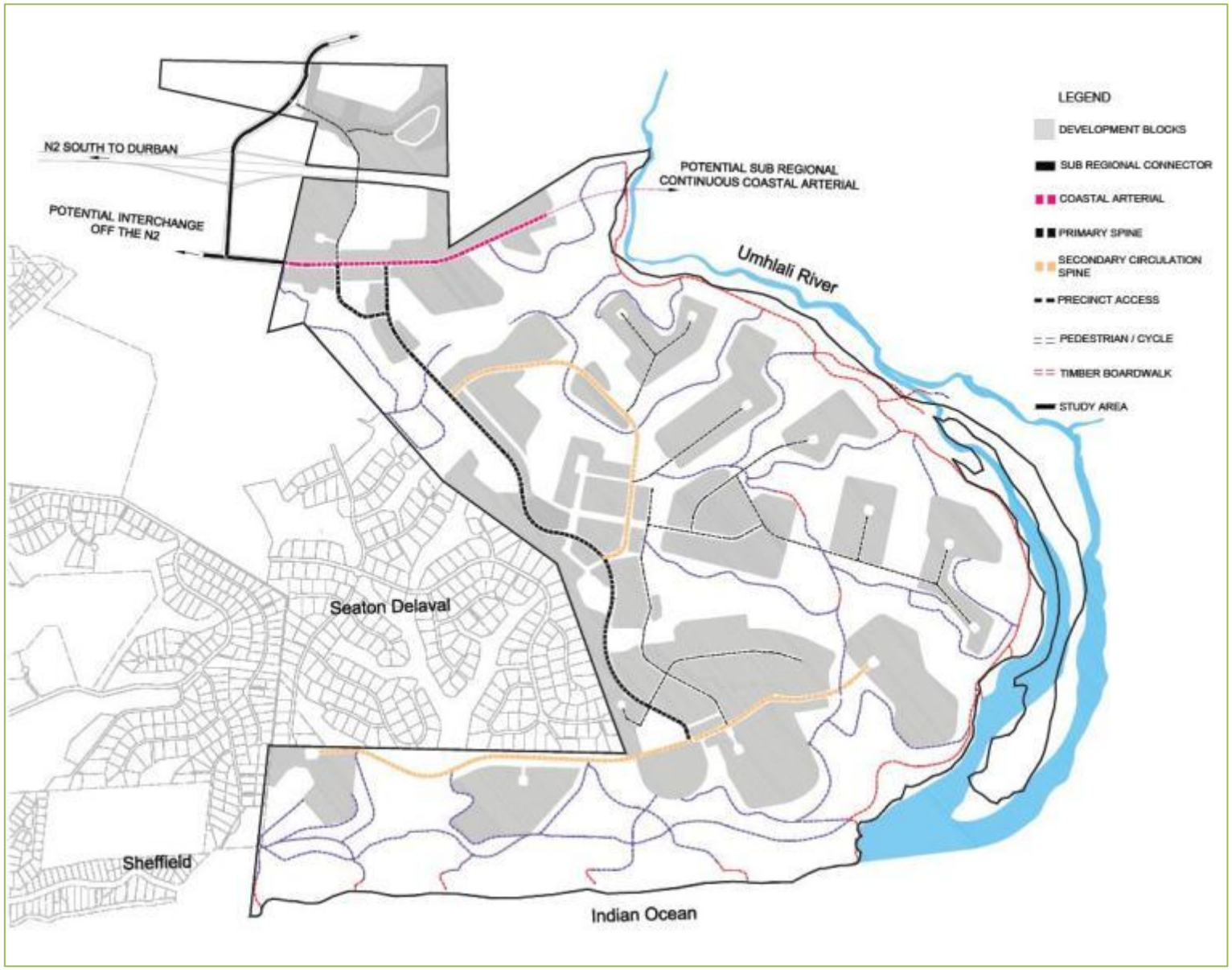

Figure 5-7: Access and circulation framework of the site

The objectives of the access and circulation framework are to:

- Provide for long-term linkage of the site into the regional and national system of the N3;
- Provide for long-term linkage into a secondary coastal arterial system, that will link the northern and southern banks of the Umhlali River;
- Promote and provide for a range of more sustainable on-site movement options, including private vehicular modes (e.g. golf carts), as well as a full range of non-motorised (e.g. bicycles) and public forms of transportation (e.g. buses of various capacities). The intent will also be to enhance the safety and ability to move around the greater site on foot. Such linkages should link the various land use nodes so as to facilitate the movement between these nodes according to the need – thus allow peak period movement from residences to employment and schooling facilities, create an association with aesthetically pleasing areas for recreational movement around the site, and crucially ensure safety for all forms of transport within and associated with the estate.
- Protect the integrity of individual land use zones, development blocks, precincts, and neighbourhoods within the development, but provide for their integration through a well-designed and efficient road / transport network. Land uses positioned to each other should not be of a type to compromise each other (e.g. high noise generation site next door to residential, office park and schools at a significant remove from residences), and should allow for enhancement of, for instance, sustainable on-site movement.
- Provide for the establishment of a safe and secure living environment without compromising convenience (i.e. functionality) and efficiency (i.e. compactness and inter-links).

The access and movement network is a hierarchical system designed to access the various development blocks on the site whilst minimising breaching of the wetland system.

The elements are as follows:

- ***Main Access Points from Regional System*** – This consists of the primary access point located off the proposed new coastal collector (extension of Sheffield Drive) and which will be able to access the proposed new interchange of Sheffield Drive with the N3.
- ***Provision for Coastal Arterial*** - Provision has been made for the long-term development of a coastal collector, east of and parallel to, the N3 and which will connect the northern and southern banks of the Umhlali River;
- ***Primary Spine*** - The primary spine road of the development will link its various components, as well as, link it into the regional movement system. The spine will begin at the entrance to the development and terminate in a T junction with the secondary coastal spine that serves the coastal leisure zone;
- ***Secondary Circulation Spines*** - Two secondary spines will serve the residential neighbourhoods and the leisure zones respectively. The first, a loop system off the primary spine, will serve a Village node at its eastern intersection with the primary spine road, and a second with a larger Village node at the junction of the primary and the secondary spine which will run parallel with the coast and will form two culs-de-sac north and south of the intersection with the primary spine.
- ***Precinct Circulation*** - Each of the precincts will be served by a system of residential access streets.
- ***Village/ Town Centre Grid*** - The Village nodes will be served through a grid of lower order streets designed to be pedestrian friendly and to enhance the Village “feel”.
- ***Pedestrian System*** - The pedestrian system consists of two components – (i) a “natural” and (ii) a “built up” component (***Figure 5-8***).
  (i) The “natural” includes the system that meanders through the open space system linking all environmental amenity zones to development zones providing routes for cycling, jogging, bird watching etc. The beach access system forms part of this and is underpinned by the ecological requirement to protect and preserve the sensitive ecological services of the site. Pathways will be designed to minimise ecological impact and their location will follow existing contour paths wherever possible, accessing the beach at existing natural breaches in the frontal dune system. Public beach access is provided from the secondary circulation spine as well as additional beach access points for lifestyle/ resort developments.
  (ii) The “built up” component is integrated with the street and road system with additional dedicated pedestrian pathways.

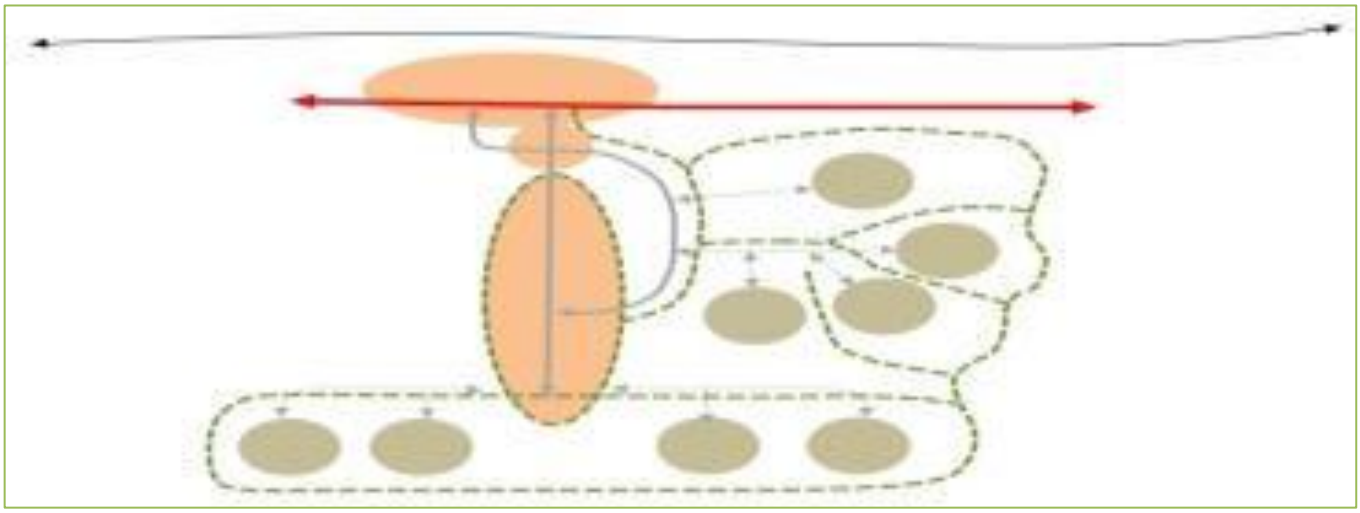

Figure 5-8: The pedestrian concept

The proposed street widths are presented in ***Table 5-1***.

Table 5-1: Proposed street widths

Street type	Street width including sidewalks
Primary Estate Spine	24 m with localised widening for turning
Secondary Circulation Spines	22 m including widened areas for parking at nodes
Major Precinct Access	16 m
Minor Precinct Access	12 m

5.1.7 Land Use Framework

The land use framework for Tinley Manor Southbanks is presented in ***Figure 5-9*** and ***Table 5-2***.

Table 5-2: Land use zoning bulk schedule

Land Use Zone	Area/ ha	% of Total	% of Dev	FAR	Bulk (m^2)	Units	Height (Storeys)
Open Space System	277.7	63.5%	0.0%				
Residential 1: High Density Residential @ 75units/ha	46.2	10.6%	29.6%	1.0	416,000	3120 units	2 to 6
Residential 2: Low-Medium Residential @ 35units/ha	12	2.7%	10.8%	0.5	54,000	189 units	max 3
Residential 3: Low Residential @ 10units/ha	44.6	10.2	28.5		201,000	21	
Low Impact Mixed-use 1: 60% residential @75 units/ha	3.1	0.7%	2%	1.0	29,000	203 units	max 3
Low Impact Mixed-use 2: Entertainment	3.7	.8%	2.4				
Medium Impact Mixed-use: 40% res @75 units/ha	17.8	4.1%	11.4%	1.0	152000	456 units	2 to 6
Resort: @55m2/room	31.3	7.2%	20%	0.25	78250	1,423 rooms	max 4
Service Area and Nursery	.60	.1%	.4%				
Total Developable	**159.30**	**36.32%**	**100%**		**928250**	**3898 units 1,423 resort rooms**	
Total Site Area	**437.0**					**5412**	

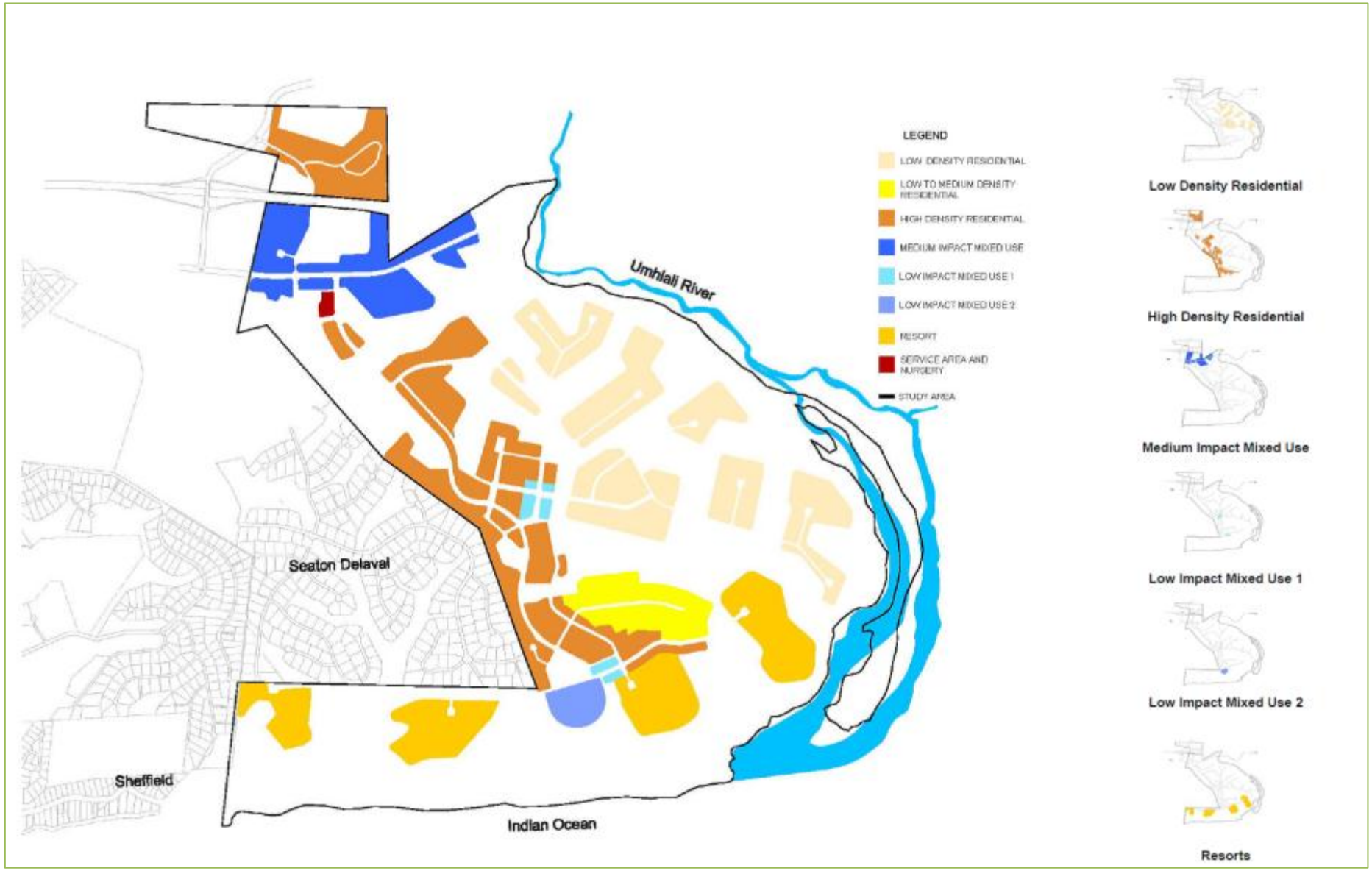

Figure 5-9: Land use framework of the site

The objectives of the land use framework are as follows:

- Optimise development of the site, without compromising the environmental character and function of the site.
- Provide for a range of vibrant, integrated "living working and playing" lifestyles (i.e. provision of an estate where work, amenities and residential accommodation are all close to each other thus leading to a lower footprint).
- Create a variety of integrated, balanced and identifiable land use zones, development precincts and neighbourhoods – the pattern of land uses should be appropriate, logical and serve to maximise benefits of each land use.
- Optimise locational advantages associated with regional and local access arrangements, and/or the diverse environmental amenities of the site.
- Provide for a range of development densities and settlement intensity (across the demographic bell-curve), whilst accommodating the demand for exclusive forms of development (both accommodation and recreational). Ensuring at the same time that opportunities are provided for integration and enhancement of linkages to the coast, through well designed public spaces and places, without compromising ecological functionality.
- Optimise beach assets for both tourists and local utilisation and facilitate appropriate beach access at the local scale. These "assets" are both recreational, aesthetic, and critically ecological functionality.

Eight (8) broad Land Use Zones have been created each containing a cluster of precincts and/or neighbourhoods.

These land use zones are as follows:

- ***Medium Impact Mixed-use*** – This land use is located in a node adjacent to the N2 and is intended to serve the new development, as well as the surrounding region, through is location at the interchange with the N2 and along the proposed future coastal arterial located east of the N2. The floor to area ratio (FAR)[11] of this precinct would be 1.0 and land uses would be set to accommodate retail, offices, and some service oriented uses commensurate with the needs of the surrounding region.
- ***Low Impact Mixed-use 1*** – This comprises two nodes. The smaller, centrally located community village node is intended to fulfil a local convenience role. The larger of the two nodes is located as a focus and termination to the central spine – that is, as an attractant from outside of the estate. The larger node provides both for commercial needs and convenience so as to provide for day to day needs. Limited entertainment and leisure (i.e. restaurants, pubs). Development will be facilitated by a FAR of 1.0, with the mixed-use to be integrated with the residential component of the higher density housing through mixed-use buildings (i.e. commercial on the lower floor, residential above) and a compact system of streets and public spaces, cross-linked into the non-motorised access as well.
- ***Low Impact Mixed-use 2*** – This land use is located centrally between the resorts and at the termination of the central spine. It is intended that this zone is to serve an entertainment function, taking advantage of its central location and spectacular views over the by-then rehabilitated indigenous vegetation and the Indian Ocean. The vision is obviously in the medium-term as it is reliant on the systematic rehabilitation of the open space network.
- ***High Density Residential*** – This zone is accommodated in two precincts, one on the coastal side of the N2 and located close to the central spine, and, a smaller precinct on the inland side of the N2. The residential precincts are to be tight clusters of development, integrated by an intricate system of streets and functional public spaces. The central precinct is to be integrated with the small mixed-use nodes and will aim to provide an opportunity for a higher density and more "urban" lifestyle within a secure estate lifestyle. The inland precinct provides an opportunity for a higher density urban lifestyle in a more regionally accessible, as well as affordable location, in close proximity to the Mixed-use Zone, with the provision of an accessible community facility. Development in these zones will be at a higher density (i.e. FAR of 1.0)[11] and built form could accommodate building heights of up to 6 storeys.

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[11] FAR = (total covered area on all floors of all buildings on a certain plot) / (area of the plot) – i.e. single-story building consuming the entire allowable area in one floor, or a multi-story building with a smaller footprint. The higher the FAR value, the greater the volume a building may occupy on a site. FAR must be balanced by required associated uses on the site such as parking vs. building footprint.

- ***Low to Medium Density Residential*** – This zone comprises a single precinct, associated with the large central wetland, wrapping around the internal face of the frontal dune. The precinct is accessed through the high density residential node from the primary spine road. The neighbourhood should provide for a range of housing types with higher densities closer to the high density precinct off the central spine (i.e. trending from this high density across the neighbourhood in a natural progression) and lower densities closer to the wetland and resort (i.e. lower intensity impact developments closer to the sensitive wetland area, and in line with the density found at the resort). Densities within this precinct are determined to balance at an average FAR of 0.5 across the neighbourhood. Built form is to vary from low (close to the wetland) to medium rise with building heights having a maximum of 3 storeys (adjacent to the high density residential node).
- ***Low Density Residential*** – This zone has five precincts, each made up of between one to three identifiable residential neighbourhoods or housing "clusters", each associated with a particular and dominant environmental feature, i.e. river, coast, wetland or agricultural area. Each precinct is to be accessed either through the central Village node or directly off the primary spine road. The neighbourhoods should be developed to have their own identity within a broader character theme. Densities within these precincts are determined to vary around an FAR of 0.5. Built form is to be low rise, with building heights having a maximum of 2 storeys.
- ***Resort and Leisure*** – This zone is located so as to optimise the coastal amenity and comprises of four development precincts. Each is positioned so as to ensure a prime location in the development so as to enhance the regional drive for the provision of tourism infrastructure. The four precincts will aim to provide for resort / leisure developments that ensure beach access for residents thereof. They will each have a separate access point off the secondary coastal spine, and exclusive and controlled access to the beach zone and overall pedestrian system. Note that only their access will be exclusive, once onto the beach area this will be public with access for all via a range of access points. The precincts are to be integrated with the surrounding enhanced open space system. Densities are set at a low level with the average FAR of 0.25 applicable to each individual resort / leisure site. Building heights will be a maximum of 4 floors – that is, a small building footprint, with a greater level of landscaped areas per unit area than the permanent residential areas.
- ***Service Area and Nursery*** – Established to provide for maintenance and operational requirements of the development. Its location is central, but located so as not to impinge on the development character in terms of traffic or visual impacts.

Figure 5-10: Development guideline – mixed-use node and hill top villages

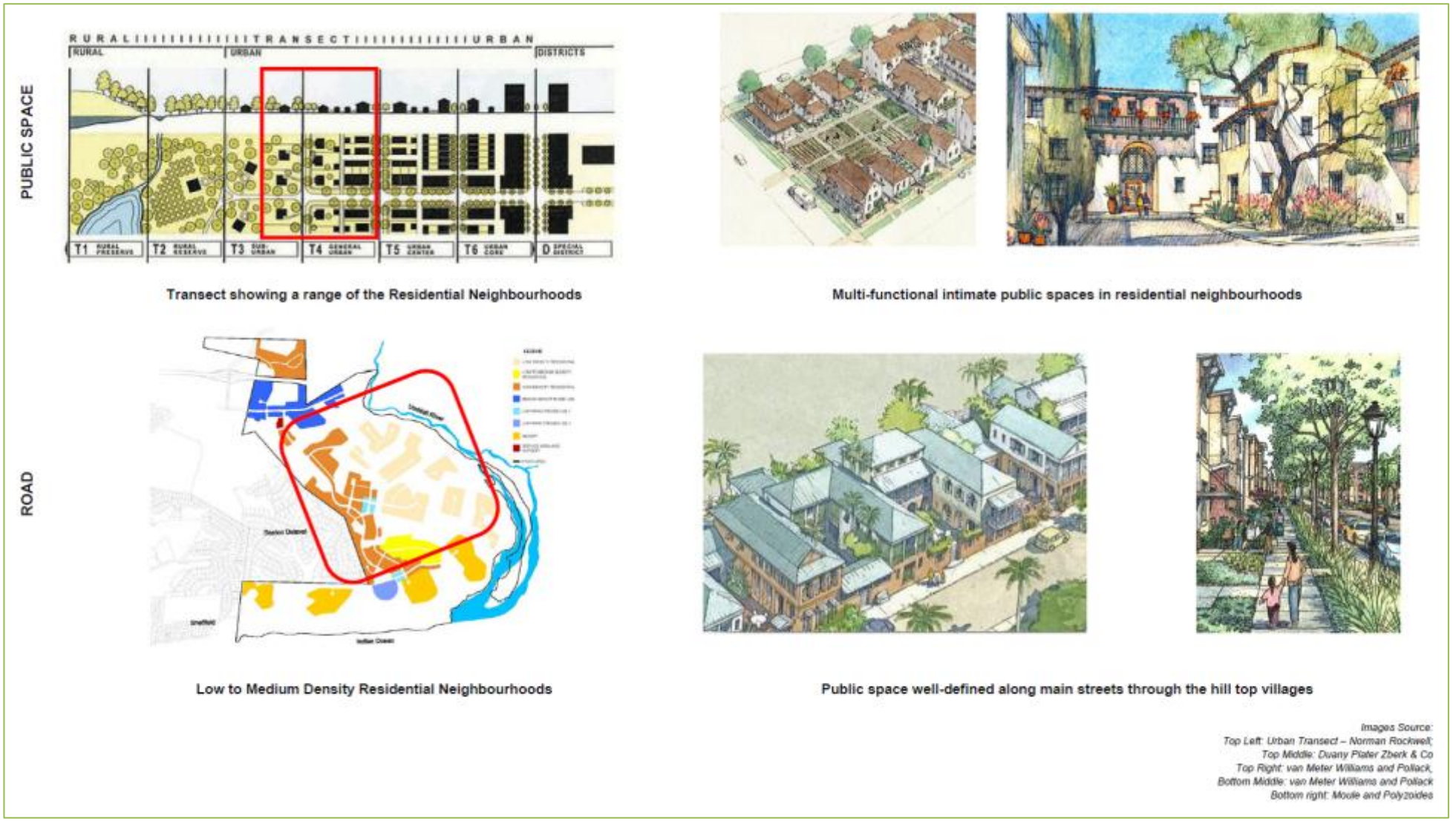

Figure 5-11: Development guideline – residential neighbourhoods

5.1.8 Landscape Strategy

The Landscape Strategy articulates the Environmental Network, showing the components of Protection, Production, Recreation, Access and the Landscape/Townscape Framework. The objectives of the Landscape Strategy are as follows:

- Create settlement with a unique, but coastal identity, character and “imageability”;
- Establish a functional and visual connection with the intrinsic ecological and agricultural assets and role of the site;
- Allow environmental features to dominate the character and development through an integrated public and private open space system, with a hierarchy of hard and soft public spaces; and
- Use a range of built form and the open space hierarchy to structure development and provide a “sense of place” within a range of development nodes, precincts, and clusters, integrated by the broader and dominant coastal landscape character.

As explained in the Environmental Framework, the integration of the various ecological and open space assets provides a green framework for the overall development. Elements of this framework that will provide the landscape character for the development include the following three (3) categories of “green” space:

- ***Protected Spaces*** – These spaces as illustrated in ***Figure 5-12*** will serve to protect, enhance, expand and "showcase" the total development. They consist of the following:
  - Existing dune, estuary, beach and coastal forest vegetation;
  - Rehabilitate and fully integrate wetlands, the upper estuary, and other natural features into the development – wetland seepage points must be left to continue functioning as optimally as possible (and rehabilitated at need) and in those wetlands that have been drained for agriculture in the past unblock the drainage channels allowing phased re-establishment of these areas; and
  - Protect and/or open views and view sheds of river and ocean.

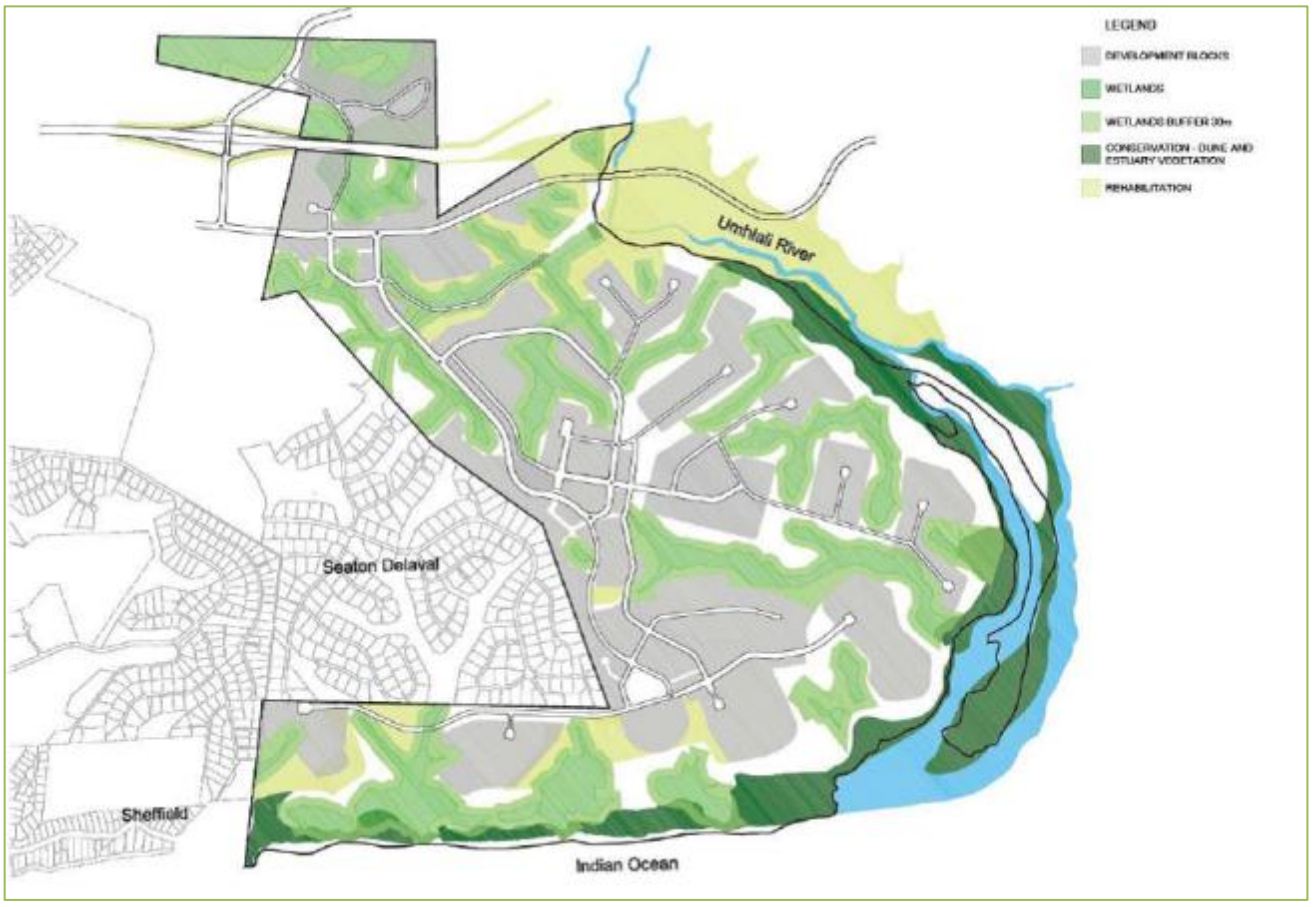

Figure 5-12: Protected spaces

- ***Production Spaces*** – these spaces as illustrated in ***Figure 5-13*** provide opportunities for cultivation of viable:
  - Mixed Produce Orchards – i.e. Bananas in sheltered, damper areas; in other more exposed areas options include: Mangos, Litchis, Avocados, Papayas, Citrus, Green Dahl, and Pigeon Pea plantings;
  - Mixed Produce Market Gardens – using the wetland buffer areas as filters from the agricultural lands;
  - New Attenuation Facilities outside the wetlands – to support production, irrigation and cultivation; and
  - Mixed Fruit trees – these will be used to soften hard landscaping on streets and within built-up portions of the site.

Figure 5-13: Production spaces

- ***Recreation Spaces*** – these spaces as illustrated in ***Figure 5-14*** provide opportunities for passive and active recreation areas as follows:
  - Passive recreation i.e. picnics and bird watching on the cultivated part of island;
  - Recreation i.e. picnics, bird watching and jetties for launching canoes in less sensitive areas along the estuary;
  - Active community recreation i.e. swimming pools, an amphitheatre, tennis / bowls, etc., in formal recreation areas forming part of the development; and
  - Beach Recreation i.e. picnics, bird watching, swimming, and ball games along the beach.

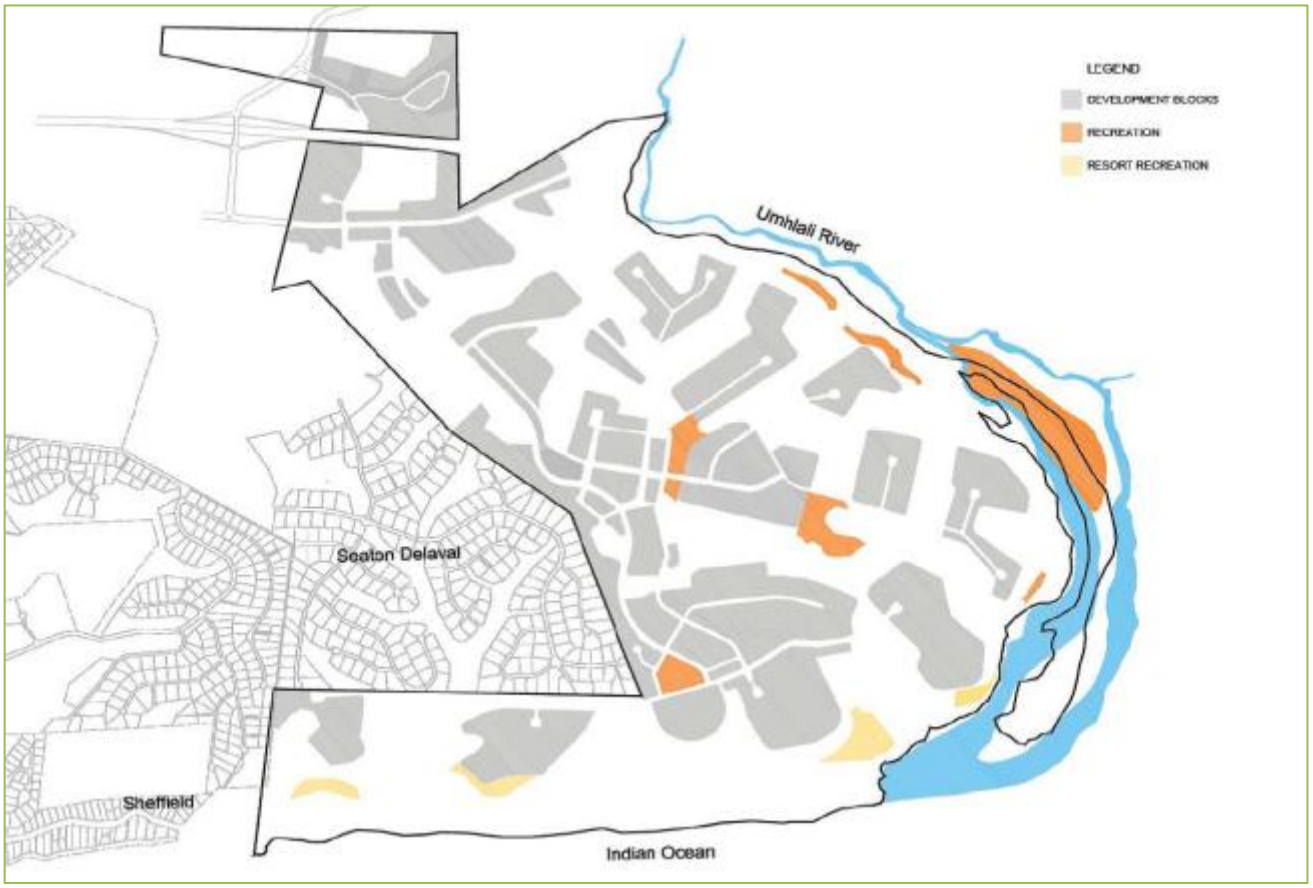

Figure 5-14: Recreation spaces

As an overarching principle to the development pattern the aim is to ensure that a compact built form is established on and around hill tops that accentuate the “hill top” / ridge line height “hierarchy” of the land form. This can be achieved through appropriate distribution of building heights, distribution of land use intensity and building density, and through the use of “land mark” planting and landscape features.

5.1.9 Landscape Elements

5.1.9.1 Mixed-use Nodes

5.1.9.1.1 Regional

The accessible regional mixed-use node is located on the western part of the study area east of the N2 motorway. The node will be along the north-south regional coastal connector route, and should be developed into a regional urban centre with high density, land use mix and building height.

Elements should include:

- A predominantly urban character with a network of landscaped hard and soft public spaces and civic squares, edged with mixed-use buildings 4 – 6 storeys high – the edges of each development type should be similar or in harmony to limit disjuncts;
- Buildings should face onto the streets, with active ground floor frontages along shopping areas and public spaces and squares to ensure inclusivity and accessibility;
- Buildings and structures, such as pedestrian walkways, should have canopies and colonnades to protect shoppers and pedestrians and to enhance the functionality and to make movement around the estate – other than by car – more appealing;
- Landmark buildings and landscaped public space at important junctions, i.e. at the entrance to the development, should be done to ensure that the development as a whole ties together and is aesthetically functional, and providing habitat for smaller animal species especially birds;

- All streets should be landscaped with pedestrian and cycle access provision – include tree planting, wide pavements with pedestrian lighting, seating and cycle parking;
- Main streets, such as the regional connector route, should have dense boulevard tree planting and high quality landscaping with generous pedestrian / cycle provision;
- Avoid large car parking areas at the front of buildings – limited car parking should be on the street, in landscaped parking courts to the rear of the buildings or basement car parking and where in the open inter-planted with shading trees;
- Provision of highly accessible public transport with pedestrian friendly interchange terminal with landscaped public space;
- Focus of safe and secure access and movement around the greater site by all users; and
- Specifically, convenient and safe pedestrian crossing points.

5.1.9.1.2 Local Mixed-use Centre

The two local centres are located at the highest part of the study area forming the heart of the development. The minor convenience centre and the larger commercial and entertainment centre should have a built form accentuating their hill top location with urban attributes of higher density, land use mix and modest building heights within a compact and pleasant pedestrian-friendly street environment.

Elements should include:

- Traditional town centre grid layout with walkable blocks of approximately 60 x 60 m;
- Landmark building with landscaped public space at gateways;
- Landscaped public spaces, squares and intimate pedestrian-orientated streets that take advantage of the unique landscape qualities, such as inland and coastal views;
- Mixed-use buildings with entrances onto the street and ground floor shopping frontages to create friendly active edges; and
- Building edges with canopies and colonnades to provide pedestrian with a protected environment.

5.1.9.2 Residential Districts

5.1.9.2.1 High density

The higher density residential areas are located along the spine routes and also in the residential neighbourhood west of the N2 motorway.

The character should be predominantly urban residential, with a range of building typologies of medium rise residential blocks. These will form the street “walls” and, along with landscaped streets and public spaces, create a sense of place.

Elements should:

- Highlight the main entrance and routes in the residential areas with special landscape features such as mass planting / roundabouts / water features, etc.
- Establish an accessible network of landscaped hard and soft public spaces with well connected pedestrian and cycle access to local facilities such as shops, communal facilities, public transport and multi-functional green space;
- Cluster facilities with landscaped civic spaces at the most accessible locations along with 3 – 4 storey higher density residential;
- Building frontages and entrances that orientate doors and windows towards the street as opposed to blank walls, fences and garages – that is, inclusive rather than exclusive;
- Streets should have landscaped pavements, providing for pedestrians and cyclists, and include sustainable urban drainage and tree planting that mixes indigenous and fruit bearing trees; and
- Avoid front garden parking – parking should be on the street edge itself or in landscaped semi-private but secured parking courts or garages to the rear of each of the buildings.

5.1.9.2.2 Low to Medium Density Residential

The private and less accessible areas should provide lower density residential with a more suburban character, that include 2 – 3 storey residential buildings on bigger plots with wider frontages.

Elements should include:

- 2 – 3 storey residential buildings forming intimate public and semi-public spaces;
- Homes orientated towards the street with veranda's, porches and balconies that create neighbourliness - avoid garages and car parking in front gardens;
- Sustainable urban drainage (SUDS) with swales and soakaways for drainage and irrigation of landscape and market gardens;
- Landscaped streets with pavements and amenity tree planting;
- Safe pedestrian crossings at regular intervals; and
- Suitable pedestrian connection to public transport at a local level.

5.1.9.3 Gateways and Landmarks

Access and entrance nodes to precincts and to neighbourhoods are to be treated according to their role in the development, through the use of appropriate buildings / structures and/or planting and landscaping.

The regional and village nodes should have landmark buildings and landscaped public spaces to establish a strong sense of place and identity. The landmark buildings should stand out from the surrounding built fabric – this can be in the material choice, height, and/or design that could include a special identifiable feature. That is, the design should be heterogenous rather than homogenous, without being jarringly inappropriate or different from building to building.

The more local residential entrances off the spine roads should also be accentuated, but this can be with special landscape features that establish identity and give significance to a neighbourhood.

The landscape features could include a surface material change and mass planting, a special landscape feature such as a stone wall with a water feature or a landscaped roundabout with feature tree planting. Landscaping should be multi-purpose as far as possible and should be water-wise.

5.1.9.4 Boulevards and Streets

The proposed development has a very clear road hierarchy and the landscape treatment of each will differ depending on their form and function.

The hierarchy of circulation routes is to be reinforced through landscaped planting, paved intersections, lighting and signage.

5.1.9.4.1 Primary Spine (Boulevard)

This is the central transit boulevard running from the entrance to the secondary spine accessing the resorts.

The landscape treatment should reflect the importance of this route, and accommodate the large volumes of pedestrian and cycle traffic.

Landscape treatment should include:

- Dense boulevard tree planting either side of the street and in the central island with indigenous tree species such as *Ekebergia capensis, Erythrina lysistemon, Ficus burtt-davyii* and *Ficus sur*;
- Pedestrian and cycle route in both directions that is well proportioned and landscaped with a paved surface, seating and bat friendly lighting that limits upward reflection; and
- Planted edge treatment to screen central spine with indigenous planting such as *Albizia adianthifolia, Alectra sessiliflora, Apodytes dimidiata, Asystasia gangetica, Brachylaena discolour, Clerodendrum glabrum, Crotolaria lanceolata, Cynodon nlemfuensis, Cyperus natalensis, Cyperus rotundus, Digitaria diversinervis, Hibiscus surattensis, Ipomoea carica, Panicum maximum, Sporobolus maximum* and *Sporobolus pyrimidalis.*

5.1.9.4.2 Secondary Spine (Boulevard)

The secondary boulevard runs off the central spine to the residential precincts, Village nodes and resorts. The landscape treatment should accommodate the distributor function of this route, which will require provision for large volumes of pedestrian and cycle traffic, as well as, convenient access to public transport.

Landscape treatment should include:

- Boulevard tree planting either side of the street to create a pleasant climate for pedestrians. Appropriate indigenous tree species such as *Albizia adianthifolia, Clerodendrum glabrum, Ekebergia capensis* and *Erythrina lysistemon,* as well as fruit trees such as Avocados, Mangos and Litchis;
- Pedestrian and cycle route in both directions that is well proportioned and landscaped with a paved surface, seating and "bat friendly" lighting that limits upward reflection. The routes should be linked into adjacent precincts with a convenient number of landscaped access points for ease of access;
- Landscaped public transport "drop off" and "pick up" points with safe convenient crossing points that provide adequate and well designed shelters for passengers; and
- Indigenous shrub planting screen to edge the route either side of the road and screen traffic from residential precincts.

5.1.9.4.3 Village Node Streets

This is predominantly an urban village focus point that requires a high quality landscape.

Landscape treatment should include:

- Wide flexible pavements that facilitate walking, as well as, alfresco dining and shopping;
- High quality pedestrian lighting that includes spotlights on focal features of the built form and landscape;
- Cycling facilities integrated into the street;
- Landmark buildings and landscaped public square that includes public art at key points in the node and taking advantage of views;
- Tree planting of both indigenous and fruit trees irrigated with sustainable urban drainage; and
- Built edge that defines the street with active ground floor frontage and canopies and colonnades.

5.1.9.4.4 Access Routes

These routes distribute traffic to the local residential precincts.

They are to be suburban in character and should help establish an identity, provide a pleasant setting and multi-functional space for the precinct, while facilitating pedestrian and cycle access.

Landscape treatment should include:

- Landscaped pavements with adequate pedestrian and cycling space;
- Street trees to establish a strong identity and be planted in themes. Appropriate indigenous tree species such as *Albizia adianthifolia, Clerodendrum glabrum, Ekebergia capensis, Erythrina lysistemon* and *Trichilia emetica*, as well as fruit trees such as Avocados, Citrus, Mangos and Litchis;
- 'Woonerf' type roadway design to facilitate multi-functional use of the street i.e. car parking, community events and informal play;
- Sustainable urban drainage within pavement design in the form of plated swales and shallow detention ponds to facilitate percolation of storm water run-off and irrigation of street trees; and
- Co-ordinated landscape furniture to reinforce identity and sense of place.

5.1.9.4.5 Pedestrian System

Pedestrian systems link all the environmental amenity zones to the development zones and provide for cycling, jogging, bird watching, etc.

The pedestrian system (***Figure 5-15***) should feature a range of pedestrian pathway treatments depending on which landscape zone the system is serving i.e. riverine, beach, town centre.

The defining landscape elements include:

- Ecological sensitive areas, such as wetlands, frontal dunes and along the estuary should have timber boardwalks and timber jetties with handrails to protect sensitive areas and prevent wandering off the pathways;
- Pathways through other less sensitive areas, such as conservation and agricultural areas, should be in a natural free draining surface material (i.e. bound gravel) with a brick edge, and should accommodate buggies and disabled access, but this may not be possible everywhere due to the extreme topography;

- Pathways in development zones should have a more formal surface material with good lighting and co-ordinated furniture such as benches and bins and always make provision for pedestrians, cyclists, buggies and people with disabilities (i.e. in wheelchairs);
- In the development block provide:
  - landscaped pavements with amenity tree planting;
  - safe pedestrian crossings at regular intervals;
  - suitable pedestrian connection to public transport at a local level; and
  - Throughout the site provide surfaced pedestrian and cycle paths;
- In ecologically sensitive areas, such as wetlands, frontal dunes and along the estuary provide timber boardwalks and timber jetties with handrails.

Figure 5-15: Pedestrian access

5.1.9.4.6 Peripheral Zone Treatment

The interface between development zones and the open space system is an important intermediary space that forms a buffer between the development and the surrounding landscape.

The buffer should be multi-functional open space that includes small scale agriculture in the form of market gardens and orchards, sport and recreation, and some small scale development with complimentary land uses such as market stalls / plant nurseries, etc.

Landscape treatment should include:

- Understated buildings and structures (such as gates and fences) should be more rural than urban in scale and materials, i.e. low heights with natural materials such as timber and stone;
- Define spaces (i.e. fields) with indigenous fruit bearing hedge planting; and
- Lighting levels to be low to protect wildlife (i.e. bat friendly) and retain a rural quality.

5.1.9.5 Overall Landscape Guideline

The overall Landscape Strategy is presented in ***Figure 5-16***.

The landscape treatment should clearly reflect the two distinct development zones, namely the hard landscape areas within the ”built up” zones, and the soft landscape areas within the open space system.

The landscape treatment for the hard landscape treatment should include:

- A more formal approach to landscape design, i.e. clean lines and uncluttered detailing;
- Structured and ordered tree, shrub and groundcover planting with planting areas that are clearly defined with an edge treatment;
- Predominant use of modern materials such as cortens steel / powder coated aluminium, and polished granite, and include a co-ordinated palate of landscape furniture; and
- Modern white lighting in public spaces and streets, with accent lighting to highlight pedestrian pathways, gateways, landmarks and planting features.

The landscape treatment for the soft landscape treatment should include:

- A more informal landscape design with natural materials used in a less structured manner, materials could include timber, gravel, crushed stone and painted elements to be in a dark submissive colour, i.e. dark green to blend with the natural surrounding;
- Planting that is less structured / more natural;
- Informal landscape features i.e. reflection ponds and water features that form part of the drainage system;
- Less intrusive, low level lighting that does not impact on the night sky and is sensitive to surrounding wildlife especially when close to wetlands as especially amphibians are strongly influenced by lighting regimes which can modify breeding patterns for instance; and
- Co-ordinated landscape furniture that together with the signage and way finding is subtle and does not detract from the natural setting.

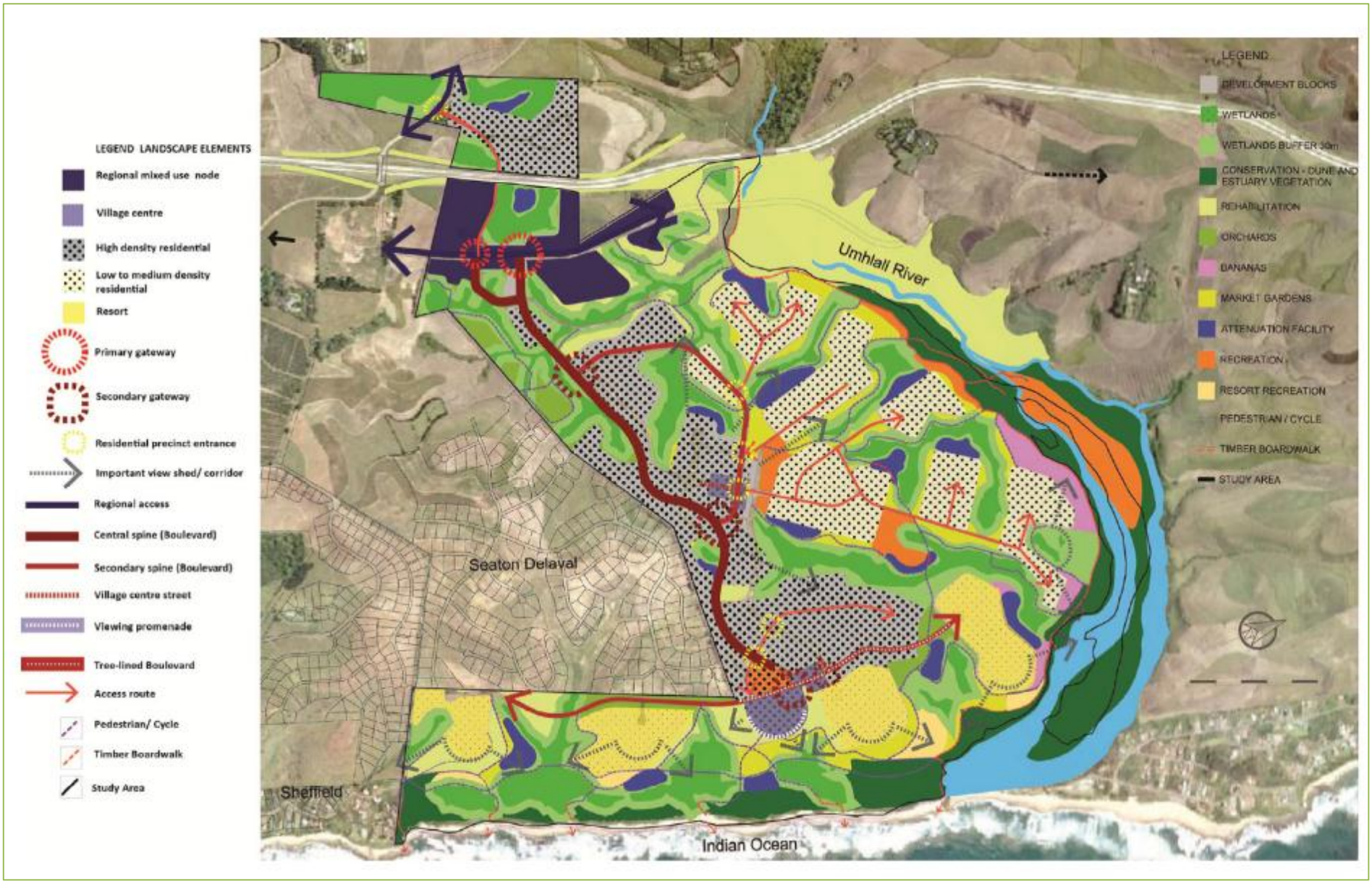

Figure 5-16: Overall Landscape Strategy

5.2 Engineering Services[12]

5.2.1 Water

Upgrades to the water supply system from Hazelmere Dam increased the availability of water to the North Coast Supply System. These upgrades included: raising the Hazelmere dam wall, increasing the WTW capacity from 45 to 75 Mℓ/day and augmenting the 450 mm diameter bulk supply main to the La Mercy bi-furcation with a 700 mm diameter main. Umgeni Water planning indicates that a future dam on the Mvoti River is also being investigated.

Sembcorp Siza Water has confirmed that their current master planning includes a reservoir to be constructed in the Seaton Delaval Estate to serve (a) Seaton Delaval phase 1B, (b) Reynolds farm development, and (c) the Tinley Manor Southbanks developments.

Initially the supply for this reservoir will be from the Taffeni reservoir in the form of a 300 mm diameter pipeline 700 m long. As the demand increases, the reservoir will need to obtain water directly from the Umgeni Water Bulk supply pipeline as indicated in ***Figure 5-17***.

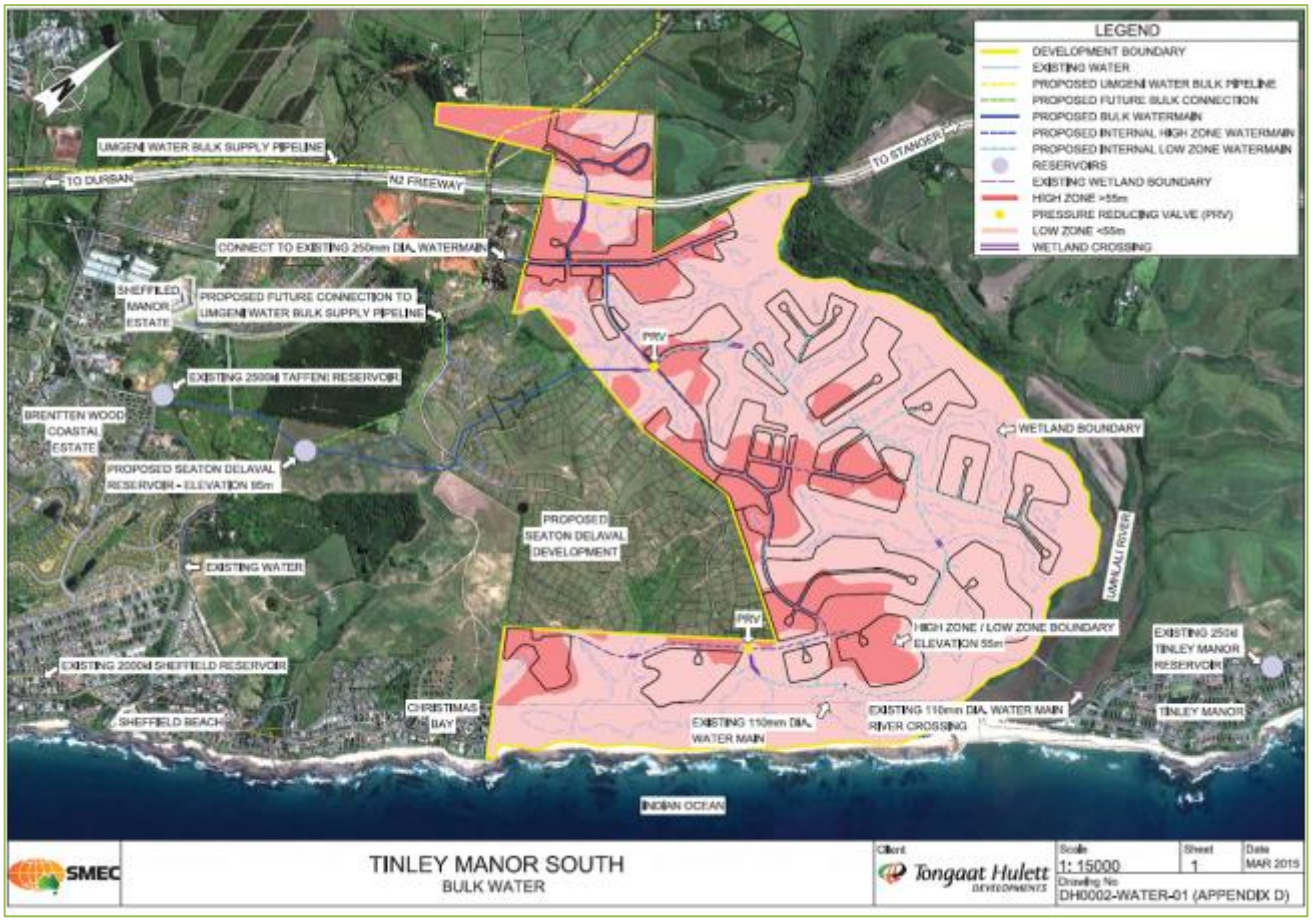

Figure 5-17: Proposed bulk water network

The Northern region planning report prepared by SMEC South Africa on behalf of THD, as well as the anticipated yields, has been used to calculate the Average Daily Demand (ADD) of the proposed development. The ADD is given as 7.34 Mℓ/day as indicated in ***Table 5-3.***

[12] *The information provided in this section has been obtained from the Tinley Manor Southbanks Engineering Services Report (2015) prepared by SMEC South Africa provided in Appendix C 11.*

Table 5-3: Water demand

Name	Area (ha)	Units	Factor	Estimated ADD Mℓ/day
High Density Residential	46.20	3120	0.001078	3.36
Low-Medium Density Residential	12.00	189	0.001438	0.27
Low Density Residential	44.60	21	0.001438	0.03
Lo Impact Mixed-use 1	3.10	203	0.001078	0.30
Low Impact Mixed-use2	3.70			0.27
Medium Impact Mixed-use	17.80	456	0.001078	1.15
Resort	31.30	1423	0.00138	1.96
Service Area and Nursery	0.60			0.04
Total Estimated ADD				**7.39**

THD have indicated that the development will be implemented in phases starting with the resort nodes, followed by residential developments, and finally mixed-use / commercial nodes.

With this in mind, the anticipated phasing of bulk water infrastructure is proposed as follows:

- Phase 1 – Sembcorp Siza Water has prioritised abandoning the existing 110 mm diameter pipeline river crossing across the Umhlali River illustrated in ***Figure 5-17*** and will service the Tinley Manor reservoir with a new pipeline north of the Umhlali River. The section of 110 mm diameter water main south of the Umhlali River will then be available to supply the initial resort nodes (approximately 2).
- Phase 2 – A new 300 mm diameter water main will be constructed from the proposed Seaton Delaval reservoir to supply the project zone. This water main will also connect into the existing 250 mm diameter at the existing gravel access to the project area to complete a ring feed.
- Phase 3 – Bulk supply from the Taffeni reservoir to the Seaton Delaval reservoir will ultimately be replaced by a direct feed from the Umgeni Water bulk supply pipeline.

5.2.2 Sewage

The sewage generation calculated in ***Table 5-4*** below is based on 80% of the water demand (as per industry norm); a further 15% is allocated to allow for infiltration.

Sewage generated will be treated at the existing Sheffield WWTW. An additional 6 Mℓ WWTW cell will be constructed to accommodate the development.

Table 5-4: Sewage demand

Sewer Generation (Based on 80% Water Demand)	Capacity
Water Demand	7.39 Mℓ/d
80 % Water Demand	5.91 Mℓ/d
Allowance for Infiltration	15 %
Total Sewer ADD	6.80 Mℓ/d

The "Red Book"[13] requires that "*a minimum emergency storage capacity representing a capacity equivalent to four hours flow at the average flow rate should be provided*". This is typically limited to not more than 250 units which is equivalent to 0.2 Mℓ/day of sewerage. Greater than this, "*the sump capacity should be subject to special consideration in consultation with the local authority concerned*".

It is proposed that the storage volume of sewage generated from one hour of peak flow rate is allowed for over and above the working capacity of the pump station sump. With the proposed storage capacity it is essential that provision be made for emergency backup generators for use during power outages. To cater for total mechanical and electrical failure it is also proposed that an emergency overflow pond (reed bed type)

[13] *The Human Settlements Planning and Design Handbook (referred to as the 'red book' due to it's cover) CSIR, 2000*

with a volume equivalent to the volume of sewage generated from four (4) hours at the average flow rate, be constructed.

The proposed sewage network is presented in ***Figure 5-18***.

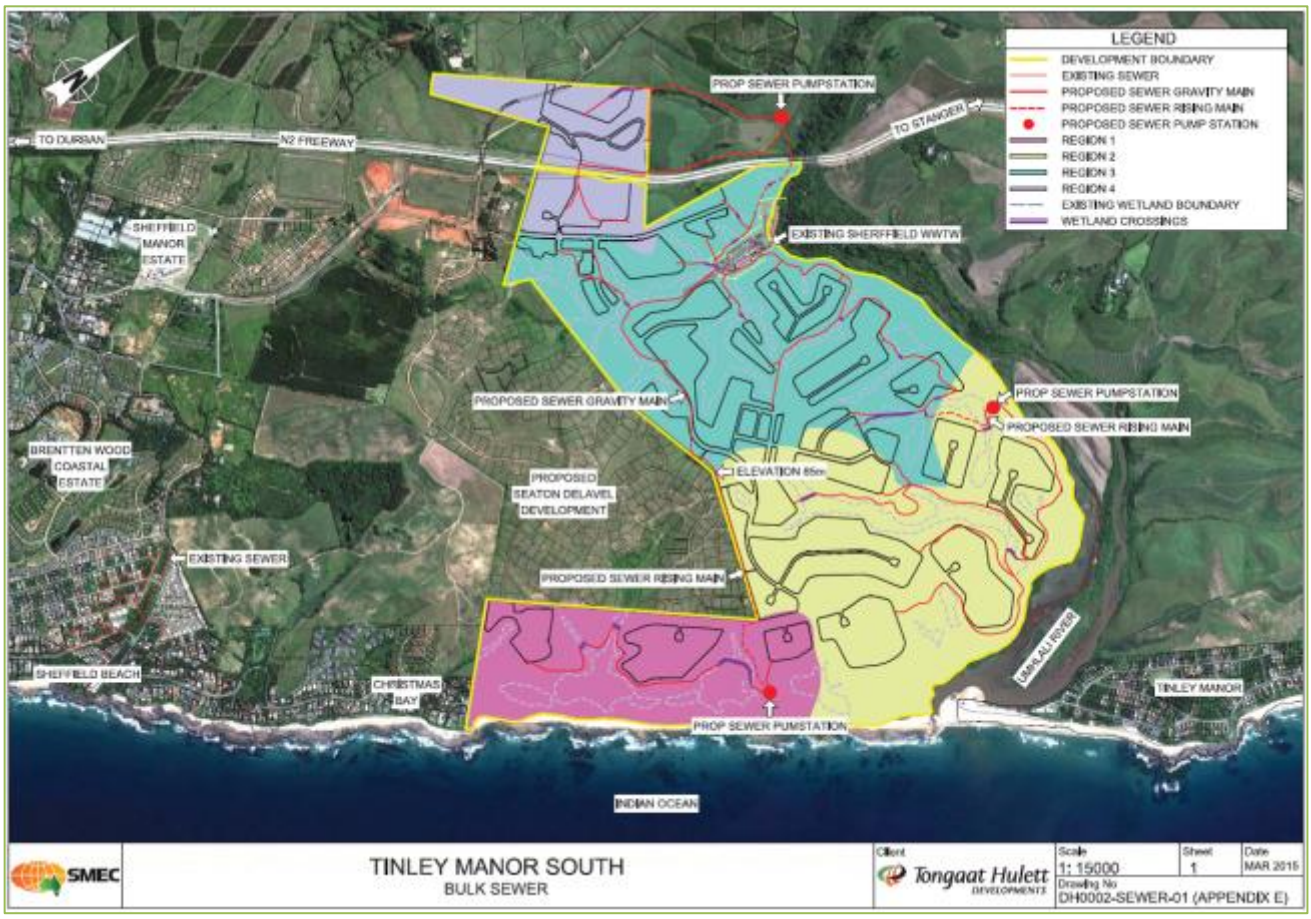

Figure 5-18: Proposed bulk sewage network

5.2.3 Roads

The proposed road network is illustrated in ***Figure 5-19***.

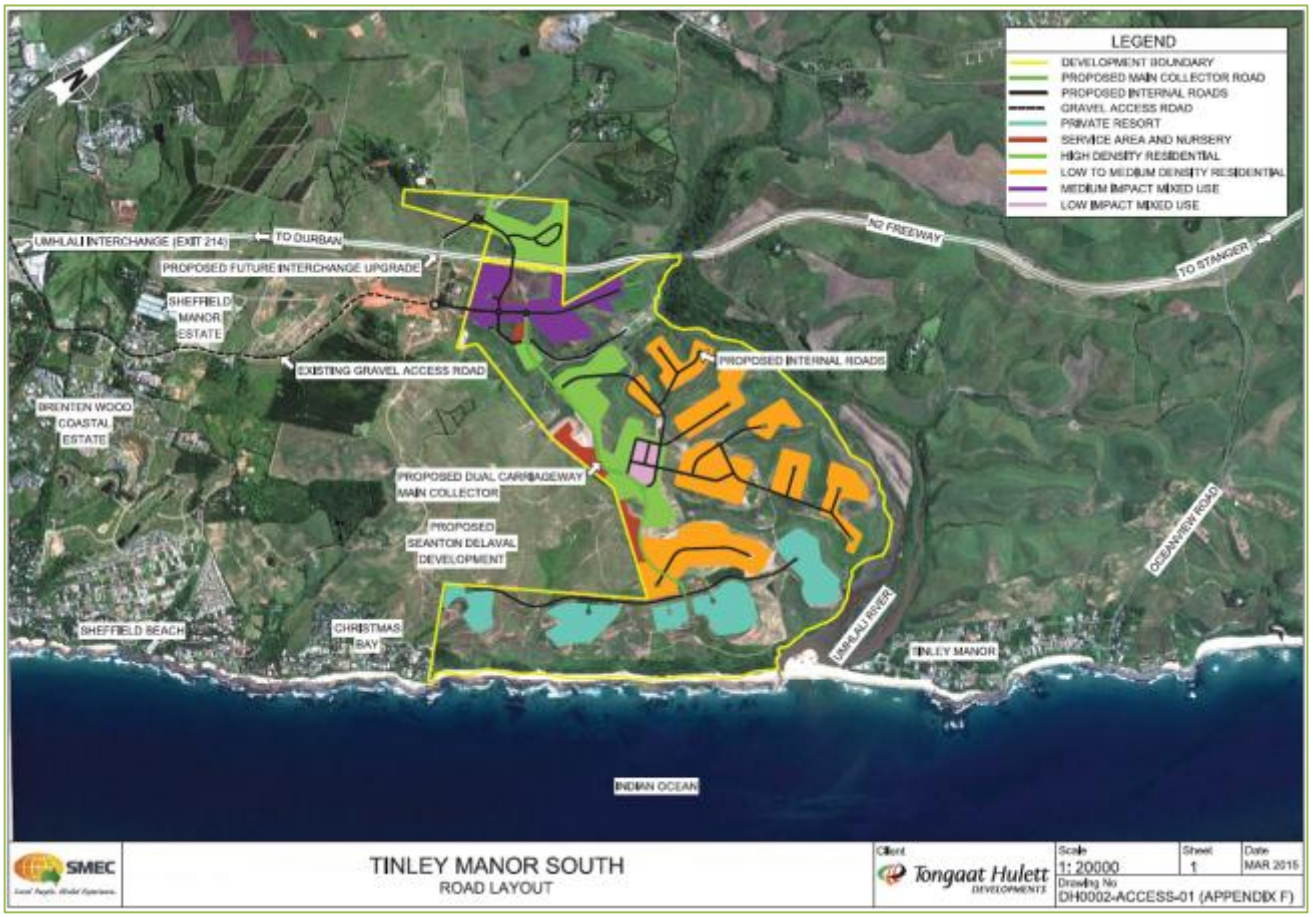

Figure 5-19: Proposed road network

The internal road layout of the development was planned in conjunction with the type of land use, volumes of traffic and visual appeal aspects. Traffic generated by each land use within the development was calculated and then distributed onto the proposed internal layout.

The traffic produced by each land use was superimposed onto the feeder roads within the development. This was then used to depict the total and hence highest volumes of traffic at the access point of the development. These volumes of traffic provided the number of lanes and road reserve widths required to cater for the traffic generated within the development.

Figure 5-20 illustrates the road categories within the proposed development.

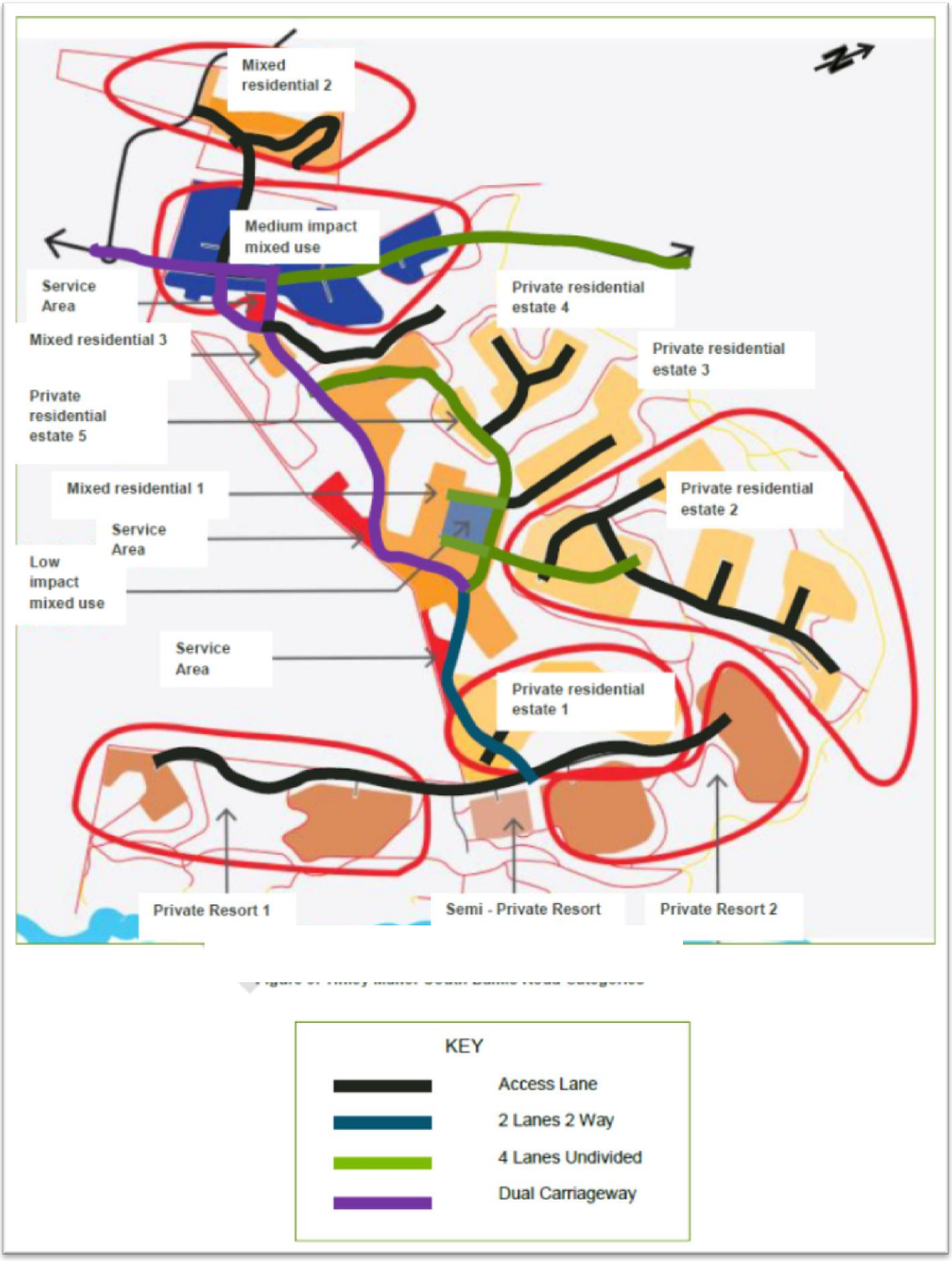

Figure 5-20: Road categories

Table 5-5 shows the road category, road reserve widths, road verge elements and capacity of these roads within the Tinley Manor Southbanks.

Table 5-5: Internal road descriptions

Road Type	Road Reserve (m)	Elements	Capacity	Comments
Dual c/way 4 lanes (2 lanes in each direction, with centre median)	28	4 x 3.4 m lanes 2 m median 2 x 6.2 m verges	3,600 passenger car units in both directions (not each direction)	Allowance for right turn lane
4-lane undivided (2 lanes in each direction, no centre median)	22	4 x 3.2 m lanes 2 x 4.5 m verges	2,400 passenger car units in both directions	Special treatment needed for right turns
2-lane, 2-way (1 lane in each direction, no centre median)	16	2 x 3.1 m lanes 2 x 4.5 m verges	700 passenger car units in both directions	No right turn lane
Access lane (1 narrow residential lane in each direction)	13	2 x 2.8 m lanes 2 x 3.5 m verges	350 passenger car units in both directions	No right turn lane

5.2.4 Stormwater

The stormwater management requirements have been addressed in a separate SMEC South Africa report entitled "*Stormwater Management Plan (SMP) for the Tinley Manor South Development*" (***Appendix B 2***).

The following key aspects will be implemented in doing the detailed design plan:

- All internal storm water reticulation will be designed with due cognisance accordance of the municipal guidelines.
- The proposed road network will act as the primary stormwater collector with controlled discharge to attenuation ponds.
- The secondary system (pipe network) will be designed to accommodate the 1:3 and 1:10 year peak flow at critical points.
- Dry attenuation ponds will be used to reduce run-off into the natural drainage system to the pre-development 1:10 and 1:50 year flood.
- Attenuation ponds will be sized to accommodate the difference in volume between 1:50 pre- and post-development run-off volumes.

5.2.5 Telecommunications

Telkom's policy is that, provided that there is a demand which produces sufficient revenue to cover the capacity expenditure. Telkom will provide the necessary infrastructure which may even require new telephone exchanges in the region.

5.2.6 Electrical[14]

The Supply Authority for Tinley Manor Southbanks is the KwaDukuza Municipality, who receives electricity in bulk from Eskom. The KwaDukuza Municipality is responsible as the Supply Authority for the reticulation, distribution and maintenance of electrical services within this electricity supply area.

5.2.6.1 Total Load Estimate

The estimated total electrical load requirement, based on NRS 069:2004 is presented in ***Table 5-6.***

[14] *The information provided in this section has been obtained from the "Tinley Manor Southbanks EIA Electrical Services Report" (2013) prepared by Bosch Projects, provided in Appendix C 12. This section must be read in conjunction with this report.*

Table 5-6: High level electrical load estimate

	Commercial Bulk (m^2)	Residential Units / Rooms	Load Factor VA/m^2	Load Factor VA/Unit	Estimated Load (MVA)
Low to Medium Density Residential		2,793		7,000	19.55
High Density Residential		2,108		6,000	12.65
Medium Impact Mixed-use	107,579	537	85	6,000	12.65
Low Impact Mixed-use	1,577	131	85	6,000	0.92
Resort	86,000	1,564	85		7.31
Total Load					**53.09**

Applying further diversification to the load at the substation, the estimated load will be in the order of 34 MVA.

5.2.6.2 Current Electrical Infrastructure

Bulk electrical infrastructure (11 kV) is available at the western section (N2) of the proposed development. However, this will be limited due to the current capacity constraints on this network. The quantum of this capacity must still be confirmed with KwaDukuza Electricity (KDE), however, correspondence provided in the Electrical Services Report indicates that this supply is already stressed.

At present an overhead line (11 kV) crosses the N2 (adjacent to the bridge crossing at the N2), where it then runs in a southerly direction towards Ballito. Having crossed the N2 the circuit terminates onto an H-structure, where a circuit feeds a Ring Main Unit (RMU). This circuit, via an underground cable, runs north-east (adjacent to N2) to the Umhlali River, and then follows the river to the treatment works. A second circuit at the H-structure follows an easterly route and supplies electricity to the Tongaat Hulett Sugar farm house / estate offices and workshops. A third overhead circuit follows a southerly route supplying the Salt Rock area.

A new 33/11 kV substation (Sheffield) is currently being built to meet the development requirements of some estates in the Salt Rock area.

5.2.6.3 Development Demands

Based on current infrastructure capacity, very little if any, electrical supply will be available to the development in the short-term without a major capacity upgrade in this area.

In the short-term, this would require the overhead line capacity to be upgraded as well as the substation capacity at Shakaskraal. This would be a temporary solution, as other developments in the area would also require electrical supply and a new major substation would have to be introduced to this area.

Should development commence on the coast, a limited electrical supply will be available from Sheffield Beach. This will assist with respect to an initial building supply. Sheffield Beach is at the end of a network and any extension to this would encounter technical problems (volt drop). An option would be to upgrade the capacity of this network, however, this would be costly.

5.2.6.4 Historical Information

In 2008/2009, the following developments required an electrical supply from the KwaDukuza Municipality: (a) Seaton Delaval, (b) Dunkirk, (c) Simbithi and Brettenwood Coastal Estate, (d) Sheffield Manor, and (e) Zululami.

The load requirements far exceeded the capacity of the network in the area and it was decided to provide a new 33/11 kV substation (Sheffield) in the area, to meet this demand in a phased approach. The KwaDukuza Municipality has proceeded with the construction of this substation which is currently under construction. Very little, if any, capacity would however be available to any other developments in the area once fully commissioned.

5.2.6.5 Further Actions

Bosch Projects and THD are presently in discussions with the KwaDukuza Municipality regarding electrical supply to Tinley Manor Southbanks. Once a Service Level Agreement is obtained, this will be submitted to the KZN EDTEA.

5.2.7 Internal Infrastructure

5.2.7.1 Water

Internal water infrastructure will comply with the Sembcorp Siza Water (SSW) standards.

The project area will be split into high and low zones. The high zone will be fed directly off the Seaton Delaval reservoir. The low zone will also be fed off the Seaton Delaval reservoir, via pressure reducing valves (PRVs).

5.2.7.2 Sewer

- ***Phase 1*** – It is anticipated that the resort nodes will be constructed first. As these nodes are lower in elevation than the Sheffield WWTW, pump stations will be required to transfer sewage to the WWTW via rising mains, splitter boxes, and gravity mains. The three (3) most southern resort nodes in sewer region 1 will gravitate to a proposed pump station (±0.4 Mℓ/day). The sewage will then be pumped via a rising main (±160 mm diameter) to an elevation of 85 m, after which it will gravitate to the Sheffield WWTW.
- ***Phase 2*** – The nodes in region 2 (two resorts and four residential nodes) will gravitate to a proposed sewer pump station (±1.4 Mℓ/day). This sewage will then be pumped via a rising main (±250 mm diameter), to an elevation of 23 m and then gravitate to the Sheffield WWTW.
- ***Phase 3*** – The nodes situated in region 3 will gravitate directly to the Sheffield WWTW via bulk sewer gravity main to be installed during phases 1 and 2.
- ***Phase 4*** – The nodes to the west of sewer region 4 will gravitate along an existing gravel road to a proposed pump station (±1.1 Mℓ) near the Umhlali River. This pump station will be located to accommodate future developments west of the N2. The nodes to the east of sewer region 4 will gravitate to the western side through an existing underpass, and then down to the proposed pump station. This sewage will then be pumped via a sewer rising main, under the N2 at the location of the Umhlali River Bridge, and up to a level of 25 m. It will then gravitate down to the Sheffield WWTW. In order for this to be viable, permission must be obtained from the land owner – this will obviously be investigated and finalised prior to Phase 4 proceeding. If not allowed, an alternative option will need to be found and approved at that time.

5.3 Social Facilities

Inclusion of a range of community related service amenities such as schools, clinics, fuel stations, community halls, along with shopping nodes, have been considered.

Shopping nodes – as previously indicated – have been integrated into the proposal, with both local and tourism related needs provided for.

Schools have not been specifically included in this development area as local schools in the area are currently below capacity and thus a school is not deemed to be an urgent priority at this time. Should the development as it is rolled-out attract a community with a significant school going age children group this will be addressed through the integration of school sites into the development as it is planned. Such schools would be a mix of private and public – dependent on interest from the KwaZulu-Natal Department of Education and their plans for the wider region.

Similarly, the provision of a dedicated and appropriately zoned erf for a small community clinic can be considered during the detailed planning stage of town planning should this be a requirement. Note that this would most likely be placed in the commercial nodes, but could also be placed in a residential node. The opportunity could also be marketed for a small-scale private medical facility in the commercial zone that could

have a community clinic sharing a portion of its site. These are however considered to be detailed town planning considerations.

The presence of a fuel station within the estate needs to be considered with great care. It would need to be contextualised in terms of the wider area's needs, the direct requirements from the development as a whole, and of course, the existing facilities already present in the region. It is noted that due to the high level of uncertainty with respect to the incorporation of such a facility, that if a need is indicated during detailed town planning design, an erf could then be set aside with appropriate zoning for such a site. The positioning of such an entity within the commercial node would need to consider the proximity to watercourses and wetlands are thus place it as far as possible from such. All other considerations for such an entity would need to be validated as a balance of the risk of potential groundwater contamination due to the presence of hazardous substances / dangerous goods.

Space is available within the commercial nodes for a range of support facilities, however, these will have to be detailed in the final town planning process to match the final number of units allowed for, the FAR of the commercial area allowed, the parking requirements, etc. The importance of such and their input to a functional and sustainable compact development is noted and will be taken forward into the detailed town planning process.

It is emphasised that should any top-structure developments such as a health facility require any additional authorisations, these will be subject to separate, independent authorisation, licencing and/or permitting processes.

6 PROJECT ALTERNATIVES

In terms of the EIA Regulations, Section 28 (1) (c) feasible alternatives are required to be considered as part of the environmental studies. In addition, the assessment of alternatives is also a requirement of Section 24(4) of the NEMA (as amended). An alternative in relation to a proposed activity refers to the different means of meeting the general purpose and requirements of the activity (as defined in Government Notice R.543 of the EIA Regulations, 2010), which may include alternatives to:

- the property on which or location where it is proposed to undertake the activity;
- the type of activity to be undertaken;
- the design or layout of the activity;
- the technology to be used in the activity;
- the operational aspects of the activity; and
- the option of not implementing the activity.

6.1 Site Alternatives

No off-site or other site-specific alternatives have been investigated due to the natural features of this site which lend themselves to a tourist resort of this nature. Moreover, the land use type proposal has been developed to fit the land morphology, rather than a pre-determined land use type being considered in terms of a site. It should furthermore be noted that THD is the sole owner of this land and acquiring another parcel of land of this magnitude, within close proximity to the coast (the primary control required to meet the development's objectives) is unlikely.

A Concept Plan has been produced for the development providing an indication of land use intention on the site as constrained, informed and modified to consider the existing and potential parameters under which such a development could function, with the intention of a sustainable and resilient development proposal. The Concept Plan should not be seen as the definitive detailed design layout or the final approved plan in terms of the town planning process for the development, but should only and has only been used to create an understanding of the conceptual framework for the ultimate development of Tinley Manor Southbanks.

This EIA will confirm whether or not there are any fundamental issues to preclude the proposed development from proceeding along the broad, conceptual basis as outlined in the Concept Plan and will also deal with the assessment of the detailed, specific issues and impacts on a micro level.

6.2 Design and Layout Alternatives

As detailed in ***Section 5.1***, the Concept Plan has been based upon a number of, in essence, existing constraints including wetlands, estuary, coastal dune forests, sensitive pockets of vegetation, roads and topography. As such there is limited scope for layout alternatives related to the primary structure of the Concept Plan.

The development proposal and planning has taken cognisance of the position of the property's environmental asset base. The estuary itself is a known highly sensitive environment, and the proposed development has added value to this asset through rehabilitation and enhancement considerations (including buffering), and is in keeping with the coastal sense of place and aesthetics.

During the early stages of the Environmental Scoping Study that culminated into the compilation of the final ESR, it was proposed that site layout alternatives would be considered which explored several options and proposals for the land use of the site. This was considered as far as possible, but the environmental constraints and the planning controls obviously limit the level of freedom to consider a wide range of site layouts. The site layout as presented thus reflects the integration of these controls to provide a viable solution to meet all relevant needs and requirements in an appropriate manner.

As noted in earlier Sections, the Tinley Manor Southbanks Concept Plan has been based upon a number of existing constraints including topography, geology, water resources, biodiversity, coastal aspects, existing services, roads, and limited access and linkage opportunities as detailed in ***Section 5.1***.

It is further emphasised that rigorous scientific assessments have informed the Tinley Manor Southbanks Concept Plan which has been through several iterations, considering and applying the recommendations of the scientific specialists at each juncture. As a result there is limited scope for alternatives related to the primary components of the Tinley Manor Southbanks Concept Plan. Through many meetings between the Developer, engineers, urban planners, various technical specialists and scientists and various service authorities, the Tinley Manor Southbanks Concept Plan was developed which has been refined to its present state. As such it should be considered that the proposal at hand is the culmination itself of various site layout plan iterations with the issues and benefits of each considered and then integrated into the next iteration, with continual improvement and a "better fit" aimed for over time.

Several land use alternatives were considered by the design team in consultation with the service authorities. However, whilst many alternatives were considered, only the most feasible alternatives have been integrated into the current proposed Concept Plan. Hence, no other land use alternative will be presented in the EIA, as the current plan satisfies the objectives set out in ***Section 3.3.1*** and all service authorities whilst aligning with environmental and technical considerations.

Primary revisions to the Tinley Manor Southbanks Concept Plan have centred around the following key aspects.

6.2.1 Coastal and Development Access

Currently, access to the coastal area adjacent to the proposed development site is limited to access along the shoreline (in a roughly north to south and south to north direction) from the neighbouring areas of Tinley Manor Beach and Sheffield Beach / Christmas Bay.

Access from an east to west direction within the confines of the affected property is limited to a single informal vehicular access point accessible with prior permission from THD and/or the respective farm manager. This is predominantly because of both the land ownership and the current agricultural land use in the hinterland of the study area.

Current access to the coast is further hindered by the topography and existence of the vegetated dune cordon and the wetland areas immediately landward of the vegetated dune cordon. The dune vegetation and wetland areas are both natural barriers to access as well as important environmental assets that play a vital role in mitigating risk from a marine sea level rise / storm surge perspective. Modification of such morphological features is considered to be inappropriate, and the only access points to the beach are to be enhancement of existing natural breaks, which are used as access points, with rehabilitation up-front and on-going maintenance thereof, with the aim to ensure problems do not develop, rather than merely "reacting".

The initial development concept showed the establishment of four (4) resorts at intervals inland of, but setback from, the vegetated dune cordon and located landward of the identified coastal risk and slippage, in such a way as to not impinge on identified environmental assets. The sustainability of this approach from an environmental perspective is commendable; but the fact that the development of resorts in this area has the potential to negatively impact on access to the coast (not access along the coast) is undeniable. A separate study was conducted responding specifically to this restriction of access and considered the prevailing legislative and policy context and can be found as an annexure to the Coastal Assessment (***Appendix C 7***). National policy directives were considered which state that the overarching objectives of the provision of coastal access are as follows:

- Opportunities for public access must be provided at appropriate coastal locations in context of the environment and social opportunities and constraints; and
- Public access must be maintained and monitored to minimise adverse impacts on the environment and public safety and to resolve incompatible uses.

In the Coastal Impact Assessment the issue of coastal access was considered within a broader spatial context. This was deemed appropriate given that the coastal access is to be reported on at a municipal level

in terms of the NEM:ICMA. Furthermore, it is important for municipalities to consider the provision of coastal access at a macro or jurisdiction-wide scale, including the issue of accessibility. It was also necessary to broaden the scope of the access issue to include factors that are outside the spatial extent of the proposed development but that also influence the demand for and supply of access in the region.

These factors include but are not limited to the following:

- The appropriate kind of access for each area based on its intended usage and associated ecological and social carrying capacity:
  - Carrying capacity is indicative of the level of intensity each area can sustain; and
  - Ecological and social carrying capacity is comprised of various factors;
- The adjacent coastal settlement of Tinley Manor Beach and its associated recreation facilities and boat launch site;
  - The close proximity of this area which is better suited to high intensity, diverse recreational use should alleviate the demand for access to such activity on the shoreline of the study area;
  - The adjacent settlement of Sheffield Beach and its associated recreation facilities; and
  - Similarly, the proximity of this area should alleviate the demand for access to areas for recreational activity;
- Potential for consolidation / expansion of recreational facilities and amenity at existing swimming beaches located at:
  - Salt Rock;
  - Blythedale Beach; and
  - Zinkwazi;
- Potential for establishment of recreational facilities and amenity at new swimming beaches located at:
  - Tinley Manor Launch Site;
  - Tinley Manor Main Beach;
  - Zetheni ;
  - Black Rock;
  - Nonoti; and
  - Iti Bay.

A further potential impact associated with the provision of access in the coastal zone is the biophysical impact on natural vegetation and dune environments. These are dynamic systems that are sensitive to disturbance and encroachment, and incursions through and over dune vegetation can cause long-term and often irreparable damage. Particularly, where access points proliferate and are not formalised, the integrity of the vegetated dune cordon as a natural and resilient defence against the impact of dynamic coastal processes can be severely compromised.

6.2.1.1 Subsequent Development

As a result of this assessment as well as on-going discussions held with the KwaDukuza Municipality, THD resolved to amend their planned gated-estate development concept to a now publically accessible resort centred, lifestyle, and mixed-use village theme, which includes a mix of residential and leisure development supported by a range of commercial and social facilities. It should be noted that due to the nature of the hotel nodes, these will remain gated, but this is in line with the nature of such developments and thus is not unexpected.

Residential and leisure oriented neighbourhoods are proposed to be integrated around village nodes and a high quality, well managed network of public spaces featuring leisure and recreation areas, along with major new beach resort developments and conservation zones.

Access to the coast with this phase of the development is now limited to pedestrian access via paths and elevated wooden boardwalks. Parking is provided at the centrally located low impact mixed-use zone behind the dunes. It is further noted that a significantly sized medium impact mixed-use zone is proposed to be provided to the north of the existing Tinley Manor urban area, providing for the establishment of additional recreational, amenity, and beach access at the Tinley Manor Launch Site.

6.2.2 Stormwater Attenuation

The original SMP and Concept Plan allowed for the attenuation of stormwater to be done via dry attenuation facilities located within wetlands (***Figure 6-1***). The logic being that current industry norms suggest the positioning of stormwater attenuation facilities within wetlands, as wetlands are situated in valleys (i.e. the natural drainage line), and therefore provide a suitable environment, from an engineering point of view, to intercept the increased surface run-off using an attenuation facility.

However, the wetland specialist team have advised that affected stakeholders, particularly the DWS, are currently not approving the placement of stormwater attenuation structures within wetlands as their concern is that such placement results in a change to the hydrological patterns.

In light of this, SMEC South Africa noted that the stormwater attenuation facilities would need to be repositioned, and the proposed position is to within the wetland buffer. The concept being that the impact on the hydrological patterns is significantly reduced, whilst still allowing for natural drainage control via gradient. As the wetland buffer is not in the natural valley line, shaping and excavation would be required during the construction of the attenuation facilities. Furthermore, the stormwater does not drain naturally to these proposed facilities, and therefore measures (drainage channels, swales, etc.) would need to be implemented to force / divert the water to the proposed facility positions. And then obviously, discharge points would be needed therefrom to ensure a diffused, controlled discharge into the watercourse from the attenuation ponds. It should be noted that attenuation ponds are dominantly designed to hold water long enough for it to infiltrate the ground and for some water to be lost to evaporation, with overflow only occurring during extreme flood events and to ensure that such overflow is managed or controlled as far as possible.

Additionally, a larger number of attenuation facilities would be required, as not all the structures can now be located along the natural drainage line (i.e. more smaller ponds). The shaping of the facility and the implementation of drainage control measures would result in increased construction costs and footprint within the open spaces.

While the sustainability principles contained in the SMP, which are in line with NEM:ICMA principles included and recommendations made, are commended, the exclusion of the free ecosystem flood attenuation service provided by the extensive rehabilitated wetland system as part of an attenuation system was queried. The use of a ‘dry’ attenuation facilities was also found to be problematic and it was recommended that these instead be vegetated and incorporated into a wetland system even if placed in the floodplain / watercourse buffer area.

Figure 6-1: Earlier iteration of the Concept Plan with stormwater attenuation located in wetlands

The above comment was noted by both SMEC, as well as the Royal HaskoningDHV planning team, and after discussion, it was agreed to exclude all attenuation ponds from wetlands, but that the attenuation ponds should be vegetated and be allowed to operate as off-stream wetland areas thus providing additional habitats and additional ecological functionality value. The Concept Plan was amended in light of this discussion as well as the stance adopted by the DWS.

6.2.3 Summary

It is therefore acknowledged that the Concept Plan structure is sound and, critically, delivers upon the strategic objectives that have been identified by both THD and the local and district Municipalities. Furthermore, it is noted that the Developer has spent a considerable amount of time and effort in the planning and contextualisation of the development and there is broad acceptance by the specialist team that the Concept Plan (at a principle level at least) is appropriate and will add value to the region.

Furthermore, it is noted that the Developer (THD) has spent a considerable amount of time and effort in the planning and contextualisation of the development over a number of planning iterations, and through responding to new planning documentation as it became available, and thus there is broad acceptance by the specialist team that the Concept Plan (at a principle level at least) is appropriate and will add value to the region.

It is reiterated that some of the items as considered in ***Section 5.3*** can only be finalised in the detailed town planning, but that the need and position for such has been acknowledged

6.3 Construction Management Alternatives

Significant quantities of surplus soil material (i.e. otherwise surplus fill material) are expected to be produced during construction activities for Tinley Manor Southbanks, due to a number of factors. These factors include, *inter alia*, the topography and poor soil quality (for construction purposes) within the area.

The challenge within the context of the development lies in how to ensure the amount of surplus soil / fill material can be minimised through re-use, reduction and/or recycling, so as to make it easier and more cost effective for the Developer to deal with, whilst taking cognisance of the natural environment and environmental legislation in South Africa.

It is neither feasible nor practical to transport surplus fill material off-site due to the prohibitive cost and also because nearby landfill sites simply do not have the capacity (or desire) to cater for the significant volumes of surplus material that needs to be accommodated.

The amount of surplus fill material expected is directly related to the amount of developable land to be transformed to accommodate new land uses, through major earth-works (cut and fill) to create platforms suitable for the construction of top-structures. A more strategic and proactive approach would therefore be required to reduce the need for a significant number of Surplus Fill Material Sites (SFMS), colloquially referred to as 'spoil sites' during the construction and operational phases.

In an effort to pro-actively deal with the surplus fill material challenge, the Developer and project team are working towards a long-term Soil Resource Management Plan. Due to the lack of detailed design and detailed geotechnical investigations at this stage, a Soil Management Framework Strategy (***Appendix B 3***) is presented with the EMPr to outline the principles for surplus fill material management for Tinley Manor Southbanks.

The intention of the Soil Management Framework Strategy is to present the framework, principals and controls within which a future Soil Resources Management Plan will fit – and thus the strategy forms the first significant step towards ensuring suitable management of the soil resources, particularly surplus fill material. It is the intention that this document will be updated / elaborated on as further detail becomes available and will eventually detail a plan of action, thus becoming a Soil Resources Management Plan.

By maintaining the full use-value of the surplus soil resources, as far as practicable, the resource would have the best chance of being allocated to a specific use, which in turn, would limit the amount of unallocated or surplus material.

Options for re-use, recycling and disposal have been identified and must be critically evaluated per area and nature of the soil type to determine a suitable allocation for the identified surplus soil resources, keeping in mind that it is neither feasible nor practical to allocate all surplus soil resources to SFMSs within the development, nor to transport all surplus soil resources off-site.

Critical in determining whether or not an allocation to a particular option is feasible, is the legality of such options, the cost of allocation, the demand for the soil resource, the available suitable land and the social considerations.

Several options for the beneficial use of surplus fill material are presented in the framework strategy and are briefly detailed below:

6.3.1.1 Engineering (Design) Changes and Incorporation of Surplus Soil Resources

This option proposes altering the design and construction methodology, where practicable, to include the use or incorporation of additional quantities of surplus soil resources. Platforms could potentially be increased in height, to accommodate more fill material. However, by raising the height of the platforms the developable area would reduce in size due to the need to ensure safe side slope angles, and increased footprints may not be viable due to possible no go areas. This may thus be an option for the Developers to significantly reduce the amount of surplus soil material, but would come at great cost and at a certain point would render the development economically unfeasible.

Furthermore, it is noted that should the quality of surplus fill material be graded above a G10 type, it would therefore be unsuitable for engineering fill, thus reducing the viable quantity that can be used. Additional quantities of unsuitable fill material may potentially be included in the design by 'wedging' or 'sandwiching' – which is the practice of alternating layers of good- and poor- fill material as platforms are constructed. This practice requires careful selection of materials, close supervision and much time and likely additional costs.

It is further noted, that this option also depends on the quality of material as not all soil material can be wedged. A conservative estimate indicates that the 10% estimated as surplus fill material is of poor quality that cannot be used as engineering back-fill.

6.3.1.2 Creating Arable Land – In Degraded Open Space – for Nurseries and/or other Urban Agriculture – in line with the Alternatives for Wetland Rehabilitation

This option proposes that historically degraded areas in the open space, previously impacted upon by agricultural activities (e.g. remnant sugarcane lands), may be rehabilitated for the purpose of establishing nurseries and/or other forms of urban agriculture. These areas would benefit specifically from additional topsoil where topsoil is lacking or is of poor quality.

Additional quantities of topsoil could potentially be allocated to raised beds, pots and/or bags for the cultivation of plants.

Another advantage of this option is that it would allow for an additional, if relatively small, revenue stream from sale of plants or produce that could help to off-set the costs of the development thereof. The nurseries would also crucially allow for growth of landscaping plants for the greater site thus reducing the cost of purchasing of such materials over the lifespan of the greater site.

6.3.1.3 Creating Arable Land – Generally in Open Space – for Nurseries and/or other Urban Agriculture - in line with the Alternatives for Wetland Rehabilitation

This option proposes that areas within the less sensitive open space areas to be identified as potentially suitable for creation of arable land.

These areas are noted as being generally outside of historically degraded areas and may for instance include areas such as the slopes of platforms – by lengthening the slopes to create a more gentle slope (perhaps 1:5 – 1:10) and which can be benched or terraced to accommodate the establishment of nurseries and/or other forms of urban agriculture.

These areas would benefit specifically from additional topsoil to allow for a gentler slope from platform sites and deeper soils that would assist root establishment.

Additional quantities of subsoil and topsoil could potentially be allocated to creating stormwater features such as berms. Furthermore additional quantities of topsoil could potentially be allocated to raised beds, pots and/or bags for the cultivation of plants.

6.3.1.4 Creating Wetland Habitats - in line with the Alternatives for Wetland Rehabilitation

This option proposes using suitable soil resources, especially clay material, to potentially artificially create wetland habitats. The artificial creation of wetland habitats will be used to off-set impacts on existing wetlands within the development. These artificially created wetland habitats would include the establishment of stormwater attenuation facilities, especially as sediment traps below areas assigned to urban agricultural use (where applicable).

Additional (mainly inert) materials that could potentially be re-used through ‘soft-engineering’ in the artificial creation of wetland habitats, including, tree stumps and branches, wetland vegetation ear-marked for destruction due to approved infilling of wetlands, wetland buffer vegetation that may be otherwise removed, and, rock material from excavations. The aim being to re-use as much material on the greater site in such a way that it has value and further does not incur a disposal cost.

The aim would be to produce more natural appearing wetland areas thus enhancing the greater site’s functionality and ecological value.

6.3.1.5 Wetland Rehabilitation - in line with the Alternatives for Wetland Rehabilitation

This option proposes using suitable soil material, especially clay material, to potentially improve upon existing structures within wetlands which are to be rehabilitated. The additional allocation of material could potentially improve these existing wetland footprints and thus bolster the wetland off-set calculation.

As in ***Section 6.3.1.4***, additional materials (as specified above) can potentially be re-used through 'soft-engineering' in the artificial creation of wetland habitats.

6.3.1.6 Creating Other Habitats

This option proposes using suitable soil material to create habitats that could potentially accommodate various fauna and flora. These habitats could be strategically located away from possible disturbance, where suitable soil material could be utilised to artificially create and/or enhance existing habitats for birds and reptiles, amongst others.

As in ***Section 6.3.1.4***, additional materials (as specified above) can potentially be re-used as 'soft-engineering' in the artificial creation of other natural habitats.

6.3.1.7 Creating and/or Enhancing Gardens and/or Parks - in line with the Alternatives for Wetland Rehabilitation

This option proposes (a) creating additional gardens and/or parks, or (b) enhancing existing areas ear-marked for gardens and/or parks. The aim is thus to make the establishment of vegetation cover as cost-effective as possible, and to allow for potentially more extensive habitat creation than would otherwise be viable.

These landscaped areas would benefit specifically from additional topsoil where topsoil is lacking or of poor quality, and allow for deeper topsoil profiles which would assist with more effective root establishment.

Additional quantities of subsoil and topsoil could also potentially be allocated to creating stormwater features such as berms. Through the use of additional materials being re-used through 'soft-engineering', the landscaping and ecological value of the greater site is further enhanced with additional habitats being created. Such berms can also help in the potential separation of clean and potentially dirty stormwater streams, linked to stormwater attenuation, and further for noise attenuation both to those within the greater site, and to those outside of the site from activities on site.

6.3.1.8 Creating and/or Enhancing Roadside Verges

This option proposes creating additional roadside verge features, or allowing for additional topsoil within the existing design of roadside verges thus allowing better establishment of plant material in these areas. These landscaped areas would benefit specifically from additional topsoil where topsoil is lacking or of poor quality, and deeper topsoil profiles would assist with root establishment.

Additional quantities of subsoil and topsoil could potentially be allocated to creating stormwater features along the roadside, especially in areas prone to flooding nearby platform sites, where perhaps higher embankments would act as a suitable stormwater control measure. Where possible / feasible, such features can be developed as stormwater control and ecological habitat niche development sites – space constraints may not always make this a viable option in verge areas.

6.3.1.9 Restoring Landfills

This option proposes the sale of suitable surplus soil resources as lining or capping material at local or regional landfill sites. This option needs to be investigated further in order to gauge the present demand. It is known that materials most sought after at the present time by these sites for the restoration (on-going or moving towards final closure) of the known landfill sites are clays and topsoil. Sub-soil may also within certain parameters be used as daily capping and stabilisation material.

6.3.1.10 Rehabilitating Borrow Sites

This option proposes the placement within and rehabilitation of existing borrow sites within or near to the development.

Additional quantities of subsoil and topsoil could potentially be allocated to creating stormwater features, such as berms, upon rehabilitation of the identified sites. Some additional materials could also potentially be re-used through 'soft-engineering' as detailed previously.

6.3.1.11 Rehabilitation of Erosion Features

This option proposes the placement within and rehabilitation of existing erosion features; this would include the potential rehabilitation of stormwater blow-outs, unstable embankments and other erosion features.

This option needs to be investigated further in order to gauge the present demand, however, depending on the haulage distance, this may provide a number of suitable locations for allocating surplus soil resources not only within the development footprint, but within the surrounding area.

The Developer will discuss this option with the relevant Departments at the KwaDukuza Municipality who may potentially have suitable areas, as described above, on land that they own that require such rehabilitation to be carried out.

6.3.1.12 Placement as Acoustic Bund

This option proposes that surplus soil resources potentially be allocated to an acoustic bund at the planned noise contour and/or incorporated elsewhere within the development as an acoustic bund, depending on the nature of the development; as a barrier between industrial and residential land uses.

This option needs to be investigated further by the Engineer (SMEC) in order to determine feasibility.

6.3.1.13 Placement within Existing Servitudes

This option proposes that surplus topsoil material potentially be allocated to raising the profile of the soil within existing servitudes (e.g. electrical servitudes). Such profile raising should be limited to areas outside of wetland areas, but potentially in consultation with EDTEA extending into limited wetland buffers to an agreed degree only.

Additional quantities of subsoil and topsoil could potentially be allocated to creating stormwater features such as berms within the servitudes. These berms could double as noise attenuation mechanisms as well.

6.3.1.14 Placement within Future Servitudes

This option is as per ***Section 6.3.1.13***, but for future proposed servitude areas. Obviously any such landscaping would need to be planned taking the future servitude use into account and should be carried out accordingly (e.g. no trees in those servitudes that will include future power lines) and should allow for effective development of the infrastructure required to run via these servitudes with minimal disturbance.

6.3.1.15 Commercial Topsoil Sale Off-site

This option proposes that clean surplus topsoil material potentially be sold commercially off-site. Although the Developer may investigate the demand options to sell topsoil to other developers within the region, it is envisaged that the vast majority of surplus topsoil resources will be sold to commercial sources.

It is further noted that in order to allow for this beneficiation that a mining permit may be required for a 'sand mining' operation as this may well fall within the definition thereof. Even if it does not, confirmation should be obtained from the Department of Mineral Resources (DMR) as to how such an activity should be handled, and to ensure that any required permits are obtained timeously.

Note that, if the material is not sold but is given to another site for an approved use, that such mining approvals may not then be required. Given the amount of material that may be considered for such off-site sale and the related revenue that could be generated, the cost and time related to obtaining the DMR permits may well be worth the effort.

6.3.1.16 Commercial Clay Sale Off-site

This option proposes that surplus clay material potentially be sold commercially off-site. Although the Developer may investigate the demand options to sell clay to other developers and commercial sources within the region, it is envisaged that the vast majority of surplus clay resources will be sold to commercial sources.

Surplus clay material will potentially be sold as lining or capping material at local or regional landfill sites.

The same constraints as detailed in ***Section 6.3.1.15*** are relevant to this option.

6.3.1.17 Commercial Shale Material Sale Off-site

This option proposes that shale material potentially be sold commercially off-site.

The same constraints as detailed in ***Section 6.3.1.15*** are relevant to this option.

6.3.1.18 Manufacturing of Topsoil for Allocation on Site and/or Commercial Sale Off-site

This option proposes that suitable soil-forming material may potentially be blended with an appropriate source of organic matter, at the required mixing ratio, in order to effectively manufacture topsoil. Suitable soil-forming material may include: subsoil and mixed soils which would need to be analysed first to see what additions or processing would be required to make a useful (functional topsoil) for use on the greater site or for sale to commercial sources off-site.

The process for this option would need to be discussed with EDTEA and DMR to determine whether any permitting requirements are triggered – however, this is strongly dependent on the specific inputs needed.

6.3.1.19 Manufacturing of Suitable Fill Material for Allocation on Site and/or Commercial Sale Off-site

This option proposes that suitable soil-forming material may potentially be blended with appropriate materials, at the required mixing ratio, in order to effectively manufacture a suitable fill material (even if low-grade). Suitable soil-forming material may include: subsoil and mixed soils which would need to be analysed first to see what it would take to make a useful (functional fill material) for sale to commercial sources off-site.

The same constraints as detailed in ***Section 6.3.1.15*** may be relevant to this option and should be confirmed prior to being initiated.

6.3.1.20 All Surplus Soil Resources to Landfill

This option proposes (in theory only) that all surplus soil resources be removed from site to landfill.

This option is not considered viable due to (a) excessive cost, (b) a lack of capacity at local and regional landfill sites, (c) the undertaking of what would essentially equate to poor environmental practice and wastage of finite resources, and (d) a significant impact on the development's carbon footprint, amongst other reasons.

6.3.1.21 Creating Tracks and/or Trails

This option proposes creating additional recreational areas, specifically for mountain biking, horse-riding and/or walking. These landscaped areas consisting of tracks and trails would be transformed to create a degree of difficulty and also to stabilise areas which could potentially pose a hazard to the rider.

Additional quantities of subsoil and topsoil could potentially be allocated to creating stormwater features such as berms. Furthermore, additional materials that could potentially be re-used through 'soft-engineering'.

6.3.1.22 Placement of Surplus Soil Resources to SFMSs

This option proposes that only the surplus soil resources, remaining after all other options have been investigated and actioned as far as viable, are placed within designated SFMS and levelled, and rehabilitated so as to blend into the open space network. These sites may then be transformed to accommodate a prescribed activity such as urban agriculture, various recreational opportunities, and other applicable activities as described above.

One SFMS has been identified and assessed for approval for use during the construction phase on Tinley Manor Southbanks as presented in ***Figure 6-2***.

Figure 6-2: Location of the proposed Surplus Fill Material Site

6.4 Operational Alternatives

THD is committed to ensuring that the development is sustainable and adheres to stringent environmental management procedures. With this is mind, operational methods and approaches must adhere to best-practise alternatives, which this EIA process seeks to achieve.

It is emphasised that the EIA is undertaken at a broad Concept Plan level for bulk earth-works and therefore, specific approaches for alternative and innovative operations cannot be committed to at this stage. However, the Developer will seek to establish best-practise approaches for the following during the operational phase:

- Water management;
- Land management;
- Waste management;
- Air quality management;
- Rehabilitation and closure.

These aspects include sustainable solutions where appropriate such as rainwater harvesting, waste beneficiation, community outreach projects and so forth.

The concept as informed by the specialist studies generated and presented in this document, sets the controls for the final detailed design, including architectural and structural design features of buildings and all infrastructure. The non-negotiable items are thus put in place and approved as part of this process, whilst allowing innovative best practice options (as considered appropriate at the time of each portion of the site goes active) to be developed without being restrained or throttled by approved but now "old hat" patterns methodology. The controls / parameters are set within which individual developers purchasing each land portion forming part of the greater site, which will allow these developers to apply their minds, but with firm thresholds, sustainable parameters, and types / classes of mechanisms that must be included within each land parcel, and, finally "no-go" items that are not open to negotiation. This will allow sustainable solutions to be innovative, and over time continue to set the bar at a higher level. Such sustainable controls are presented in the document at hand, and are taken forward into the EMPr as enabling controls. Such controls will be enforced by being underwritten as part of the township development controls per land parcel, along with the controls relating to transfer of applicable controls from the EMPr per land parcel in any purchase agreements.

As presented in the EMPr, all individual Erven within the greater site shall comply with energy and water saving mechanisms as well as current carbon-footprint reduction options. These shall be in line with current best practice and shall take into account both minimisation of resource usage as well as the constraints of the local environment. This may include, but are not limited to:

- Use of solar and other alternate energy mechanisms to minimise the effective footprint of the greater site on bulk infrastructure, e.g. solar geysers and/or use of geyser blankets;
- Low energy / energy efficient lighting, use of motion sensors on security lighting, and 'down-lighter' options to limit ambient light pollution;
- Passive cooling and/or heating mechanisms;
- Water saving mechanisms, e.g. low flush volume toilets, inclusion of conservancy tanks to store stormwater off roofs for use in landscaping, aerated shower heads and taps, grey water harvesting, consideration of dry compost toilets;
- Appropriate structural design so as to limit excessive heating or cooling of buildings, e.g. use of efficient ceiling insulation mechanisms;
- Use of appropriate landscaping, e.g. trees and groundcover, to enhance energy efficiency;
- Preferential use of locally sourced resources which are obtained in an environmentally sustainable manner;
- Use of colours and materials so as to minimise the visual impact of the buildings; and
- Inclusion of home office facilities within the design of buildings to limit long distance daily travel (where feasible), etc.

6.5 No-go Alternative

This option involves retaining the existing land use – agriculture. The property would remain under sugarcane cultivation and would continue to operate as a working sugarcane farm. The result of the detailed Agricultural Assessment Study conducted has indicated that there are significant constraints to long-term sugarcane farming in the area. These constraints include poor soil together with the lack of access to irrigation water. Therefore, the recreational, commercial or industrial development of the estate 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. The topography, presence of climax forest and estuary is the greatest long-term asset to the owners of the land than its sugarcane production potential and therefore the no-go alternative is not the most feasible option.

This is a mixed-use development that entails a huge component for housing; as such the no-go alternative will prevent all the positives that can be associated with housing developments as well as for economic growth. This option does not facilitate diversification and/or tourism.

6.6 Summary of Alternatives to be Assessed

This EIA study therefore considers the following alternatives (***Table 6-1***):

Table 6-1: Description of alternatives

Alternative	Description
Site Alternatives	
No off-site or other site alternatives have been investigated due to the natural features of this site which lend themselves to a tourist resort of this nature. Furthermore, THD is the sole owner of this land and acquiring a parcel of land of this magnitude within close proximity to the coast (required to meet the developments objectives) is unlikely. A Concept Plan has been produced for the development providing an indication of land use intention on the site. The Concept Plan should not be seen as the definitive layout or final approved plan for the development, but should only be used to create an understanding of the conceptual framework for the ultimate development of Tinley Manor Southbanks. This EIA will confirm whether or not there are any fundamental issues to preclude the proposed development from proceeding along the broad, conceptual basis as outlined in the Concept Plan and will also deal with the assessment of the detailed, specific issues and impacts on a micro level.	
Design and Layout Alternatives	
Layout Alternatives	The Concept Plan has been based upon a number of, in essence, existing constraints including wetlands, estuary, coastal dune forests, sensitive pockets of vegetation, roads and topography. As such there is limited scope for layout alternatives related to the primary structure of the Concept Plan. The development proposal and planning has taken cognisance of the position of the property's environmental asset base and recommendations by the scientific specialist team. Several land use alternatives were considered by the design team in consultation with the service authorities. However, whilst many alternatives were considered, only the most feasible alternatives have been integrated into the current proposed Concept Plan. Hence, no other land use alternative will be presented in the EIA, as the current plan satisfies the objectives set out in ***Section 3.3.1*** and all service authorities whilst aligning with environmental and technical considerations.
Coastal and Development Access	• The initial development concept showed the establishment of four resorts at intervals inland of, but setback from, the vegetated dune cordon and located landward of the identified coastal risk and slippage in such a way as to not impinge on identified environmental assets. The sustainability of this approach from an environmental perspective is commendable; but the fact that the development of resorts in this area has the potential to negatively impact on access to the coast (not access along the coast) is undeniable. • THD resolved to amend their planned gated-estate development concept to a now publically accessible resort centred, lifestyle and mixed-use village theme which includes a mix of residential and leisure development supported by a range of commercial and social facilities.
Stormwater Attenuation	• The original Concept Plan considered stormwater attenuation facilities to be located within wetlands. • The revised Concept Plan presented in this EIA allows for stormwater attenuation facilities to be located outside wetlands but within the 30 m wetland buffer in line with current requirements by the DWS.
Construction Management Alternatives	
Surplus Fill Material Management	A number of alternatives exist for the re-use/recycling of surplus fill material. These have been listed in ***Section 6.3***. It should be noted that not all of the alternatives will be used during this phase of the project or similarly a combination of the alternatives will be used.
Operational Alternatives	
The EMPr details operational best practise approaches to be adopted. The Developer and each end-use Developer is to investigate sustainable operational practices.	
No-Go Option	
This option involves retaining the existing land use – agriculture. The property would remain under sugarcane cultivation, and would continue to operate as a working sugarcane farm. The Agricultural Potential Assessment indicates that the long-term viability of sugarcane cultivation at Tinley Manor is limited due to poor soils and limited irrigation options. The topography, presence of climax forest and estuary is the greatest long-term asset to the owners of the land than its sugarcane production potential and therefore the no-go alternative is not a feasible option.	

7 FINDINGS OF THE SPECIALIST ASSESSMENTS

The findings and recommendations of the specialists and reports of specialised processes have been incorporated in this chapter.

The following studies have been incorporated into this EIA study:

- Agricultural Potential Study (***Appendix C 1***);
- Geotechnical Assessment (***Appendix C 2***);
- Heritage Assessment (***Appendix C 3***);
- Vegetation Assessment (***Appendix C 4***);
- Wetland Assessment (***Appendix C 5***)
- Estuarine Assessment (***Appendix C 6***);
- Coastal Assessment (***Appendix C 7***)
- Socio-Economic Study (***Appendix C 8***);
- Traffic Impact Assessment (***Appendix C 9***); and
- Stormwater Management (***Appendix B 2***).

7.1 Agricultural Potential Study

The findings of the Agricultural Potential Assessment for the landholdings suggest that most of the existing sugarcane fields can function as economically viable production units for the medium term, provided high standards of management are maintained. However, the assessment indicates that the soils on the site present some agronomic challenges. In the medium- to long-term, sugarcane farming will become progressively less viable, even when considering milling margins. Furthermore, steep slopes and excessive permeability and shallow rooting depths severely limit the choice for other crops, and in particular, annually cultivated row crops.

Industry emphasis and investment is moving away from dry land farming in KwaZulu-Natal to irrigated production further north, however the estate does not have access to irrigation water, nor is there any likelihood of new irrigation permits being issued.

Due to slope, permeability and soil shallowness, these estates cannot make full use of the abundant rain experienced. Therefore, the class of land is subject to severe cultivation restrictions. Less than 30 ha are agronomically suitable for arable annual crops. This area does not have access to irrigation water.

These farms are however capable of yielding between 50 and 60 tons sugarcane per ha, which at present sugar prices gives a miller excellent margins, provided there is sufficient mill throughput.

Other factors to consider include future local and world sugar prices, the future cost of fertilizers and herbicides, as well as the cost of labour. Steep slopes such as those at the estate are far more labour intensive than level fields.

In view of the high predominance of low quality soils together with no irrigation water, the long-term economic viability of the North Coast Corridor as sugarcane producing units is questionable.

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. Urbanisation 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 KwaZulu-Natal appears to have stabilised, sugarcane production has declined. Industry emphasis and investment is moving away from dry land farming in KwaZulu-Natal 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 Department of Agriculture is the decline of small grower hectarage under sugarcane and the even greater decline in yields per hectare evidenced in small grower production. This trend severely inhibits horizontal expansion of sugarcane production.

The three new major sugar milling projects that are currently on the drawing boards and only if approved are for the production of ethanol only. Thereafter no more water will be allocated to the irrigation of sugarcane. None of the properties for the proposed Tinley Manor Southbanks Coastal development 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 sugarcane 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.

Therefore, the assessment concludes that the topography, presence of climax forest and estuaries is the greatest long-term asset to the owners of the land than its sugarcane production potential. However, these assets need, in the meanwhile, to be cared for and nurtured.

Furthermore, it is important to note that Tongaat Hulett, who currently farm this land, have been proactive with regards to the 'replacement' of agricultural land in more long-term and appropriate locations. To this end, initiatives such as Operation Vuselela which is a partnership between Tongaat Hulett and the Department of Economic Development, it is estimated that over 3,300 ha of fallow land will be planted with sugarcane. In 2010, Tongaat Hulett rehabilitated nearly 6 000 ha of land for sugarcane production. Between 2009 and 2014 over 34 000 ha of new sugarcane has been planted and is targeting substantial additional areas over the next few years.

7.2 Geotechnical Assessment

The development proposes platforms created by cutting the hill tops and spurs and creating fill embankments on the lower slopes for development. The geotechnical assessment indicates that the proposal is feasible; however there are a few challenges / constraints which need to be taken into consideration.

7.2.1 Development Constraints

7.2.1.1 Slope Stability

7.2.1.1.1 Berea Formation

In general areas underlain by Berea Formation sand and sandy clay and the overlying Recent aeolian dune sand are characterised by moderately to steeply inclined mid to upper slopes ranging between 15 – 30°. As such given the natural angle of repose of the unconsolidated sandy material is typically in the order of 28 – 30°, it is evident that some slopes in these area are at their limit of stability and therefore are considered to be potentially unstable. Therefore, any cutting or removal of binding vegetation may likely increase instability and induce slope failure.

Evidence of such instability was noted in these materials during the drive over survey where percolating groundwater likely became perched on less permeable Berea Formation clayey sand, leading to the saturation of the sandy material and eventual slope failure. Such failure is most likely as a result of heavy or prolonged rainfall.

7.2.1.1.2 Vryheid Formation

No evidence of potential slope instability was identified in areas underlain by the Vryheid Formation sedimentary bedrock.

However, it is possible that some potentially unstable slopes will be identified during the detailed investigation on moderately steep to steep, mid to upper, easterly facing slopes where the weathered bedrock dips unfavourably out of the slope, or, on slopes where the weathered bedrock has been disturbed and possible tilted by the intrusive dolerite.

In this regard, for planning purposes all easterly facing slopes underlain by Vryheid Formation bedrock with natural slope angles greater than 1:3 (18°) should be considered as potentially unstable.

7.2.1.1.3 Karoo Dolerite

Slope instability is known to occur within areas underlain by dolerite bedrock and in particular the very clayey residual material derived therefrom. An example of such instability was noted during the drive over survey. A localised, relatively small, slope failure occurred at the base of a steep slope adjacent to a natural drainage line. It is assumed the very clayey material became saturated and subsequently failed.

Furthermore, where dolerite has intruded the Vryheid Formation bedrock, if deeply weathered to residual material, the residual clays can act as failure planes, especially where percolating or perched groundwater seepage acts as a lubricant.

7.2.1.1.4 General

Notwithstanding the above, it must be noted that at the time of the drive over survey large portions of the development area were covered by mature uncultivated sugarcane and/or thick natural vegetation. As such further evidence of unstable slopes may have been obscured from view. However, where instability is prone this will likely be detected during the detailed phase of the investigation or during initial development of the site.

7.2.1.2 Problem Soils

7.2.1.2.1 Collapsible Soils

The loose unconsolidated Recent aeolian dune sand and underlying Berea Formation sands that characterise the central and eastern portion of the site as well as alluvial and hillwash material within drainage lines, are likely to have a moderately high to high collapse potential in the sense that when subjected to a critical increase in moisture content under load, they undergo a densification and subsequent settlement.

7.2.1.2.2 Active Soils

The colluvial clayey sand and sandy clay, residual clayey sands and sandy clays as well as completely weathered sandstone and shale of the Vryheid Formation and Karoo dolerite are likely to be moderately to highly active in the sense that they will be subject to volume changes with fluctuations in the materials in-situ moisture content.

7.2.1.2.3 Erosive Soils

The very loose to loose consistency, low cohesion between individual particles and fine to medium grained particle size of the Recent aeolian Dune sand, sandy Berea Formation and sandy colluvium results in these material being highly prone to erosion via wind and flowing stormwater run-off, especially given the sloping nature of the site. Furthermore, the likelihood of erosion will increase dramatically once the site is cleared of covering vegetation for the purpose of the development, which has a binding action on the underlying soils.

As such, strict measures should be in place both during and after construction to control stormwater run-off across the site. Post construction all batters and unpaved areas should be vegetated in order to keep the erosion of upper soils to a minimum. Due to the likely moderately high clay content within the more clayey colluvial and residual materials, these soils are not as susceptible to erosion, however, if subjected to concentrated surface flow, erosion is probable.

7.2.1.3 Subsoil Seepage

Subsoil seepage is likely to be substantial at the base of a number of stream valleys as well as the heads of the stream valleys. Furthermore, where relatively permeable sandy dune material, overlies more clayey, less permeable, residual or colluvial material or weathered sandstone, shale or dolerite bedrock, seepage is likely especially after rainfall events. However, although subsoil seepage may be problematic in development, the presence of which does not preclude the development of the area unless the area falls within the “wetland” area as defined by the wetland specialist. Within developable areas, where subsoil seepage is encountered, the seepage can be curtailed or managed through the suitable placement of adequate subsoil drains.

7.2.1.4 Percolation Characteristics

No percolation tests were carried out across the proposed development area during this preliminary investigation. However, the very loose to loose, sandy material underlying the coastal eastern portion and southern central portion of the area are likely to be highly to moderately permeable and thus suitable for waste water disposal via subsoil percolation. In contrast the likely residual clayey material derived from the weathering of the sedimentary bedrock and in particular dolerite bedrock are likely to have poor percolation characteristics and thus deemed not suitable for waste water disposal via subsoil percolation.

Similarly areas with high water tables are also not suitable for subsoil waste water disposal.

Therefore, in such areas underlain by residual and clayey colluvial material or shallow water table conditions, we recommend that in the planning phase of the development, provisions are made for a waterborne sewage option. It is noted that these would tend to be associated with wetland areas which are specifically excluded from the developable footprint area.

7.2.1.5 Construction Materials

No sampling for laboratory testing has been carried out on the materials occurring in the site area for this preliminary investigation. Extensive sampling and testing will be carried out during the detailed investigation in order to quantify the geotechnical conditions.

However, from knowledge of the materials occurring on site and previous investigations in the area regarding material suitability for construction, general classifications after TRH 14 – 1985 and the Revised US Classification are likely and can be used for the preliminary design of road and pavement layer-works and have been provided by the Geotechnical Specialists.

7.2.2 NHBRC Classifications

Based on the initial assessment, the anticipated soils underlying various portions of the investigated area are likely to classify according to NHBRC classifications as R (Shallow bedrock < 0.5), C – C2 (Collapsible soils), H – H2 (Heaving soils), and potentially S (Compressible soils) type soils.

More detailed assessment regarding NHBRC classifications will be provided in the detailed investigation once Dynamic Cone Penetrometer and laboratory data has been analysed.

7.2.3 Development Recommendations

At this planning stage, no details with regard to earth-works are available. However, given the undulating nature of the site area, significant earth-works are envisaged. In this regard the following general cutting and filling recommendations as presented in ***Section 9.3.2*** should be taken into account for planning purposes.

7.2.3.1 Excavatability

In terms of the materials underlying the development area, “soft” excavation, according to SABS 1200D standards, is anticipated through the entire depth of the Recent Aeolian dune sand, Berea Formation sands and clayey sands, residuum, colluvium and completely weathered bedrock. Where underlying Vryheid Formation and Karoo dolerite bedrock is intersected excavation is likely to become more labour intensive and require pneumatic tools and in possibly even blasting to remove.

7.2.3.2 Site Drainage

Taking into account the preliminary percolation assessment of the subsoils on site, it is apparent that stormwater disposal via subsoil percolation is feasible across the eastern coastal and central areas underlain by sandy material. However, where underlain by more clayey colluvial and residual subsoils, storm water disposal via soak pits may not be a viable option. As such, across portions of the site, provision must be made

for control of stormwater whereby run-off is piped or carried in surface drains to discharge into the stormwater system, comprising suitably designed attenuation ponds which ultimately discharge into the Umhlali River.

After construction of the respective sites, the area should be graded to facilitate effective and efficient run-off and prevent ponding of stormwater on surface adjacent to any structures.

7.2.3.3 Founding

Founding conditions are likely to vary significantly across the area, depending on the parent rock type, and the colluvial and residual soils derived therefrom. In this regard, in areas underlain by colluvial and residual clayey soils overlying weathered shale and dolerite bedrock, the subsoils are likely to be active, and thus special founding measures will be required. Similarly, specific founding measures will be required within areas underlain by Recent Aeolian dune sand and Berea Formation sediment to considerable depth where collapsible conditions are to be encountered. Further recommendations are presented in Section 9.

Notwithstanding the above, we consider it essential that detailed geotechnical investigations are carried out for the individual developments proposed in the area once the details of these developments are made available.

7.3 Heritage Assessment

Two occurrences of unmarked ancestral graves are recorded on the Tongaat Hulett Estates' database and are located within non-development zones of the current proposal due to steepness of slope and the underlying lithography.

The first occurrence of unmarked graves is approximately 100 x 50 m in size. The number of graves is not known. Long-term residents in the area are aware of people being buried there as long as they can remember; in some cases over 70 years. There is a known grave of Mfana Leonard Sibisi who died 1946. The GPS co-ordinates of this occurrence is as follows: 29° 27.334'S 31° 15.061'E (***Figure 7-1***).

The second occurrence of unmarked graves is a line of graves on the boundary line of S&P Farm between the following two co-ordinates: 29° 27.544'S 31° 15.013'E to 29° 27.453'S 31° 14.814'E (***Figure 7-1***). There are no visible evidence of graves and no dates, numbers or names known.

All graves are to be accorded the highest level of protection and may not be disturbed without both family consent and a permit from Amafa. Should any impact on these grave locations be anticipated these would be the subject of the graves protocol as described in the EMPr.

Having assessed the site, it is found that the potential impact to heritage resources through implementation of the proposed Tinley Manor Southbanks is very low.

On the basis of the foregoing it has been requested from Amafa that the proposed project area be exempt from the requirements of a full Phase 1 Heritage Impact Assessment.

Figure 7-1: Grave locations

7.4 Vegetation Assessment

7.4.1 Biodiversity Maintenance Scores

In terms of assessing the impacts of a proposed development on the receiving environment, it is vital that the current state of the environment is assessed, and the level at which it contributes currently, is considered and recorded.

SiVEST have developed an assessment matrix which assists in determining the current biodiversity and conservation value of the various vegetation types that were encountered during the field survey. In addition, consideration is afforded to 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 the functional integrity and future sustainability of the vegetation types in the immediate vicinity of the development. The final condition score of each landscape was calculated 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.

The detailed methodology for the Biodiversity Assessment and matrices are provided in ***Appendix C 4***.

The findings of the Biodiversity Assessment are provided below.

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 in ***Table 7-1*** below.

Table 7-1: Biodiversity Maintenance Scores per vegetation type

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

Three areas of significance exist on the site in terms of vegetation, and these are (a) the Umhlali River and associated Estuary area, (b) the Primary Dune and Coastal Dune Scrub / Forest, and (c) the Incised wetland area above the WWTW.

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 need to be adhered to and implemented.

Furthermore, 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 in other areas other vegetation types are functioning at a higher level of functionality due to their position on the site affording them greater resistance to degradation.

7.4.2 Recommendations

The following recommendations for the vegetation occurring on the Tinley Manor Southbanks site are as follows:

- Should the layout change in any way and the resultant change affect the vegetation identified in ***Figure 4-2***, 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.

7.5 Wetland Assessment

7.5.1 Present Wetland Health

As presented in ***Section 4.6.3*** the following wetland hydrogeomorphic units were identified in the study:

- Six (6) channelled valley bottom wetlands;
- Seven (7) unchannelled valley bottom wetlands;
- Fifteen (15) hillslope seep wetlands; and

- One (1) floodplain wetland.

7.5.1.1 Channelled Valley Bottom Wetlands

The present ecological state (PES) for the channelled valley bottom wetlands are shown in ***Table 7-2*** below.

The general present ecological state of the channelled valley bottom wetlands was found to be largely (Category D) to greatly modified (Category E).

Despite differences in the sizes of the wetlands, many of the same impacts were found to affect all of the wetlands with varying degrees of severity. Factors that were found be impacting on the present ecological status are elaborated on below.

Table 7-2: Channelled Valley Bottom (CVB) Wetlands PES

Wetland Name	Hydrology		Geomorphology		Vegetation		Overall Health Score for entire Wetland	
CVB_1	6.5	E	0.9	A	10	F	5.80	D (Largely modified)
CVB_2	6.5	E	1.6	B	10	F	6.03	E (Greatly modified)
CVB_3	5	D	1.1	B	10	F	5.37	D (Largely modified)
CVB_4	8.5	F	0.9	A	10	F	6.47	E (Greatly modified)
CVB_5	8.5	F	0.9	A	10	F	6.47	E (Greatly modified)
CVB_6	6.5	E	0.4	A	10	F	5.63	E (Greatly modified)

The vegetation present ecological state for all the channelled valley bottom wetlands was attributed to a Category F (Critically modified).

According to the results of the WET-Ecoservices Assessment, the ecosystem service offered by the channelled valley bottom wetlands which scored the highest (moderately high) was the sediment trapping ability of the wetlands. Other ecosystem services which scored at an intermediate level include erosion control, toxicant removal, nitrate removal, phosphate trapping, flood attenuation and water supply for human use.

The ecosystem services which scored below intermediate levels include streamflow regulation, maintenance of biodiversity, carbon storage, tourism and recreation, education and research, cultural significance, cultivated foods and natural resources. The current transformed state of the wetlands has bearing on the degree of ecosystem services offered by the wetland. As a result of the level of transformation, the ecosystem services are limited to intermediate to low scores.

The channelled valley bottom wetlands almost all scored a Class C (Moderate) level of ecological importance and sensitivity (EIS), with the exception of channelled valley bottom wetland 2. Contributing factors for a moderate level of ecological importance and sensitivity for most of the wetlands include transformation and channelisation impacts, which have a bearing on habitat quality and the potential occurrence of wetland fauna. Channelled valley bottom wetland 2 however was found to be associated with a riparian habitat which contained protected plant and tree species. These include *Cryptocarya latifolia, Dracaena aletriformis* and *Drimiopsis maculate*. Channelled valley bottom wetland 2 scored a Class B (High) level of EIS as a result.

7.5.1.1.1 Unchannelled Valley Bottom Wetlands

The PES for the unchannelled valley bottom wetlands are shown in ***Table 7-3*** below.

The general present ecological state of the unchannelled valley bottom wetlands was found to be moderately (Category C) to greatly modified (Category E). Again, many of the same impacts were found to affect all of the wetlands with varying degrees of severity impacting on the overall present ecological status.

Factors that were found be impacting on the present ecological status are elaborated on below.

Table 7-3: Unchannelled Valley Bottom Wetlands (UCVB) PES

Wetland Name	Hydrology		Geomorphology		Vegetation		Overall Health Score for entire Wetland	
UCVB_1	5	D	0.7	A	9.8	F	5.17	D (Largely modified)
UCVB_2	3	C	1	A	4.8	D	2.93	C (Moderately modified)
UCVB_3	6.5	E	3.1	C	9.8	F	6.47	E (Greatly modified)
UCVB_4	5	D	1.5	B	10	F	5.50	D (Largely modified)
UCVB_5	3	C	0.4	A	5.6	D	3.00	C (Moderately modified)
UCVB_6	6.5	E	0.3	A	10	F	5.60	D (Largely modified)
UCVB_7	1	A	0	A	10	F	3.67	C (Moderately modified)

The vegetation present ecological state for all channelled valley bottom wetlands attributed with either a Category D (Moderately modified) or a Category F (Critically modified).

The ecosystem services provided by the channelled valley bottom wetlands were very similar to the channelled valley bottom wetlands given similar impacts and a similar ecological state. However, the unchannelled valley bottom wetlands were found to provide a higher level of ecosystem services for a greater range functions. Accordingly, the wetlands were assessed as providing a moderately high level of ecosystems services in terms of sediment trapping ability, phosphate trapping, nitrate removal, toxicant removal and erosion control.

The only ecosystem service with an intermediate score was flood attenuation ability. The remaining ecosystem services that scored below intermediate included carbon storage, maintenance of biodiversity, water supply for human use, natural resources, cultivated foods, cultural significance, tourism and recreation, education and research as well as streamflow regulation. Transformation of the wetland for agricultural purposes and the resultant effect on alteration of flow can once more be considered to be a significant factor affecting the ability of the wetland to contribute to a higher degree of ecosystem services provided.

Due to the similar ecological state for many of the wetlands were scored to have a Class C (Moderate) level of EIS. Transformation and channelisation impacts again had a major influence decreasing the sensitivity of the wetlands.

Unchannelled valley bottom wetlands 1 and 3 were more impacted by artificial drainage ditches which further degraded the ecological condition and therefore sensitivity of the wetlands. These two wetlands were assigned a Class D (Low) EIS.

7.5.1.2 Hillslope Seep Wetlands

The PES for the hillslope seep wetlands are shown in ***Table 7-4*** below. The general present ecological state of the hillslope seep wetlands was found to range between a Category A (Unmodified/natural) to a Category E (Greatly modified).

Many of the same impacts (sugarcane cultivation/transformation, roads and drainage channels) were found to affect all of the wetlands with varying degrees of severity impacting on the overall present ecological status.

Factors that were found be impacting on the present ecological status are elaborated on below.

Table 7-4: Hillslope Seep (HS) Wetlands PES

Wetland Name	Hydrology		Geomorphology		Vegetation		Overall Health Score for entire Wetland	
HS_1	0.00	A	0.30	A	4.90	D	1.73	B (Largely natural)
HS_2	1.00	A	1.30	B	5.60	D	2.63	C (Moderately modified)
HS_3	6.50	E	0.70	A	10.00	F	5.73	D (Largely modified)
HS_4	5.00	D	0.30	A	10.00	F	5.10	D (Largely modified)
HS_5	8.50	F	0.40	A	10.00	F	6.30	E (Greatly modified)
HS_6	8.50	F	0.50	A	10.00	F	6.33	E (Greatly modified)
HS_7	5.00	D	0.20	A	10.00	F	5.07	D (Largely modified)
HS_8	6.50	E	0.50	A	10.00	F	5.67	D (Largely modified)
HS_9	5.00	D	0.10	A	10.00	F	5.03	D (Largely modified)
HS_10	6.00	D	1.10	B	8.30	F	5.13	D (Largely modified)
HS_11	6.00	D	0.90	A	9.80	F	5.57	D (Largely modified)
HS_12	6.50	E	0.20	A	8.90	F	5.20	D (Largely modified)
HS_13	6.50	E	1.80	B	7.80	E	5.37	D (Largely modified)
HS_14	0.00	A	0.10	A	0.20	A	0.10	A (Unmodified)
HS_15	0.00	A	0.00	A	0.20	A	0.07	A (Unmodified)

The vegetation present ecological state ranged from Category A (Unmodified/natural) to Category F (Critically modified).

The ecosystem services identified that can be provided by the hillslope seep wetlands were found to be diverse but very limited. The highest scoring ecosystem services, which were assessed at a moderately high level, include phosphate trapping, nitrate removal and toxicant removal abilities.

At an intermediate level, the ecosystems services provided include sediment trapping, flood attenuation and erosion control. Most scores however were below intermediate to low. These include streamflow regulation, carbon storage, maintenance of biodiversity, water supply for human use, natural resources, cultivated foods, tourism and recreation, education and research.

Complete transformation of the vegetation component of the wetland and associated impacts to the present ecological condition are the main contributing factors affecting the ability of the wetland to contribute to a greater degree of ecosystem services.

Due to the similar ecological state for many of the hillslope seep wetlands, hillslope seep wetlands 3-13 were scored to have a Class D (Low) level of EIS. Hillslope seep wetlands 1, 2, 14 and 15 however scored much higher due to the decreased level of transformation of the wetlands and their location on the secondary dune just off the coastline. These wetlands were scored as having a Class B (High) EIS.

7.5.1.3 Floodplain Wetland

The PES for the single floodplain wetland is shown in ***Table 7-5*** below. The general present ecological state of the wetland is a Category C (Moderately modified).

Factors that were found be impacting on the present ecological status are elaborated on below.

Table 7-5: Umhlali Floodplain PES

Module	Impact Score	Category
Hydrology	6.5	E
Geomorphology	1.2	B
Vegetation	2.4	C
Overall Health Score for entire Wetland	3.37	C (Moderately modified)

The vegetation present ecological state of the floodplain wetland was attributed to a Category C (Moderately modified).

According to the results of the ecosystem services assessment for the floodplain wetland, the highest scoring ecosystem services which were assessed at a moderately high level included maintenance of biodiversity, sediment trapping, phosphate trapping, nitrate removal, toxicant removal, erosion control and as well as tourism and recreation.

At an intermediate level, ecosystems services included carbon storage and flood attenuation. Below intermediate level of ecosystems services provided include streamflow regulation, water supply for human use, natural resources, cultivated foods and, education and research. The lowest scoring ecosystem services provided by the floodplain wetland is cultural significance.

Land use impacts associated with the wetland catchment for the purposes of agriculture can be considered to be a factor affecting the ability of the wetland to provide a higher degree of wetland ecosystem services.

The wetland EIS for the floodplain wetland was categorised as a Class B (High). The floodplain has been impacted on by three main factors including cultivation on the banks of the Umhlali River, roads through the wetland and a degree of alien vegetation species encroachment.

Nonetheless, functionality of the wetland and habitat quality is still good with a riparian habitat associated with the wetland. Assemblages of protected tree species were observed including *Barringtonia racemosa* and *Sclerocarya birrea*. Fish, amphibian and avifaunal occurrence and activity were also observed although the species could not be identified.

7.5.2 Proposed Infrastructure

7.5.2.1 Road Infrastructure

A preliminary road layout has been compiled. Ideally this proposed layout should minimise the impacts on the on-site wetlands and riparian areas. This can be achieved by:

- Avoiding / circumventing wetlands and sensitive environmental areas;
- Upgrading existing farm roads, rather than constructing new roads; and
- Where wetland areas need to be crossed, a single crossing, perpendicular to the flow and shortest crossing distance should be implemented.

The Tinley Manor Southbanks has significant access constraints and thus finding a zero or low impact access point is difficult. In all likelihood on-site wetland areas will be affected or even lost due to necessary road construction to open up the development opportunities contained on the site.

Associated impacts can be mitigated by careful planning and resource loss will need to be off-set by wetland rehabilitation on the remainder of the site.

Even though the proposed road layout does take cognisance of the delineated wetland areas for the most part, there are still some areas which are cause for concern.

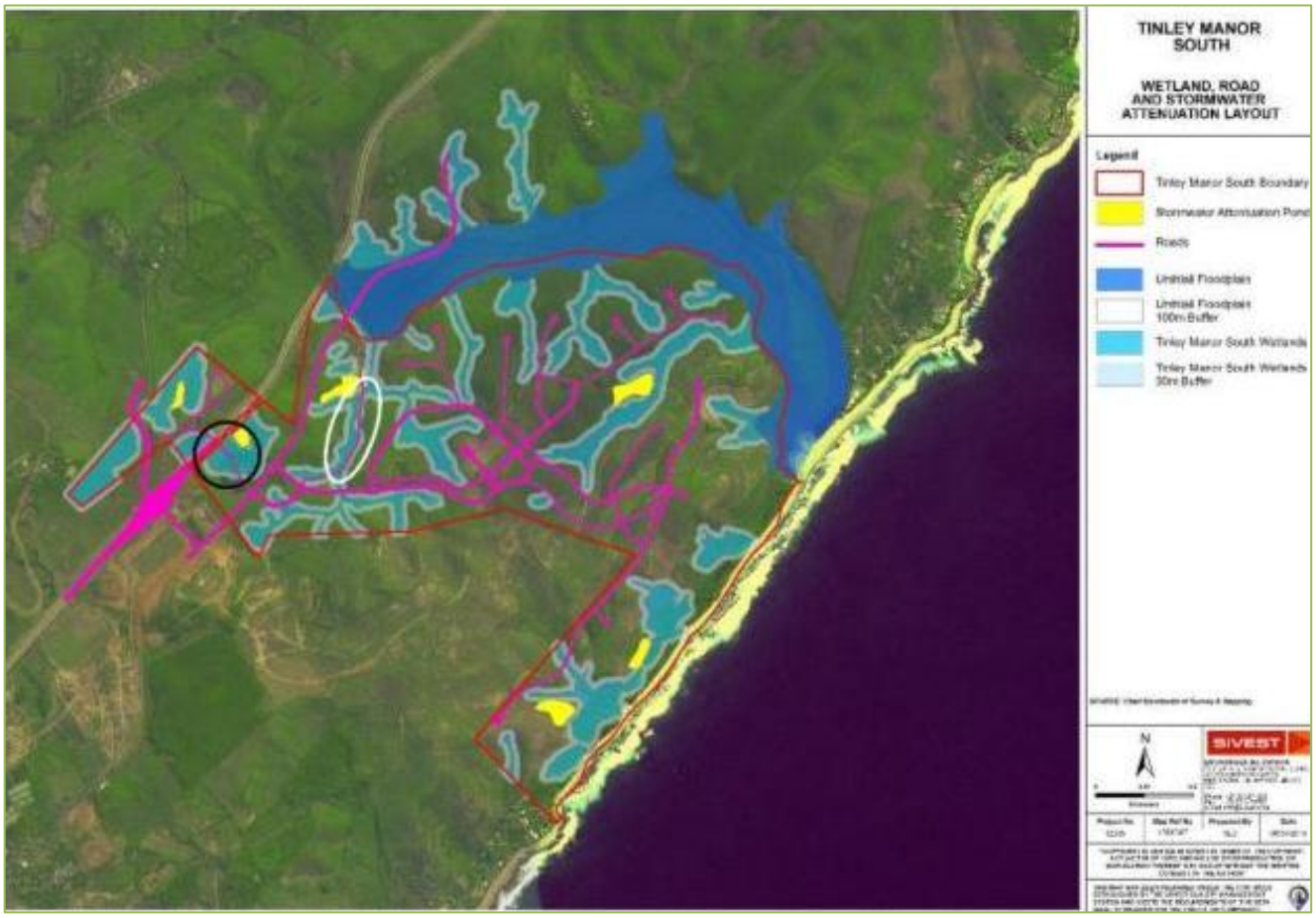

Figure 7-2: Wetland, road and stormwater layout

7.5.2.1.1 Litchi Orchard Wetland

The Litchi Orchid wetland (black circle in ***Figure 7-2*** above) is located near the south western corner of the site. This wetland can best be described as a hillslope seep which drains towards the adjacent N2 highway. This wetland used to form part of a larger system but has since been divided by the construction of the N2 highway (***Figure 7-3***).

Historically, much of this wetland unit was developed as part of a litchi orchid, which has subsequently been replaced by sugarcane. A number of tree stumps still remain as a last vestige of its former use.

A small functional wetland core remains intact (***Figure 7-4***). This wetland unit has been subjected to a number of anthropogenic impacts including agricultural development, alien infestation, artificial drainage road creation.

These impacts have resulted in a shrinkage of the effective wetland area as well as a decrease in wetland function, typically associated with hillslope seeps *inter alia*; water quality enhancement and erosion control. This wetland ultimately drains into the N2 stormwater management system, an anthropogenic system which is not in need of direct environmental protection.

The current road layout plans to cross this system in order to gain access to the eastern portion of the site. Currently the road alignment bisects the hill side slope (***Figure 7-4***) and if this alignment is developed the wetland will effectively be destroyed. Although this wetland has been significantly modified it still can be rehabilitated to provide valuable wetland functions in the future.

Figure 7-3: Litchi orchard wetland

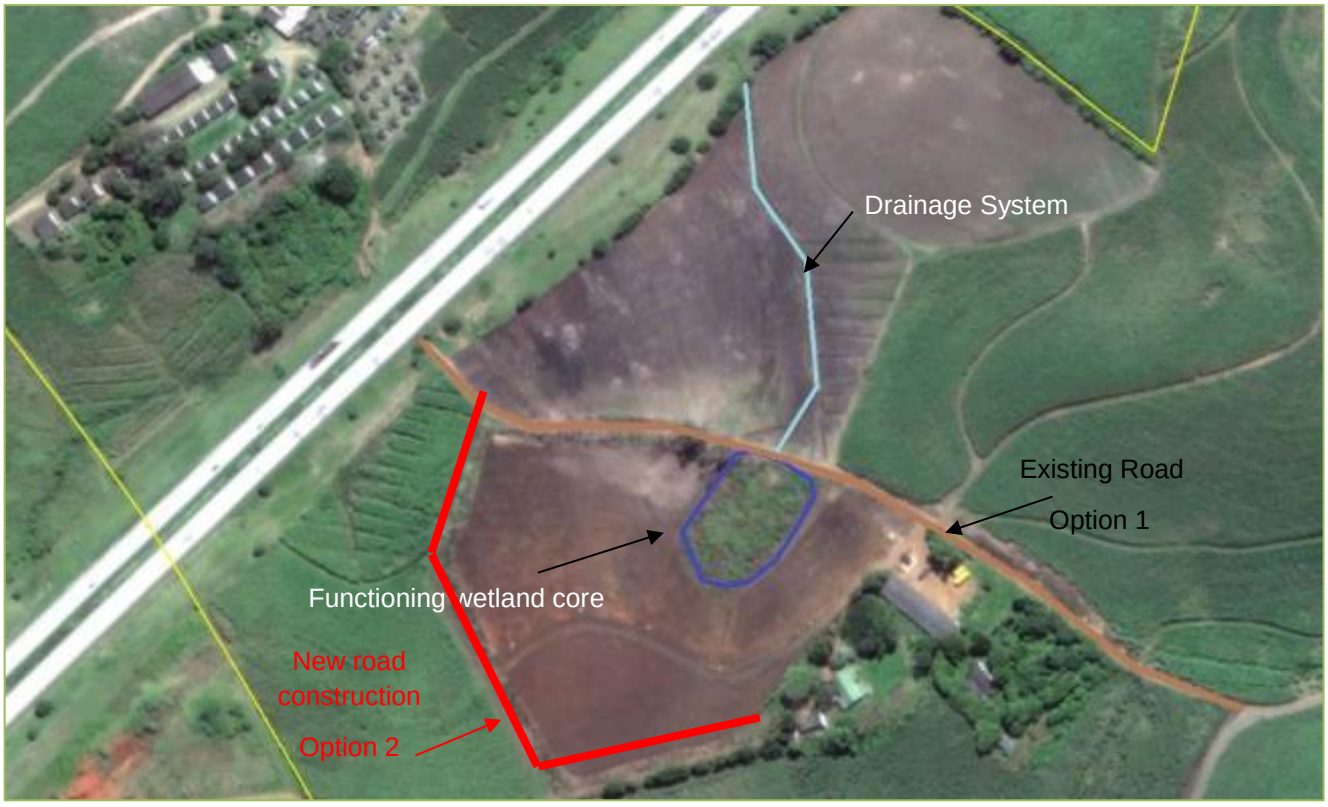

Figure 7-4: Litchi orchard wetland and road options

Two access options have been identified:

- ***Option 1*** entails upgrade the existing road that bisects the hill side seep. If road widening is required it should take place into the sugarcane (downstream) rather than into the functioning wetland core (located along the southern boundary of the road).
- ***Option 2*** entails constructing a new road whose routing goes above the existing wetland (***Figure 7-4***). The proposed road routing will need to cross relatively steep slopes and thus erosion control measures will need to be implemented to ensure the downslope wetland core is not negatively influenced.

Option 2 is recommended with the following conditions:

- Comment from a road engineer is sourced to determine if the proposed routing is viable;
- The road routing does not infringe on the upper boundary of the delineated wetland;
- Erosion control and storm water management mitigatory measures are implemented; and
- The litchi orchard wetland is rehabilitated which may include removing / modifying the existing road.

7.5.2.1.2 Wastewater Treatment Facility Wetland

The wastewater treatment facility wetland (white circle in ***Figure 7-2*** above) is located near the south western portion of the Umhlali floodplain on site.

This wetland can best be described as a channelled valley Bottom wetland which drains towards the Umhlali floodplain. This wetland used to form part of a larger system but has since been altered by the construction of a wastewater treatment facility (***Figure 7-5***).

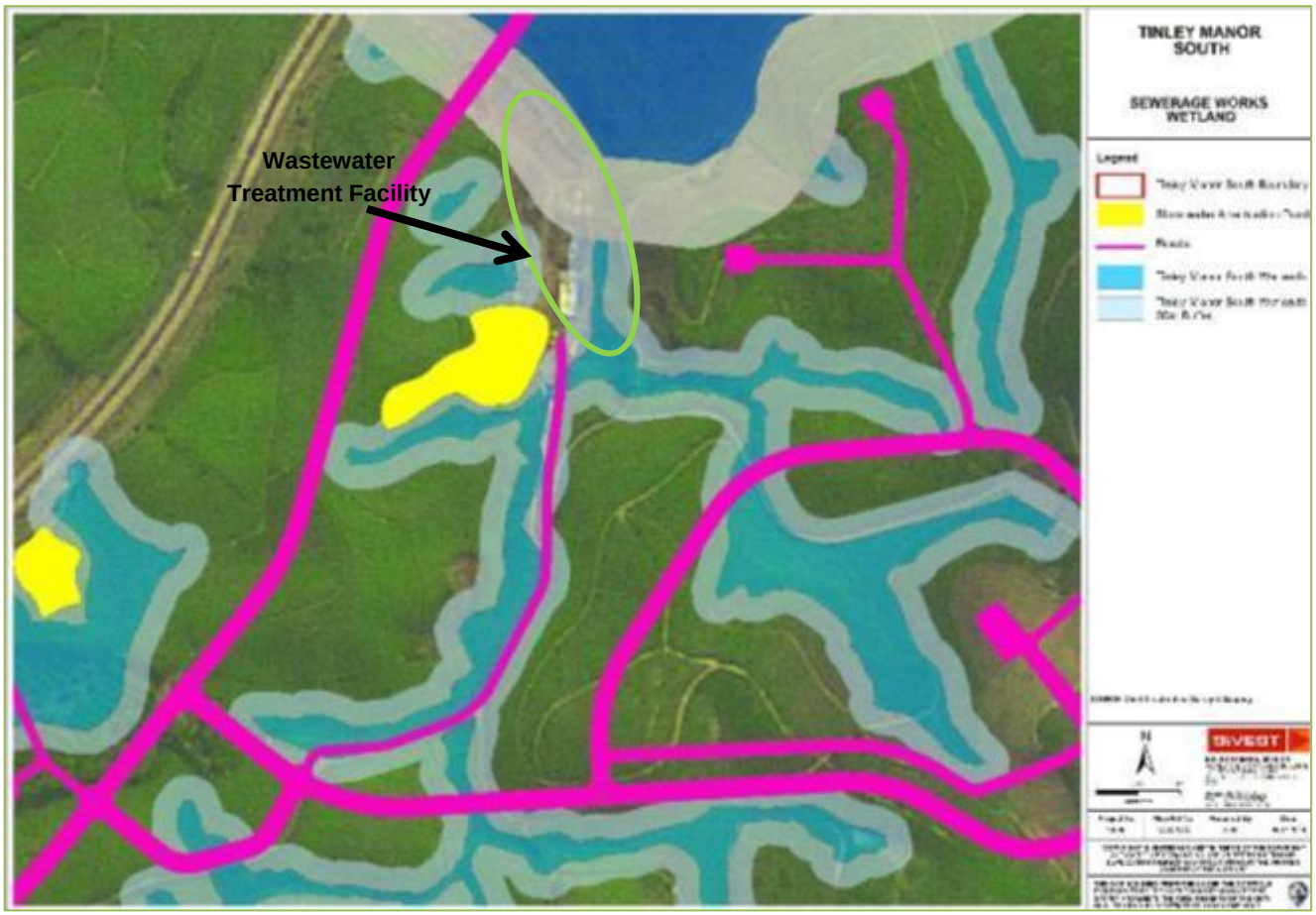

Figure 7-5: Wastewater treatment facility wetland and road

Although this road is within the buffer of the wetland unit found along the valley bottom, the alignment makes use of the existing road routing to the sewerage treatment works, and attempts to remove the existing road from the wetland wherever possible.

7.5.2.2 Stormwater Attenuation Infrastructure

A number of stormwater attenuation ponds have been designed across the site (see ***Figure 7-2*** above), and these have been placed so as to be outside of the wetlands that are present on site, while making use of the wetland buffers to ameliorate the potential impacts that water released from these structures could have. The storm water attenuation ponds should therefore have minimal impact on the wetlands across the site.

7.5.2.3 Water and Sewerage Infrastructure

With a development of this nature, it is a requirement that appropriate services are supplied to the development, and therefore water and sewerage infrastructure has been designed across the site (***Figure 7-6***). The water supply for the site will be sourced from existing Umgeni Water pipe lines within the general area, and will then be able to be gravity fed from the high southern portion of the site to the lower lying areas. The sewer system will obviously collect at the lower reaches of the site, and will be fed into the existing wastewater treatment facility that is on site. There will however be a requirement to build a pump station and sewer rising main from the beach front portions of the site to ensure that the waste water can then be fed into the existing wastewater treatment facility.

Figure 7-6: Sewer and water infrastructure routing and wetlands

Both the water and wastewater systems include a number of wetland crossings, and where possible the systems have been placed outside of the wetlands and their associated buffers. However, the wastewater system especially, will need to be placed within the Umhlali floodplain buffer for large portions of the site, as a gravity feed is required, and the floodplain buffer is the lowest lying area outside of the floodplain wetland itself. The placement of infrastructure within the buffer will reduce the impact significantly. Further the buffer will require some form of rehabilitation as it is currently utilised for sugarcane production. Therefore when these areas are transformed away from agriculture, it will provide the perfect opportunity to place the infrastructure into the soils and then rehabilitate the land thereafter.

7.5.3 Potential Impacts and Recommendations

The primary recommendation from a wetland perspective is to plan the position of the buildings, roads alignments, services and stormwater management structures outside of wetlands to avoid impacts. Should this be undertaken, there will be minimal impacts on the wetland areas.

A secondary recommendation is to maintain all wetlands as conservation areas and rehabilitate each wetland by removing crops and re-vegetating with suggested species. Should this be undertaken, the proposed development will have a positive impact on the identified wetlands and improve the present ecological state. Additionally, rehabilitating the wetlands will improve the functionality and the delivery of ecosystem services as identified in this report.

Finally, site specific recommendations must also be taken into consideration. These include:

- The Tinley Manor Southbanks has significant access constraints and thus finding a zero or low impact access point is difficult. In all likelihood on-site wetland areas will be affected or even lost due to site access road construction. Associated impacts can be mitigated by careful planning, and resource loss will need to be off-set by any wetland rehabilitation on the remainder of the site;
- A low impact internal road layout can be achieved by:
  - Avoiding / circumventing wetlands and sensitive environmental areas;
  - Upgrading existing farm roads, rather than constructing new roads; and
  - Where wetland areas need to be crossed, a single crossing and shortest crossing distance should be implemented;
- Two options have been tabled in order to provide site access near the litchi orchard wetland. Option 2, which entails constructing a new road above the existing wetland is recommended if the following conditions are met:
  - Comment from a road engineer is sourced to determine if the proposed routing is viable;
  - The road routing does not infringe on the upper boundary of the delineated wetland;
  - Erosion control and storm water management mitigatory measures are implemented; and
  - The litchi orchard wetland is rehabilitated which may include removing / modifying the existing road.

Potential impacts and recommendations are presented in ***Table 7-6***.

Table 7-6: Potential impacts and recommendations

Key Concerns Raised	Recommendations
Impacts associated with the Construction Lay-down Area A construction lay-down area is likely to be required for development. The location of the construction lay-down area will be important as placing this area in the wetlands are likely to result in direct negative physical impacts. Direct negative impacts can include vegetation clearing and degradation, topsoil removal and compaction impacts due to temporary structures and vehicle movement. Impacts related to worker ingress and the degradation of the wetlands may similarly result. Potential contamination and pollution impacts from stored oils, fuels, and other hazardous substances or materials are also a possibility. Finally, where site clearing may be required in the wetland in order for the lay-down area to be established, this will result in the clearance/removal of vegetation at the surface leaving the wetlands vulnerable to erosion and sedimentation impacts.	• Seasonal Scheduling of the Construction process: Construction should be scheduled to take place during winter when flows are lowest (preferably May and August). • Location of the Lay-down Area: Lay-down areas must not be situated in any wetlands or associated buffer zones. All wetlands must be clearly demarcated for the duration of the pre-construction and construction phases. Utilization of Bonnox fencing or wooden stakes at sufficient height that is visible from a distance must be used. Storage of materials, liquids or solid / hazardous and non-hazardous are not to be located in any of the wetlands or the associated buffer zones. Vehicles must be kept at least 100 m from any of the wetlands. • Preventing Fire Risks to Wetlands and People: Operational fire extinguishers are to be available in the case of a fire emergency. It is recommended that a fire management and emergency plan be compiled by a suitably qualified health and safety officer and implemented for the development.

Key Concerns Raised	Recommendations
Road Impacts Roads will be required to be established during the construction phase. The roads may potentially traverse the identified wetlands. Should this take place, road establishment may have negative physical impacts on the wetlands. Roads may be in the form of dirt roads or tarred roads for main access areas that will be consolidated for the purposes of the proposed development. In both instances, loss of wetland vegetation and habitat will take place. Additionally, in order to avoid permanently wet areas, culverts under the roads may be required to avoid standing or flowing water. The establishment of the culvert bridges will result in direct degradation of the wetland as well as loss of wetland soils and vegetation. Indirect impacts that may also be anticipated include increased run-off entering wetlands. Following rainfall events, increased and accelerated run-off can be generated. Exposed bare and compacted surfaces contribute to increased surface run-off and preclude water infiltration. Increased run-off can affect the current hydrological regime of the wetland altering its state even further. Additional secondary impacts as a result of increased run-off include erosion of the banks and bed of the wetlands due to increased base flow. Sediment accumulated by surface run-off can also be picked up and transported into the wetland systems, resulting in sediment plumes which are commonly associated with the establishment of alien vegetation within wetlands. Construction vehicles (heavy and light) are likely to require access to areas where the proposed development is to take place. Potential negative impacts can include vibration (disturbance), compaction and degradation impacts to the wetlands and the associated buffer zone soils and flora. Moreover, leaks or spills of oils, fluids or fuels from vehicles and machinery in general or during re-fuelling or servicing in the wetlands and the associated buffer zones are a possibility. Should any leakage or spillage occur in a wetland, watercourse and/or the associated buffer zone, potential soil contamination can result and further degrading the state of the wetlands. Fuels and oils also pose a fire risk not only to the wetlands but also neighbouring areas and nearby farming settlement areas. Therefore, adequate measures must be in place to prevent potential harm or loss of life.	• Permission and Approval to construct in Wetlands (if required): No vehicles are allowed in the demarcated wetlands areas unless authorisation from the DWS and the relevant environmental authorities has been applied for and granted. • Preventing Physical Degradation of Wetlands: Existing roads are to be used where possible. New roads must be planned to avoid all wetlands. Additionally, road designs must integrate adequate measures to prevent the generation of increased run-off for temporary access areas (dirt roads) as well as roads that will be developed for the operational phase of the proposed development. A construction and operational storm water management plan must therefore be compiled and adhered to. The operational storm water management plan must take into account water outlet structures that incorporate energy dissipation designs. Where possible “soft” structures are to be implemented into the designs (such as grass blocks etc.). • No culvert bridges are to be established. However, only where this is completely unavoidable and authorisation has been granted from the relevant environmental and water authorities, any bridges that will be constructed must be designed so as to limit the disruption, constriction or canalisation of flow under them. Where possible, existing crossing points should be upgraded rather than new crossings created and redundant crossings rehabilitated. The road crossings must also be routed so that the wetland is crossed at right angles to the direction of flow. Box culverts should be used to divert flow through the wetland and stream crossings and the box culverts must be established across the entire stream channel or seasonal wetland zone. If existing crossings are utilised, pipe culverts must be replaced with an adequate number of box culverts. With regards to wetland crossings only, the road fill foundation and base should be permeable to water flow to ensure low flow seepage is maintained and that water does not dam up behind the road during heavy rainfall. Erosion protection measures (e.g. Reno-mattresses) must be established below the box culverts. The final design for each wetland crossing must be approved by the wetland specialist prior to construction commencing. Disturbance to the wetland soils along the road crossing footprint should be restricted to an established construction right-of-way (ROW) corridor. The ROW corridor within the wetland should be as narrow as practically possible and should be demarcated and fenced off during the site setup phase to the satisfaction of the Environmental Control Officer (ECO). The construction ROW should comprise the road and embankment footprint only. All wetland areas outside of the demarcated ROW must be considered no-go areas.

Key Concerns Raised	Recommendations
	✦ Other appropriate mitigation measures are presented in ***Section 9.3.6*** and in the EMPr (***Appendix B***).
Establishment of Housing Units Impacts A layout of the proposed development has not been provided. However, it is possible that the housing units may enter into the identified wetland areas and the associated buffer zones. Potential impacts that may result include the clearing of wetland vegetation and soils for foundation establishment. As a result, the established footprint of the housing units in a wetland will result in wetland loss of habitat.	✦ The final layout plan for the proposed development must take into consideration the wetland and associated buffer zones and where possible avoid these highly sensitive areas. Additionally, it is recommended that the wetlands and the associated buffer zones be designated as conservation of open space areas and managed as such. In doing so, impacts to the wetlands can be avoided in this instance.
Service Installation Impacts The installation of water, sewer and telephone lines may have a negative impact on the identified wetlands and the associated buffer zones. In order for the installation of these services to be undertaken, excavation is generally required. Should planned service networks enter into wetland areas, excavation and consequent removal of overlying vegetation can result. Additionally, in order for excavation to take place, often heavy vehicles can be used which can inflict added compaction and physical impacts. Ultimately, wetland degradation is therefore a likely possibility.	✦ The service plan layout must take into consideration the identified wetlands and buffer zones. All wetland and associated buffer zone areas are to be regarded as no-go areas. No services are to be routed through or into the wetlands and the associated buffer zone areas, with services crossing being contained to road ways and existing corridors of disturbance. ✦ Sewer manholes must not be located within the wetland and its associated buffer, i.e. the horizontal and vertical alignments of the pipes must remain constant when passing through these sensitive areas.
Increased Run-off, Erosion and Sedimentation Impacts During Construction Extensive vegetation clearing will need to take place for the proposed development. Excessive or complete vegetation clearance in the surrounding areas is likely to result in exposing the soil surface, leaving the ground susceptible to wind erosion and storm water run-off impacts after rainfall events. A further impact as a result of erosion and storm water run-off impacts is increased sedimentation to wetlands. Increased sediments deposited from eroded areas into the wetland areas tend to destabilise the natural hydrological dynamics and the associated ecological processes often leading to negative impacts. Deposited sediments can smother vegetation and change wetland flow paths and dynamics, making affected areas susceptible to alien plant invasion leading to negative impacts.	✦ To reduce the erosion risks on site during the construction phase, stormwater and erosion control measures must be implemented by the contractor to ensure that the erosion and sedimentation of the wetlands and streams do not occur during the establishment phase. The recommended stormwater and erosion control measures are presented as mitigation measures in ***Section 9.3.6*** and in the EMPr (***Appendix B***).
Increased Run-off, Erosion and Sedimentation Impacts During Operations The proposed development will include housing units as well as extensive areas of paving and / or tarred roads. As a result, impermeable surfaces will contribute to the generation of increased surface run-off. Increased run-off is also likely to generate accelerated run-off as flows accumulate and carry momentum as it flows down slope. Increased accelerated run-off can create a more powerful erosive force as flows progress into the lower lying areas and wetlands. Additionally, sediment can easily be transported with increased run-off into the lower lying valley bottom areas and wetlands. Sedimentation in wetlands is considered pollution and affecting the natural	✦ An operational storm water management plan must be designed. This plan must consider the use of energy dissipation structures in the overall design. Importantly, all discharge points must make use of energy dissipation structures. It may be required that an attenuation pond is necessary to assist with storm water management. It is likely that the position of the attenuation pond will need to be situated in a low lying valley bottom area. However, the position of the attenuation pond must not be located in a wetland area but rather outside of it. Additionally, every effort must be made so that run-off levels are adequately calculated so as not to completely obstruct flows to wetlands that rely on water inputs. Natural run-off levels will therefore need to be calculated and taken into consideration when designing

Key Concerns Raised	Recommendations
sediment regime of the wetland and the natural flow paths and dynamics.	attenuation structures.
Post-construction Wetland Rehabilitation Impacts At the time that the wetland assessment was undertaken, all wetlands had been impacted on to a greater or lesser degree by the transformation of wetland areas to sugarcane fields. An opportunity therefore exists for the rehabilitation of the affected wetland areas to restore a more natural state. Positive impacts that can be expected as a result include restoration of wetland habitat for wetland specific species, restoration of wetland hydrological and geomorphological functionality and restoration of wetland vegetation. This can be achieved by implementing prudent wetland rehabilitation and management strategies.	✭ To restore the wetland functional components, the sugarcane crops will need to be removed and the drains within them will require deactivation Plugging of the drainage ditches by means of vegetation plugs will improve surface roughness and the attenuation ability of the wetland. Additional positive impacts associated with this measure will be an increase in wetland perimeter of the degraded wetlands. All alien vegetation within the drains will also need removal. Once this has been undertaken, initial re-vegetation should focus on restoring a protective ground cover once the sugarcane has been removed to prevent erosion. ✭ To restore the wetland functional components, wetland rehabilitation must be undertaken in accordance with the EMPr and an approved Wetland Rehabilitation Plan. The recommended wetland rehabilitation measures are presented in ***Section 9.3.6*** and in the EMPr (***Appendix B***).

Given the responsible planning that has been undertaken, and the associated reduction in wetland impacts through the realignment and removal of infrastructure from wetland areas, the proposed development of the Tinley Manor Southbanks site will have minimal negative impacts on the wetlands on site. It is the opinion of this specialist that the proposed layout will actually lead to a significant positive impact for the wetlands on site through the rehabilitation of systems that have previously been heavily degraded. Further the connectivity of the wetlands has been retained, and will be further enhanced through the removal of unnecessary cane tracks, and thus their functionality will be greatly improved. The proposed development layout that has gone to great lengths to reduce encroachment and placement of services within sensitive wetland environments, and the promotion of these contiguous landscape features with rehabilitation will see a significant increase in the delivery of ecosystem goods and services.

7.6 Estuarine Assessment

7.6.1 Physico-chemical and Sediment Characteristics

7.6.1.1 Water Quality

Estuaries are the transitional point between saline marine water and land-derived freshwater. As such, the salinity of the Umhlali Estuary is strongly dependent on the state of the mouth, the amount of marine exchange that occurs, and the volume of freshwater input.

Begg (1984) measured a range of salinities and marked layering and attributed this to tidal influences during open mouth conditions. During periods of mouth closure, accompanied by the rise in water level and stable conditions, Forbes & Demetriades (2009) recorded relatively low salinities ranging between 5 and 10 throughout most of the system. During open mouth conditions, salinities rose to that of seawater (35) at the mouth and 28 in the southern channel, while strong salinity layering was noted in the northern channel with bottom water approximating seawater. The southern arm is known to retain salinities higher than that of the northern arm as it is does not receive the main river flow (Begg, 1984).

The amount of dissolved oxygen (measured as percentage saturation) is affected by water temperature, depth water turbulence, salinity and biological processes such as photosynthesis and decomposition. Eighty percent saturation is considered healthy for aquatic ecosystems.

In the Umhlali Estuary, dissolved oxygen levels generally ranged between 50 and 100% saturation. However, following prolonged mouth closure, significant oxygen depletion was evident overtime, dropping to below 50% in the southern channel, and at depths greater than 1.2 m in the northern arm.

Natural breaching of the estuary did / does alleviate low oxygen conditions of the main channel to some degree. The mouth region was less affected by closed conditions due to the predominantly shallow depth, prevalence of photosynthetic bottom algae and wind-induced mixing (Forbes & Demetriades, 2009).

Turbidity of the water column arises from fine particulate matter in suspension. Begg (1978) remarked that the northern channel was mostly muddy and turbid, while the southern arm retained clear water. Forbes & Demetriades (2009) described the Umhlali Estuary as a 'clear water' system as turbidity levels were typically low (<15 NTU) at all sites and depths. Nonetheless, during the periodic opening of the system, turbidity increased as a result of turbulence generated by currents; and during the closed mouth period, turbidity decreased as suspended materials settled out from the water column with the onset of calmer conditions. During the 2012 field investigation, a rapid decrease in water level and turbid conditions were evident throughout the estuary following recent rainfall within the catchment and the subsequent breaching of the estuary mouth.

Although natural to all aquatic ecosystems, high levels of nutrients (namely phosphorus and nitrogen) resulting mainly from stormwater run-off, agriculture practices, and discharges from wastewater treatment plants, negatively affect water quality, estuarine biota and ecological processes. Nutrient loading is generally an indication of environmental degradation. Similarly, a high bacterial concentration, typically arising from sewage contamination and agricultural and urban run-off, is indicative of poor water quality and is a threat to human health.

Based on the prescribed thresholds for phosphorus and nitrogen for aquatic ecosystems (DWAF, 1996), the Umhlali Estuary exhibits signs of nutrient enrichment with measurements ranging between <0.01–0.21 mg/L and <0.01–36 mg/ℓ, respectively (Forbes & Demetriades, 2009). These are indicative of an meso- to eutrophic ecosystem, that is, a state where relatively high nutrient concentrations cause notable reductions in species diversity, and enhance primary production to a high enough level, so as to produce harmful algal blooms (DWAF, 1996).

Bacterial analyses by Forbes & Demetriades (2009) revealed that the Umhali Estuary is faecally contaminated and that the recorded levels of bacteria were well above the recommended levels (often by orders of magnitude) for domestic (0 – 10 counts/100 ml) or recreational use (<1,000 counts/mℓ) of the river and estuary.

Faecal bacterial measurements in excess of 10,000 counts/mℓ, were likely attributed to flushing of the catchment surfaces and run-off generated by the spring rainfall period. Such high values were recorded mostly in the southern channel, rather than in the northern channel or at the mouth (Forbes & Demetriades, 2009), and are due to its marginalisation from the main channel of flow, and consequent reduction in flushing of any contaminants from this area. *Escherichia coli* (*E. coli*), the preferred indicator of human and animal faecal pollution, was prevalent throughout the survey.

7.6.1.2 Sediments and Sedimentation

Begg (1984, p. 47) described the Umhlali Estuary as "*in a badly silted condition due to agricultural malpractices immediately around and upstream of the estuary*". He found the sediments of the system to be characteristically firm and sandy (with areas of silt). During the open mouth state, extensive sand banks were exposed, particularly along the southern channel. At the mouth, the Umhlali Estuary was protected by dolerite outcrop and established dune thicket on the southern bank.

This description remains unchanged as noted in the recent site inspection, where a thick layer of mud was encountered in the mouth region, which gave way to large expanses of firm river sand moving into the middle and upper reaches. The northern arm functioned as the main channel of flow, while the south arm was virtually completely drained as a result of its visibly highly silted condition.

In 2009, the sediments comprised predominantly well-sorted, medium-grained sand (0.25 mm particle size) (Forbes & Demetriades, 2009). The depositional nature of the mouth region, following the summer rainfall

period, was evident in the mixture of medium- to very fine-grained sand (0.063 mm), with a mud component making up more than 50% of the sediment sample (Forbes & Demetriades, 2009). The organic content of sediment was highest at this time, comprising 1.22 – 2.74% of the sediment composition.

After the breaching of the estuary and scouring of most of the very fine-grained material and mud, the estuary sediments at all sites were almost uniformly medium- to fine-grained sand (0.125 mm). This was possibly attributed to low flow conditions, which may have also resulted in the deposition of mud and organic matter in the northern channel, constituting approximately 15% and between 0.76 – 1.28% of the sediment sample, respectively.

7.6.2 Ecology

7.6.2.1 Flora

7.6.2.1.1 Algal forms

There are no historical measurements of algae for the Umhlali Estuary apart from the mention of a mild bloom of the algae *Chaetomorpha* provided by Begg (1984). Algal growth is influenced by nutrient availability and turbidity and abstraction of chlorophyll-a from phytoplankton is used as an indicator of water quality based on the quantity of algae in the water column (Forbes & Demetriades, 2009).

An average chlorophyll-a concentration of 1.8 µg.L-1 (range 1.2 – 3.4 µg.L-1) was recorded in the headwaters entering the Umhlali Estuary in 2009, which was similar to that measured in the southern channel, of 1.9 µg.L-1 (range 1.1 – 3.3 µg.L-1). Chlorophyll-a levels in the northern channel and near the mouth were slightly higher at 2.9 µg.L-1 (range 1.0 – 5.4 µg.L-1) and 2.1 µg.L-1 (range 0.6 – 5.5 µg.L-1), respectively (Forbes & Demetriades, 2009). The authors suggest that although these levels were not high, they were still indicative of some nutrient enrichment relative to other KwaZulu-Natal estuaries. In comparison with the urban estuaries of the eThekwini Metropolitan Area (Forbes & Demetriades, 2010), these levels are considered to be minimal. Although no measurements were taken during the 2012 field investigation, microphytobenthos was visible on recently drained sediment in both estuary channels.

7.6.2.1.2 Riparian and Estuarine Vegetation

The historical accounts of the vegetation of the Umhlali Estuary refer to the occurrence of *Hibiscus tiliaceous* (lagoon / freshwater hibiscus), *Barringtonia racemosa,* and *Phragmites* reed beds lining the Umhlali Estuary (Begg, 1978).

A substantial portion of the *H. tiliaceous* fringe was removed from the estuary edge in 1981 to expand sugarcane plantations. The extent of this species, and other riparian vegetation, was further reduced due to harvesting for firewood (Begg, 1984). Part of the central island was also planted with sugarcane.

Evidently, the peripheral vegetation of the Umhlali Estuary has been greatly impacted by cane encroachment as Begg (1978) described the system as ‘unimportant’ in terms of botanical value. Currently, a narrow strip of *H. tiliaceous* and *B. racemosa* swamp forest remains along both the southern bank and northern banks, the latter forming a large stand on the northern channel and becoming particularly dense near the weir.

The central island is vegetated with clumps of *B. racemosa* and *H. tiliaceous*, as well as *Phragmites spp. Juncus kraussi, Phoenix reclinata, Cyperus spp.* and other *hygrophilious grasses*.

Farther upstream, sugarcane is grown in the interior portion of the island, which is fringed by *B. racemosa*.

There appears to be significant reed encroachment from the southern bank, where extensive reed beds have developed, possibly as a result of silting of the southern channel. *Echinocloa grass* is well established in the upper reaches of the estuary.

At the mouth, the sand bar is stabilised by dune pioneer species and grasses, as well coastal dune forest species, such as *Strelizia nicolai, Brachylaena discolour*, and *Mimusops caffra*.

Invasive alien plants and weeds are abundant in the upper reaches of the system on both the northern and southern banks, specifically in the vicinity of the wastewater treatment works. Numerous exotic species were noted, including: *Lantana camara, Chromalaena odorata, Melia azedarach* (Syringa), *Schinus terebinthifolius*

(Brazilian pepper tree), and *Solanum mauritianum* (Bugweed). Exotic gum trees (*Euclaytpus grandis*) and bamboo (*Bambusa vulgaris*) also occur in this area.

It is important to note that *B. racemosa* and *M. caffra* are protected tree species under the National Forests Act (Act No. 84 of 1998). While the *M. caffra* is sparse along the estuary, a large portion of the estuary margin, including the central island, is fringed with *B. racemosa*. This protected status may have implications for the proposed development, such that protected species may not be cut, disturbed, damaged or destroyed except without a licence from the DAFF. Furthermore, special conditions of the licence will also have to be fulfilled, if issued.

7.6.2.2 Fauna

7.6.2.2.1 Benthic Invertebrates

Benthic invertebrates are those organisms found living in or on the sediment surface. They are an important component of estuarine ecosystems reaching high diversity, density and biomass in healthy environments.

Begg (1984) recorded 11 species of prawns and 7 species of crabs collected during trawling of the Mhlali Estuary. A large proportion of the catch (58%) comprised penaeid prawns, predominantly *Penaeus indicus*, which indicated the important function of the Mhlali system as a nursery ground for marine prawn species.

Soft-sediment sampling by Forbes & Demetriades (2009) produced a total of 23 taxa dominated by polychaete worms and amphipod crustaceans. The densities of the amphipods increased significantly in the spring season from 3,027 to 40,672 individuals/m^2. The presence of the polychaete species, *Capitella capitata*, a well-known indicator species of organic pollution, was negligible.

The most conspicuous feature of the benthos was the wide distribution of the burrowing prawn, *Callianassa kraussi*, where burrows were visible mainly in the lower and middle reaches. However, the abundance of this species was not assessed as the burrows extend deeper than that of the surface sampling technique that was used.

In addition, the presence of the alien invasive snail, *Tarebia granifera*, was particularly noteworthy. This species reached a maximum density of 10 848 individuals/m2 in the southern channel (Forbes & Demetriades, 2009). While *T. granifera* is present in numerous estuaries across KwaZulu-Natal (Forbes & Demetriades, 2010; (Meyer, 2011), the exceedingly high abundance in the Umhlali Estuary is cause for concern, as invasive species typically outcompete native species for critical resources, which results in a loss of diversity.

The high occurrence of both *C. kraussi* and *T. granifera* was confirmed during the 2012 field inspection, where the latter were densely clustered, appearing as narrow green mats in shallow areas.

7.6.2.2.2 Fish Fauna

Early intensive sampling of the fish community of the Umhlali Estuary using beam trawling, yielded 37 species, 21 of which occurred consistently throughout the sampling period (Begg, 1984).

Harrison (unpublished, cf. Forbes & Demetriades, 2009), using seine and gill netting, collected some 30 species, 15 of which were regularly occurring. More recent sampling using the same technique yielded 13 identified species. Only six of these were common (i.e. more than five individuals), namely *Liza dumerilii, L. alata,* and *Valamugil cunnesius* (three mullet species), *Rhabdosargus holubi, R. sarba* (two stumpnose species), and *Abassis natalensis* (Slender glassy) (Forbes & Demetriades, 2009). The most abundant group was mullet, comprising 80% of the total catch.

In comparison with Harrison's records, there were several species that did not appear (or appeared in very low numbers) in the most recent samples, namely, *A. ambassis, Oreochromis mossambicus, Pomadasys commersonnii, Terapon jarbua,* and the mullet species, *Myxus capensis* and *Mugil cephalus* (Forbes & Demetriades, 2009).

While Harrison *et al.* (2000) rated the fish community of the Umhlali Estuary as 'Good', the results by the latest survey suggest a decline in species diversity and population numbers, which is indicative of the reduced capacity of the Umhlali Estuary as favourable fish habitat (Forbes & Demetriades, 2009).

During the 2012 field inspection, there was heightened fish activity (leaping fish), specifically in shallow sections of the estuary where shoals became concentrated as the system continued to drain through the open mouth.

7.6.2.2.3 Birds

Begg (1984) refers to some 1500 terns of various species, predominantly the Arctic Tern (*Sterna macrura*), utilising the Umhlali Estuary as a roosting area, specifically the extensive sandbanks which become exposed during low tide, open mouth conditions. Forbes & Demetriades (2009) did not record such numbers during their survey, presumably due to closed mouth conditions. They documented 20 species of water associated birds, with the greatest number of species (13) and individuals (42) recorded in July, in comparison with to October (10 species, 29 individuals). The overall abundance of water- associated birds was relatively low.

During the 2012 field inspection when the estuary mouth was open, large numbers of birds were also not observed. However, wading bird species including Common Greenshank, Little Egret, and White Fronted Plovers were seen foraging on the exposed sandbanks and in the shallows. Other bird species noted were Spurwing Goose, White breasted Cormorant, Reed Cormorant, Pied Kingfisher, Fish Eagle, and Woolly necked storks.

7.6.3 Health Status and Importance

7.6.3.1 Health Status

Harrison *et al*. (2000) rated the condition of the Umhlali Estuary as good in all aspects, including ichthyofauna, water quality, and aesthetics. Whitfield (2000) rated the overall condition of the estuary as fair, although information on the system was limited/poor.

The 2011 National Biodiversity Assessment (NBA) (Van Niekerk & Turpie, 2012), provides *inter alia* an updated assessment of the health status of estuaries in South Africa. The health condition of each estuary (also known as the PES was provisionally determined at the desktop level using the Estuarine Health Index, in which the current conditions of various abiotic and biotic components are rated as a percentage of the probable pristine condition).

Table 7-7: Estuarine Health Index (EHI) scores allocated to the Mhlali Estuary

Estuarine Component	Weight	Score	Grading	Weighted Score
Habitat Assessment				
Hydrology	25	75	Fair	18.7
Hydrodynamics & mouth condition	25	80	Good	20
Water quality	25	44	Fair	11
Physical habitat alteration	25	60	Fair	15
Habitat Score				65
Biological Assessment				
Microalgae	20	58	Fair	11.6
Macrophytes	20	60	Fair	12
Invertebrates	20	70	Fair	14
Fish	20	55	Fair	11
Birds	20	70	Fair	14
Biological Score				63
Estuarine Health Score (*average of habitat & biotic scores)*				**64**
Provisional PES				**C**

Table 7-8: Correlation between the EHI Score and the PES

EHI Score	PES	General Description
91 – 100	A	Unmodified, natural
76 – 90	B	Largely natural with few modifications
61 – 75	**C**	**Moderately modified**
41 – 60	D	Largely modified

EHI Score	PES	General Description
21 – 40	E	Highly degraded
0 – 20	F	Extremely degraded

The status of the Umhlali Estuary was recently updated as part of the Water Resources Classification Study for the Umzimkulu-Mvoti Water Management Area (DWA, 2014). The revised EHI score was estimated to be 57, translating into a lower PES of Category D, i.e. Largely Modified. This is largely ascribed to non-flow related impacts, specifically the depressed biotic health scores for all of the biotic components. Addressing poor water quality was considered to be of highest priority in order to improve the health of the system. High nutrient inputs resulted in increased plant growth, and subsequent loss of open intertidal riparian habitat, while low oxygen levels resulted in reduced invertebrate abundance and reduced nursery functionality (DWA, 2014).

7.6.3.2 National and Regional Importance of the Umhlali Estuary

Turpie *et al.* (2002) prioritised South African estuaries based on their conservation importance derived from various factors including size, type, biogeographical zone, habitat and biodiversity (plants, invertebrates, fish and birds). The updated prioritisation (Turpie & Clark, 2007) ranks the Umhlali Estuary as the 71st most important estuary out of 256 systems in South Africa. In comparison with other temporarily open/closed estuaries of the iLembe District Municipality, it is the second most important system after the Zinkwasi Estuary, particularly in terms of its biodiversity and the ecological habitat it provides.

Through a more detailed specialist workshop, the functional importance of the Umhlali Estuary was determined (under the Water Resources Classification Project, DWA, 2014) and incorporated into the above estuary importance score. The functional importance score was estimated to be 70, rendering the overall estuarine importance score as 63, inferring that the system is regionally important.

Based on the updated PES and the overall importance, the Recommended Ecological Category (i.e. the target for protection and management) for the Umhlali Estuary is Category B (i.e. a largely natural system with few modifications).

Of critical relevance is the fact that the Umhlali Estuary is one of the core estuarine systems to be protected in order to reach the national estuarine biodiversity conservation targets. Thus, suitable protection of the estuary must established and appropriate management interventions and mitigation measures applied towards reaching this improved condition. Ideally, the system should be afforded partial no-take protection, and 50% of the estuarine margin should remain undeveloped (Van Niekerk & Turpie, 2012; DWA, 2014).

7.6.3.3 Importance of estuarine habitats

The Umhlali Estuary has been moderately modified from its original natural condition, mostly by sugarcane encroachment, which has reduced the extent of available estuarine habitat through accelerated sedimentation, draining of wetlands, clearing of marginal swamp forest and construction of the weir. Nonetheless, sensitive estuarine habitats still exist (Van Niekerk & Turpie, 2012).

The bifurcated channel constitutes the greatest area of available habitat (21 ha), the health of which is essential for all life in the estuary. The calm water environment provided by an estuary provides essential nursery habitat and feeding grounds for juvenile fish and invertebrates. The estuary water body also serves to dilute, assimilate and transport pollutants and nutrients to the marine environment. The mouth sandbar itself provides protection against marine storms.

The sand/mud banks and swamp forest constitute 8 and 7 ha, respectively, however the extent of the sand/mud banks varies depending on the open/closed state of the mouth, river flow and tides during open periods. During exposure, sand/ mud banks become important feeding areas for birds.

The relative extent of reed and sedge coverage in the Umhlali is noteworthy and arguable attributed to significant sedimentation of the southern channel. The swamp forest, reed beds and riparian vegetation perform the valuable functions of wildlife refugia, flood regulation, erosion protection (bank stabilisation), water filtration, sediment retention and carbon storage, and generation of organic food sources.

Figure 7-7 depicts a conceptual habitat map, indicating the various estuarine habitats in the Umhlali Estuary that are most likely to be impacted on by the proposed coastal development. As the development will occupy the land parcel up to the N2 bridge, almost the entire Umhlali Estuary could potentially be affected.

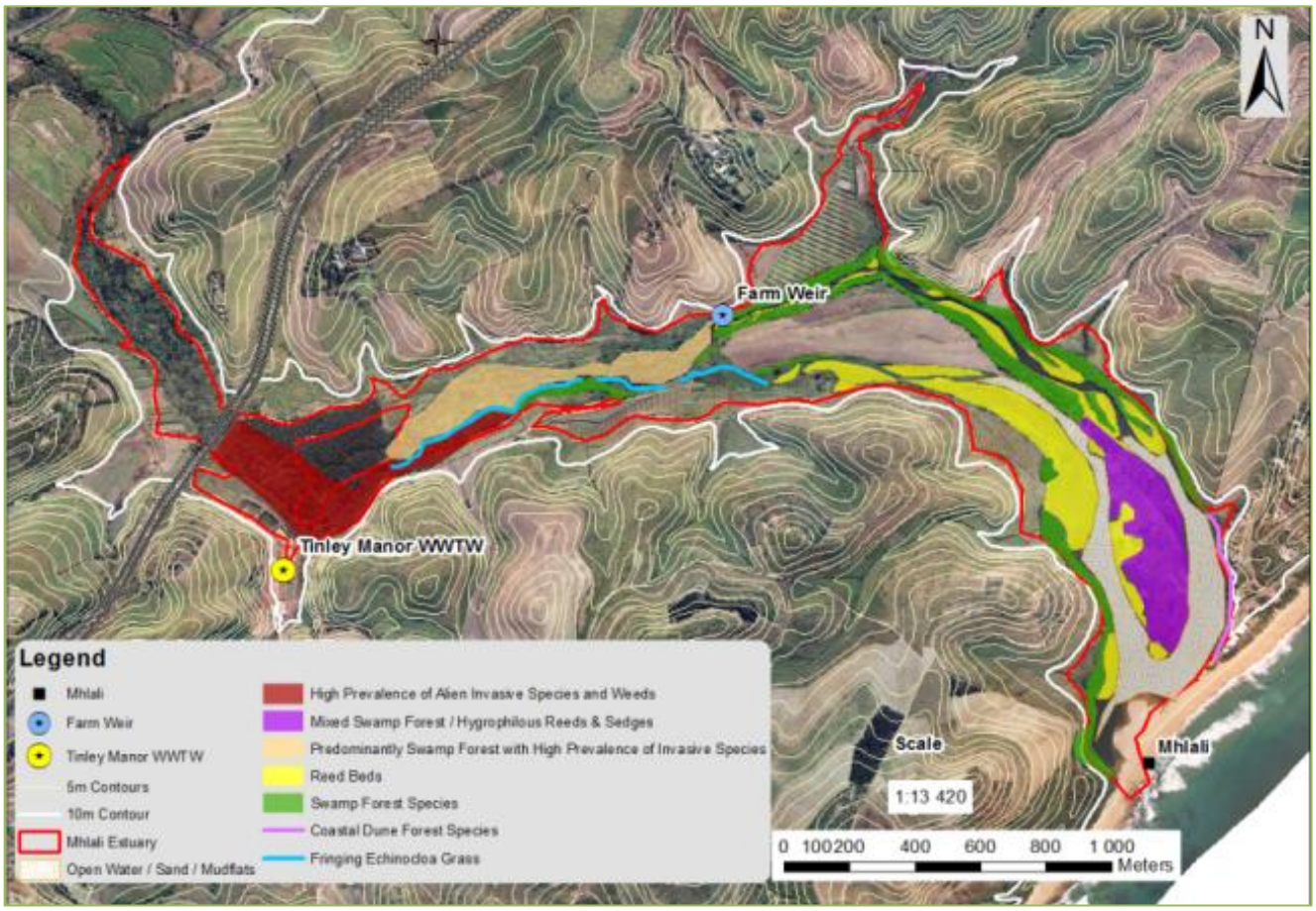

Figure 7-7: Conceptual habitat map for the Umhlali Estuary in relation to the proposed Tinley Manor Southbanks

7.6.4 Existing Impacts

Historically, the Umhlali Estuary has been subject to severe siltation, caused by poor agricultural practices (Begg, 1978). It is also suggested that the total area and volume have been reduced over time due to this accelerated sedimentation (Forbes & Demetriades, 2009).

As a sediment-rich system, sand winning has been and is still prevalent in the Umhlali River above the estuary (Demetriades, 2007). This has additional negative impacts, which influence the estuarine environment, including disturbance and downstream transportation of fine sediment, modification of the river course and flow patterns, destruction of riparian habitat and potential introduction of pollution.

Apart from the broader impacts of sugarcane cultivation, namely increased sedimentation and nutrient input, direct anthropogenic impacts on the estuary itself have been relatively limited because of its remote location and extensive plantation surroundings.

The most significant impact, in terms of estuarine function, is the presence of the weir, which was originally constructed for irrigation purposes. By preventing saline intrusion and acting as a barrier, the weir has effectively decreased available estuarine habitat and restricted natural estuarine processes and faunal movement. The existence of the weir and adjacent pumping station indicates the abstraction of water from the immediate estuarine functional zone. While there are no major dams on the Umhlali River, water abstraction from the greater catchment is highly probable given that agriculture is the dominant land use. However, abstraction does not appear to be having an adverse effect on the state of the mouth, as the system is mostly open (for approximately 55% of the year; Ezemvelo 2011) and as described by both Begg (1984) and Harrison *et al.* (2000). Nonetheless, it is arguable that the duration of mouth closure has increased (Forbes & Demetriades, 2009).

The Umhlali Estuary has history of artificial breaching which was allegedly undertaken by sugarcane farmers to prevent flooding and damage to fields (Begg, 1978), but also prolonged by locals to enable the collection of bait organisms (*C. kraussi* and *Upogebia africana*) (Begg, 1984). In the last 20 years, the number of known artificial breaching events was limited to two (Ezemvelo, 2011) but it is possible that more undocumented breaching events have taken place.

The collection of bait organisms still occurs (Forbes & Demetriades, 2009).

Urban encroachment is relatively low, apart from the towns of Tinley Manor and Shakaskraal, located on the northern bank of the Umhlali Estuary and River, at the mouth and 7 km upstream, respectively. Begg (1984) refers to the inappropriate development of the existing Tinley Manor on the "*vegetatively sensitive and highly unstable*" sand bar, followed by resultant slumping of the estuary-facing slopes.

There are two WWTW's located along the Umhlali River and Estuary, namely the Shakaskraal WWTW and the newly constructed Tinley Manor WWTW located in the estuarine functional zone adjacent to the proposed development site, approximately 8 km and 3.6 km upstream, respectively.

Only the Shakaskraal Works is currently discharging, at a rate of 0.8 Mℓ/day into the Mhlali River (DWA, 2014), while discharge from the latter will only commence once the first stages of development are complete (planned for 2015) and is estimated to add 6.75 Mℓ/day into the system (SMEC, 2014). The discharge of treated wastewater invariably contributes to the nutrient status of system, and serves as source of added freshwater input and potential faecal contamination.

In addition, Begg (1978) refers to the use of the Etete River (a tributary of the Umhlali River located 6.4 km upstream of the mouth) for bathing and laundry, resulting in an "*enormously enriched and faecally polluted*" state. It is quite possible that these conditions still exist to some degree, and cascade into the Umhlali Estuary as indicated by recent bacterial results (Forbes & Demetriades, 2009).

Human-induced threats to the Umhlali Estuary are summarised in ***Table 7-9*** below.

Table 7-9: Human induced threats to the Umhlali Estuary

Threats	Description
Habitat Loss	Construction of weir, agriculture plantation in the floodplain, draining of marginal wetlands, and firewood collection have caused significant habitat loss for the system
Eutrophication	Relatively low provided mouth status is maintained
Freshwater diversions	Unknown levels of abstraction for irrigation purposes, and added treated wastewater input from WWTW. Additional input anticipated from Tinley Manor WWTW.
Sewage	Daily discharge of treated water from WWTW, contaminated run-off from settlements
Chemical contamination	Run-off containing agricultural pesticides is likely entering the system
Litter/debris	Contaminated run-off from settlements
Introduced species	High densities of the invasive snail, *Tarebia granifera.* Potential to influence benthic communities but impact is yet unknown
Sea level rise	Estuarine setback proposed at the 10 m amsl[15] as a result of sea level rise (Mather & Swart, 2010)
Overexploitation	Bait collection and fishing effort is low

7.6.5 Expected Impacts

The expected impacts of the Tinley Manor Southbanks on the Umhlali Estuary is detailed in ***Table 7-10***.

Table 7-10: Estuarine impacts and recommendations

Impact	Recommendation
Erosion The construction of the residential units, resorts, facilities and associated infrastructure will necessitate	On-site erosion as a result of land clearing and construction activities must be prevented as much as possible. The developer must follow

[15] *Mather & Swart (2010) delineated the estuarine boundary at the 6 m amsl contour, with an environmental buffer to the 10 m amsl contour*

Impact	Recommendation
the clearing of land and major earth-works. This will lead to soil exposure with the potential for erosion and consequent loss of topsoil. While agricultural practises have already depleted this soil component, healthier soils will still exist in the remaining pockets of indigenous vegetation. Eroded material may be transported from the site via surface water run-off into the estuary. Topsoil contains nutrients essential for plant growth but is problematic for estuaries and other aquatic habitats, as nutrient enrichment will lead to eutrophication and subsequent oxygen depletion. The potential for erosion is high, given that the prospective land is currently used for farming, the steepness of the landscape adjacent to the estuary and the sparseness of well-established vegetation communities (e.g. forests, grasslands, wetlands) to stabilise the soil.	best-practise construction methods to reduce erosion, particularly in steep areas and close to the estuary. This potential impact can be easily and significantly reduced if the following mitigation measures presented in ***Section 9.3.5*** and the EMPr (***Appendix B***) are complied with. • No development should be constructed below the 1:100 year floodline or the recommended 10 m amsl contour (whichever is intercepted first from the point of development), as these areas are susceptible to erosion during storm events, flooding, and natural back flooding of the estuary. This may result in damage/loss of property and negatively impact on estuarine functioning (detailed below). To further reduce run-off velocities and the chances of erosion, wetlands and riparian habitats may be reconstructed / reinstated / rehabilitated where appropriate as directed by a wetland expert. Suitable flow attenuation must be implemented, prior to directed flow entering such wetlands and the estuary, to prevent scouring and exacerbated erosion.
Sedimentation Sedimentation (caused predominantly by agriculture) is one of the leading causes of the poor condition of many KwaZulu-Natal estuaries. The severely silted nature of the Umhlali Estuary has been largely attributed to sugarcane farming and poor agricultural practises, as well as numerous sand mining operations located above the estuary. The increased erosion of soil and subsequent deposition within the estuary can have severe negative impacts on the estuarine environment, including: • exacerbation of the already shallow nature of the system (particularly the southern channel) leading to reduced aquatic habitat, and reed and terrestrial vegetation encroachment; • increased turbidity which reduces light penetration thereby impairing photosynthesis and primary productivity; • reduced oxygen concentration in the water column and benthic habitat; • smothering of benthic invertebrates and aquatic plants resulting in reduced food resources; and • modification of current sediment characteristics, thereby altering the distribution and composition of benthic invertebrate communities and aquatic plants. Overall, the impact of sedimentation on aquatic habitats associated with the estuary will be highly significant with long-term, and often irreversible repercussions. This impact is rated at a local to regional scale, as excessive sedimentation will affect the natural functioning of the estuary, all biota (both plants and animals), and the provision of certain ecosystem services, which would decrease the overall condition and importance of the system for conserving estuarine biodiversity. Heavily silted and muddy	• Sedimentation is directly related to increased erosion, thus the above-mentioned mitigation measures will reduce the probability of this impact. • In addition, maximum vegetation cover should be maintained outside of construction areas, particularly in the drainage lines / riparian areas, as these will serve as sediment traps. This will require additional planting, landscaping and rehabilitation of such as areas where indigenous vegetation has been replaced by sugarcane. • Similarly, no indigenous vegetation along the estuary margin must be removed. This will serve to maintain the natural ecological functioning of the riparian and estuarine areas as well as function as an ecological corridor between terrestrial and aquatic environments.

Impact	Recommendation
conditions reduce the aesthetic value of an estuary.	
Buffers and Conservation Areas The eco-centric design concept of the coastal development proposes to *inter alia*, conserve and enhance the remaining natural elements of the surrounding landscape, as well as rehabilitate (and recreate) the degraded wetland areas that have been damaged by the sugarcane plantations. This will increase the amount of available habitat, thereby enhancing the biodiversity of the area. Furthermore, the preservation of natural areas and corridors allows for the migration of species and interconnection between terrestrial, estuarine and freshwater ecosystems. The reinstatement of these habitats will also assist with erosion protection, and reducing sedimentation and contamination of the estuary. Essentially, the overall ecological state and functioning of the Umhlali Estuary may potentially be improved and this has regional significance.	✓ The buffer / conservation area should include the entire Umhlali Estuary (i.e. below the 5 m amsl contour), as well as the remaining area below the 10 m amsl contour which constitutes a horizontal buffer distance of between 16 m (in severe case) and 257 m depending on topographical constraints. ✓ The reinstatement and rehabilitation of natural areas must be undertaken according to expert recommendations, using local / indigenous species. ✓ Consideration should be given to extending the rehabilitation programme to upstream riparian areas and tributaries, and other 'green' areas of the Tongaat Hulett Holdings (i.e. northern bank). ✓ The design of the development perimeter fencing should consider the movement of animals (e.g. antelope) between the estuary and the conservation areas.
Disturbance of Functional Areas and Supporting Habitats The establishment of green spaces / conservation areas in the current design offers residents and visitors the opportunity to engage with the environment, particularly with the estuarine environment. The potential thus exists for low impact structures, such as wooden boardwalks and bird hides, to be constructed along the edge of the estuary, on the central island, and across other supporting habitats, such as wetlands and streams / drainage lines. These structures will enable controlled access to the estuary margin, reduce trampling of important habitats, and would serve as a means to educate users about the estuarine ecosystem. If approved, they must ensure strictly controlled / directed access to these sensitive environments. This will have a positive impact, however the construction process will still impact negatively on the natural vegetation through trampling, potential small scale vegetation removal and potential contamination. The EIA regulations maintain that estuaries are 'sensitive areas' and environmental authorisation must be obtained before development within the estuarine boundary (i.e. below the natural 5 m amsl contour) may proceed. Any development below the 5 m contour will have a significant long-term negative impact on the estuary and riparian / wetland areas. By limiting development to outside the estuarine boundary, damage to the estuarine biota is reduced, and the natural functioning and processes of an estuary are preserved. The current layout of the proposed development respects the estuarine boundary, apart from potential boardwalks. It is anticipated that wooden boardwalks constructed within the estuarine area will be damaged during periodic floods, but due to their low impact on the environment, low costs of construction and maintenance/repair and the infrequency of floods, this is considered acceptable, in comparison to major	✓ The Umhlali estuarine boundary plus an environmental buffer up to the 10 m amsl contour should be used to determine the boundary of the development footprint, and not the current extent of the sugarcane plantations. All buildings and infrastructure, such as sewer pipelines and roadways of the proposed development, must be setback from the 5 m contour as an absolute minimum. ✓ Artificial environments such as lawns and sports grounds should also be restricted by the estuary boundary. Any clearing of vegetation within this area for improved vistas should not take place, and should require approval if considered necessary. ✓ Areas that were previously planted with sugarcane within the estuarine functional zone should be rehabilitated to reflect the natural supporting habitats of the estuary (e.g. swamp forest, reed beds, wetlands, riverine habitats). ✓ The infilling of wetlands and estuarine habitat, and any other methods to reduce such environments, cannot be supported. ✓ Although the boardwalks may be constructed within the estuarine boundary, the design must ensure the unobstructed / unimpeded flow of water, the least disturbance to sensitive habitats, the shortest span, and that the least harmful materials and methods are used, to ensure minimal impact on the aquatic environment. ✓ The construction of solid concrete jetties and slipways, and other hard edges, on the estuary must not be allowed. ✓ In addition, the number of access points and wooden structures (boardwalks, jetties, bird hides) should be kept to a minimum. ✓ Recommendations for estuaries where boardwalks and bird hides are to be constructed are provided in ***Section 9.3.5***. ✓ The developer must follow acceptable and sustainable construction, maintenance and

Impact	Recommendation
development. A new access road and river crossing is proposed in the long-term to provide a link to the northern bank of the Umhlali Estuary. An assessment of the potential impacts associated with this development is beyond the scope of this report, but will need to be undertaken in detail prior to obtaining specific environmental authorisation at a detailed design stage. Nonetheless, it is safe to say, that the construction of a bridge will have significant short to long-term effects on the Umhlali Estuary.	operational practices to prevent unnecessary disturbance to the estuarine area and to ensure its sustainable use. • If the boardwalks and bird hides are damaged during a storm or flood event, damage needs to be assessed and appropriate measures taken to remove all debris from the estuary and re-construct the damaged boardwalk, if deemed viable and appropriate.
Solid Waste Contamination Solid waste will be generated by construction (and operational) activities and may include concrete rubble and bricks, material off-cuts and surplus. If not properly managed and contained, these items may find their way into drainage lines, wetlands, and the estuarine environment where they will not only pollute, but also impede flow and the ecological functioning of these habitats. Unwanted vegetation off-cuts, including large tree stumps, will also pose a threat to such habitats through physical damage, if not handled correctly, or through decomposition, which will result in nutrient enrichment. Materials deposited in the estuary and riparian areas may lead to the accumulation of sediment and debris, and cause consequent blockage and back flooding.	• A minimum number of site construction camps should be established. All site camps and storage areas for any development must be sited outside of the estuarine boundary and away from drainage lines and steep slopes. • Most importantly, construction and associated activities must be undertaken according to a site-specific approved EMPr and must be monitored daily by an on-site environmental officer. • All solid waste must be removed as soon as possible from each construction point and the broader development site to an appropriate disposal facility. • Every effort must be made to prevent construction waste entering the estuary and supporting habitats. • Dumping of vegetation off-cuts in aquatic habitats is not recommended. • Regular visual surveys of the estuary must be undertaken and any accumulated waste removed and disposed of at an appropriate disposal facility.
Liquid Waste Contamination Liquid pollution may result from accidental spillage of fuels, oils, cement–laden water, curing compounds, sealants, paints and other chemicals. This will be transported as contaminated run-off into the estuary or occur via seepage, which pollutes the soil and groundwater. Once in the estuary, contaminants will be transported downstream and out to sea if the mouth is open. However, accumulation to lethal concentrations, in both the water column and in the sediment, may occur during closed mouth conditions.	• A minimum number of site construction camps should be established. All site camps and storage areas for any development must be sited outside of the estuarine boundary and away from drainage lines and steep slopes. • Most importantly, construction and associated activities must be undertaken according to an approved site-specific EMPr and must be monitored daily by an on-site environmental officer. • Other mitigation measures are presented in ***Section 9.3.5*** and the EMPr (***Appendix B***).
Water Quality The Tinley Manor WWTW was constructed, as approved through a formal EIA process, to service future development in the surrounding area, including the proposed Southbanks development. While there are no water quality guidelines or standards for estuaries, treated wastewater will definitely add to the current nutrient status of the Umhlali Estuary. The water quality of the system is already impaired due to nutrient and faecal inputs from existing WWTW, surrounding farmlands, contaminated run-off from rural settlements, and seepage from possible septic tanks located in the floodplain. This is somewhat ameliorated by estuarine habitats, and associated wetlands and riparian habitats, which perform free ecosystems services, such as filtration ('polishing')	• At a minimum, the discharge standards set for the WWTW as a condition of the Environmental Authorisation must be adhered to, as well as all mitigation and contingency measure identified as part of the EIA process for the WWTW. However, past case studies on estuaries, which receive wastewater discharge that is compliant with the prescribed standards, have illustrated that nutrient loading is still prevalent and detrimental to the estuarine environment. Thus special water quality standards should be determined and implemented for the discharge of treated wastewater to the system. • Mechanical and or biochemical processes to remove nutrients to the said standards need to be investigated, for example, the addition of alum for

Impact	Recommendation
and entrapment of sediment and contaminants. However, recent assessments have indicated that poor water quality remains a significant threat to the health of the Umhlali Estuary. Unless properly managed and well maintained, the sewer reticulation system could deteriorate over time, which could have very severe negative impacts on the Umhlali Estuary, such as contamination of soils, ground and surface waters in the event of a leak, pump station overflow or failure. In addition, inadequate ablution facilities for construction workers during the construction phase will also contribute to faecal and nutrient contamination of the surrounding environment. The development initially proposed to include market gardening practises. These farming areas, if implemented, may potentially be located in close proximity to the estuarine buffer. In general, farming activities serve as sources of nutrients (particularly nitrates and phosphates), which may result in nutrient loading of various aquatic habitats and the estuary, and potential development of a eutrophic state and ultimately contribute to poor water quality. Despite the generally open mouth conditions which enables the continuous removal of most contaminants, increased inputs of treated wastewater, potential sewer problems and potential run-off from market gardening, will have devastating effects on the estuary, particularly during periods of low base flow and closed mouth conditions (e.g. oxygen depletion resulting in fish kills), progressing as a steady decline in ecological condition. This potential impact is rated at a regional scale, as sewage and nutrient input will affect all biota (both plants and animals), estuarine health and functioning, and the provision of ecosystems, which would decrease the overall importance of the system for conserving estuarine biodiversity.	the precipitation and removal of phosphates, or the processes of bio-electrochemical denitrification or electrocoagulation, the latter produces less sludge and is cost-effective for removal both nitrates and phosphates. • Furthermore, it is imperative that the sewer reticulation system and WWTW are properly managed and well maintained to prevent environmental contamination and the associated risks to human health. Regular maintenance and inspections, and on-going water quality monitoring of the estuary and selected sites within the development complex, are required. • Apart from the existing WWTW, the entire sewer network must be located outside of the estuarine boundary. • The stormwater system must be kept separate from the sewer system. • Should market gardening be implemented, all designated farming areas must follow environmental best practice (such as, no insecticides, pesticides or herbicides) and eutrophication (i.e. high nutrient loads) of all watercourse and water bodies, including the estuary the estuary, due to run-off from market gardens must be prevented. • The estuarine vegetation (reed beds, swamp forest), as well as existing wetland and riparian habitats, must be retained and allowed to function naturally, enabling it to continue to perform important ecosystem services. • It is further recommended that degraded habitats be rehabilitated and additional wetlands be reconstructed where appropriate, and as directed by a wetland expert to assist with purification of run-off. • The design of additional wetlands must ensure sustained baseflow to natural drainage lines and the estuary.
Water Quantity Reduced freshwater inflow (mostly through abstraction) is another major threat facing South African estuaries, including the Umhlali Estuary. The system currently receives approximately 0.8 Mℓ of treated wastewater per day from the Shakaskraal WWTW which will be increased to approximately 7.55 Mℓ/day with the commissioning of the Tinley Manor WWTW. When operating at full capacity, approximately 20Mℓ/d will be added to the estuary in total. The discharge of treated wastewater from the Tinley Manor WWTW may be thought of as a means to augmenting the depressed mean annual run-off or off-set freshwater abstraction, which would have a positive effect on estuarine health and function. However, due to the concomitant increase in nutrients related to the discharge, the overall impact will be highly negative. Water quality impacts aside, increased volumes of freshwater input will affect mouth dynamics and functioning of the system.	• Given that the Ecological Flow Requirement is the estuary 'ideal', and that this estuarine impact assessment is being conducted in light of obtaining Environmental Authorisation for a development project, the following mitigation measures are recommended in circumstances where the 'ideal' is unattainable. • No untreated effluent or wastewater discharge should be permitted to enter the Umhlali Estuary under any circumstances. • Every effort must be made to reduce the level of nutrients introduced to the Umhlali Estuary through treated wastewater and special water quality standards must be set for the discharge of treated wastewater to the system. • Maximum discharge from the WWTWs is not recommended and should be capped at a level to prevent exceedance of the natural flow volume for the estuary (MAR 56.31 x106^3). • Any abstraction from the estuary functional zone should be discontinued. • It is likely that artificial breaching will be

Impact	Recommendation
The open or closed state of the estuary mouth is regulated by both marine and fluvial processes. For temporarily open/closed systems (such as the Umhlali Estuary), which fluctuate between these two states, the closed state is a time of nutrient accumulation and assimilation, heightened productivity and when estuary nursery function is highly effective. However, elevated flow volumes and flow velocities will alter sediment erosion / deposition patterns, sediment habitat properties (e.g. removal of muddy material), water column characteristics (e.g. salinity stratification) and will generally lead to increased frequency and duration of mouth openings through erosion of the sand bar, and ultimately reduction of the productive growth period. Overall, changes in the estuary mouth dynamics will affect changes to the abiotic and biotic ecosystem components and estuarine functioning relative to the temporarily open/closed template. However, reduced freshwater input generally results in prolonged mouth closure, during which time prolific algal growth may occur, followed by low oxygen conditions may develop, and when contaminants can accumulate to toxic levels. The Reserve Determination Study for the Umhlali Estuary (Water Resources Classification Study; DWA, 2014) established that the optimum flow conditions to achieve the Recommended Ecological Category, is the natural flow conditions, i.e. without abstractions or WWTW inputs and without the current system impacts. The volume of water provided by both WWTWs will assist in restoring freshwater input to the system, and this may be considered a positive impact on the premise of no added nutrients. However, the estuary is predicted to deteriorate significantly when the WWTWs are operating at full capacity and maximum discharge, particularly due to the high nutrient load and water quality impacts. This potential impact is rated at a regional scale, as increased water input via treated effluent will affect estuarine functioning, ecological processes, all biota (both plants and animals), and the provision of ecosystems, which would decrease the overall importance of the system for conserving estuarine biodiversity.	considered when flow volumes are not sufficient to open the mouth and water quality within the system declines to concerning levels. Artificial breaching is strongly not recommended, and that at this early development stage, that the quality of the wastewater be improved prior to considerations of artificial breaching. Notwithstanding the above, the development of a Breaching Protocol is recommended to facilitate appropriate breaching methodology.
Stormwater Run-off and Contamination Open soil will be replaced by hardened surfaces through the construction process, which will result in increased surface run-off with high erosion potential. An effective stormwater management system will be required. However, the 'first flush' emanating from run-off directed through a stormwater system carries many contaminants, particularly oils, fuels and heavy metals from roads, vehicle parking areas and general traffic, as well as litter and debris, and potential nutrients from the market gardening practises, in the case of the Tinely Manor Southbanks. If this is allowed to be discharged directly into the estuary, without prior treatment or screening, nutrients, toxic substances and solid waste will contaminate the estuary, which in turn will have significant long-term impacts for the biota of the	✭ Stormwater design needs to ensure that stormwater run-off from the new hardened surfaces is clean and that flows are attenuated prior to reaching the estuary. ✭ Creative means of 'scrubbing' and removing litter and debris from the run-off must implemented. ✭ The developer proposes to enhance the vegetation along several drainage lines and restore certain wetland areas to capitalise on the natural ecosystem services of filtration ('polishing' of contaminants) and flood control (slowing flow velocities and promoting percolation) prior to entering the estuary. Direct stormwater discharge into the Umhlali Estuary is strongly discouraged, and any potential influences on the natural functioning of the estuary mouth must be prevented.

Impact	Recommendation
system. Furthermore, without flow attenuation, the 'first flush' or 'pulse' of stormwater input has the potential to alter river flow, erosion and deposition patterns, and ultimately river channel morphology, as well as the state of the estuary mouth and nutrient status of the system.	
Chemical Contamination The draft design concept indicates the conservation of natural areas along the estuary margin and drainage lines, as well as the reinstatement of wetland habitats. These areas will be interspersed with a "*flexible open space system*" which may comprise active recreation areas (sports grounds), passive recreation areas (seating areas, viewing points) and possibly market gardening, where conditions are suitable. In such instances, fertilizers and insecticides are likely to be applied, as well as in landscaping and resort gardens. Certain chemicals (e.g. some organophosphates like Chlorpyrifos and Diazinon), are known to adversely affect aquatic biota, particularly fish. Pesticides are largely indiscriminate, resulting in the die-off of numerous organisms. These would likely enter watercourses through surface run-off. The use of such chemicals to manage and maintain the vegetation, including lawns, is thus strongly discouraged. Local vegetation and grass species should rather be planted as part of the landscaping scheme, as these are adapted to local conditions and would not require chemical maintenance.	• Pesticides should not be applied to the grounds of the proposed development. • If the use of chemicals is deemed necessary, a trained aquatic scientist and horticulturalist should be consulted in order to determine what chemicals can be used, in what quantities and during which seasons. • The use of fertilisers in proposed market gardens should be kept to a minimum, as contaminated run-off will contribute to nutrient enrichment and potential eutrophication if it reaches the estuary.
Increased Pressure on the Estuary Previously, the limited access to the extensive sugarcane plantations enclosing the estuary (apart from a portion at Tinley Manor at the mouth) restricted the recreational use of the Umhlali Estuary, including fishing and bait harvesting. The recorded history of bait harvesting in the system is noted. By increasing the residential capacity of the area and marketing the proposed development as a holiday destination, accessibility of the estuary as a recreational resource will be greatly improved. This is likely to result in increased fishing and bait collection in the system and in the beach zone, as well as increased disturbance to sensitive habitats (e.g. sand/mud flats, marginal swamp forest, buffer zones and corridor). The diversity and abundance of commonly occurring fish species appear to have decreased. Increased fishing pressure may significantly reduce fish populations through the removal of adults as well as young individuals that have not yet reached reproductive maturity. Increased bait harvesting will not only reduce the populations of sand and mudprawns, but will also result in trampling of important estuarine habitat and disturbance to wading birds, which also utilise these areas. Such activities, and increased human presence and vehicular traffic in general, will contribute to elevated	• It is vitally important that an Estuary Management Plan be developed for the Umhlali Estuary by the Municipality to regulate the use of resources and activities within the system, to minimise user conflict and to ensure sustained estuarine health. While this is a legislative requirement in terms of the NEM:ICMA, it is not the responsibility of the developer. • In the interim, best practice estuarine management principles should be adopted and communicated to all residents and visitors. • The sensitivity of the estuarine ecosystem, its supporting habitats and associated biota, fishing and bait collecting regulations, and susceptibility of the estuary to overexploitation must be communicated. This could possibly be achieved through (a) the establishment of an information / visitors centre, (b) the distribution of informative brochures and posters, and (c) placement of educational signboards throughout the development complex. • Regulations with respect to harvesting of natural resources (fish and bait) must be enforced. • Access to designated fishing and bait collection points must be formalised (e.g. via elevated boardwalks) to prevent the impacts of trampling and habitat disturbance. • Although the Umhlali Estuary is naturally shallow, the use of motorized boats during the deeper closed mouth phase should not be permitted, and

Impact	Recommendation
disturbance for the estuarine system, and will in turn adversely impact fish, birds and other animals' distributions. These potential impacts are rated at a local to regional scale as decimation of fish communities and damage to estuarine habitat would decrease the biodiversity, functioning and overall conservation importance of the system.	other low impact recreational activities, such as canoeing, are preferred. • The construction of solid concrete jetties and slipways on the estuary must not be allowed as these reduce estuarine habitat, impede and alter water flow. • The number of access points and wooden structures (boardwalks, jetties, bird hides) should be kept to a minimum and avoid highly sensitive environments. • Any alien invasive vegetation and weeds that are introduced and become established as a result of habitat disturbance must be removed.

7.6.6 Summary of Key Findings and Recommendations

Given the national conservation importance of the Umhlali Estuary, a strong opportunity exists to reverse, to some degree, the past maltreatments of the surrounding landscape (sugarcane plantations, salt weir, etc.) and the current impacts on the system. This would contribute to the improved ecological state of the Umhlali Estuary.

Furthermore, the design concept of the proposed development, as it currently stands, accommodates the preservation of the estuary and its supporting habitats. This essentially denotes the first step to achieving some form of conservancy status, with the greater goal of achieving formal protected area status in future.

In light of the above, the proposed development may in-fact be beneficial for the ecological functioning and conservation status of the Umhlali Estuary, conditional upon the implementation of the mitigation measures and the following recommendations to minimise potential impacts on the estuary, should the development be approved:

- Establish estuarine and riparian buffers;
- Sustaining water quality;
- Maintaining water quantity and flow;
- Sustainable stormwater management;
- Implementing monitoring programmes; and
- Implementing management plans.

7.7 Coastal Assessment

Whilst the area under assessment is currently undeveloped, historical land use and practices have resulted in a number of negative environmental impacts and almost complete land transformation. The Coastal Impact Assessment section must be viewed against the backdrop of these pre-existing impacts as described in ***Table 7-11***.

Table 7-11: Human-induced threats to the proposed development area

Threats	Description
Habitat loss	Extensive commercial sugarcane plantations with only fragmented natural habitat remnants.
Sense of place	Natural coastal grassland and forest largely replaced by commercial sugarcane.
Loss of wetlands	Wetlands particularly affected through agricultural practices ('herringbone' drains).
Eutrophication and chemical contamination	Increased nutrient loading to terrestrial and aquatic resources from agricultural activities has long-term negative impacts.
Introduced species	Disturbance of natural areas via sugarcane agriculture increases the probability of the occurrence of invasive alien species.
Coastal access	Limited incursions onto sensitive beach and estuary environment for pedestrian access.

This Coastal Impact Assessment considers potential impacts that could affect the study site because of the proposed development. It is noted that the assessment is applicable to the development component that is specifically coastal in nature, i.e. the eastern boundary that borders the Indian Ocean and the area immediately inland of the vegetated dune cordon.

It is noted that the Coastal Impact Assessment has been amended on numerous occasions and now reflects the negotiated layout plan, which has taken cognisance of potential negative impacts identified.

The identified impact, proposed mitigation and implementation in terms of the Concept Plan presented in ***Section 5*** are detailed in ***Table 7-12***.

Table 7-12: Coastal impacts, mitigation and implementation

Impact	Description	Mitigation	Implementation
Climate Change Vulnerability	The coastal location of the proposed development means that it is inherently exposed to risks associated with natural and dynamic coastal processes. This is exacerbated by the study area's proximity to the Umhlali Estuary which adds the additional risk factor of terrestrial flooding. These factors have far-reaching and significant impacts for the sustainability of any development proposed in the coastal area, and were taken into account both during the feasibility assessment and at the earliest stages of the development planning concept by means of the delineation of a hazard line and limited development line. This approach was aligned with national and provincial thinking at the time in respect to the application of the proposed coastal setback line or coastal management line methodology and best-practice risk aversion within the coastal zone in a South African context. An additional known risk factor within the KwaZulu-Natal coastal zone taken into consideration is the potential for geologically unstable areas to 'slip' or fail due to, *inter alia*, an advancing high-water mark because of coastal erosion. This has the potential to further negatively impact the sustainability of developments proposed in the coastal zone.	Adherence to the limited development line (i.e. setting back any proposed development from the coast) and the maintenance (and potentially rehabilitation / re-establishment) of natural coastal vegetation should prove adequate mitigation against the impacts of dynamic coastal processes and vulnerability to climate change. It is noted that the sea level rise modelling exercise that informed the delineation of the hazard line and limited development line included the identification of areas with unstable geology that are prone to slippage / failure.	Mitigation measures proposed by the specialists have been taken into consideration and the layout plan adjusted to setback from identified coastal risk.
Pollution	Solid waste will be generated by day-to-day construction as well as operational activities and may include, but will possibly not be limited to, concrete rubble and bricks, material off-cuts and other surplus construction and other materials. If not properly managed and contained, these items may find their way into drainage lines, wetlands, and other remaining natural areas and eventually into the coastal zone where they will not only pollute, but also impede flow and the	The establishment of site construction camps should be kept to a minimum. All site camps and storage areas for any development must be sited away from drainage lines, wetlands, steep slopes and other environmentally sensitive areas. Most importantly, construction and associated activities must be undertaken according to a site-specific EMPr and must be monitored daily by an on-site environmental officer. All solid waste must be removed as soon as possible	Waterborne sanitation is proposed to be implemented.

Impact	Description	Mitigation	Implementation
	ecological functioning of these habitats. Unwanted vegetation off-cuts, including large tree stumps, will also pose a threat to such habitats through physical damage, if not handled correctly, or through decomposition, which has the potential to result in nutrient enrichment. Similarly to contamination by means of solid waste, liquid pollution may result from accidental spillage of fuels, oils, cement–laden water, curing compounds, sealants, paints and other chemicals. These materials are all associated with day-to-day construction activities and are common throughout construction sites. This pollution can be transported as contaminated run-off into the soil and groundwater systems. In terms of sanitation infrastructure, practices in coastal areas, such as the installation of septic tanks and the illegal connection of sewage disposal and stormwater systems, can have severe negative pollution impacts. Furthermore, the proposed design concept incorporates a "*flexible open space system*" which may comprise active recreation areas (sports grounds), passive recreation areas (seating areas, viewing points) and possibly market gardening, where conditions are suitable. In such instances, fertilisers and insecticides are likely to be applied, which is also applicable to landscaping and general maintenance of resort and residential gardens that are sure to be implemented. Certain chemicals (e.g. some organophosphates like Chlorpyrifos and Diazinon), are known to adversely affect aquatic biota, particularly fish. Pesticides are largely indiscriminate, resulting in the die-off of numerous organisms. These would likely enter watercourses through surface run-off. The use of such chemicals to manage and maintain the vegetation, including lawns, is thus strongly discouraged.	from each construction point and the broader development site to an appropriate disposal facility. Dumping of vegetation off-cuts in aquatic habitats is not recommended. Regular monitoring of the periphery of construction camps must be undertaken and any accumulated waste removed and disposed of at an appropriate disposal facility. A method statement in respect to the use, handling, storage and disposal of all chemical and contaminated waste must be compiled and submitted as part of any EMPr. All chemicals must be stored in specifically demarcated and secured areas, which are suitably lined to avoid any contamination. An Emergency Response Plan for accidental spillages of chemical substances must also be developed. Every effort must be made to prevent the discharge of any pollutants, such as fuels, cements, concrete, lime, and chemicals into any aquatic or coastal habitats. Regular water quality monitoring of all watercourses and wetlands must be undertaken for the early detection of harmful substances. In the event of a spill from any construction contractor, resident or hotel operator, a penalty should be issued and the 'polluter pays' principle should be applied for clean-up operations and rehabilitation, if necessary. Waterborne sanitation infrastructure must be prioritised over discrete infrastructure such as septic tanks, soak pits and French drains. Under no circumstances must stormwater and sanitation infrastructure be linked such that sewage and stormwater are mixed. Pesticides should not be applied to the grounds of the proposed development. If the use of chemicals is deemed necessary, a trained aquatic scientist and horticulturalist should be consulted in order to determine what chemicals may be used, in what quantities and during which seasons. The use of fertilizers in proposed market gardens should be kept to a minimum, as contaminated run-off	

Impact	Description	Mitigation	Implementation
	Endemic vegetation and grass species should be planted as part of the landscaping scheme, as these are adapted to local conditions and would not require chemical maintenance.	will contribute to nutrient enrichment and potential eutrophication if it reaches the estuary. These mitigation measures are not limited to the construction phase, and must be incorporated into an operational phase EMPr where applicable.	
Stormwater Run-off and Contamination	Construction activities associated with mixed-use, residential and resort development, as proposed, generally result in the replacement of vegetated areas or bare ground with impervious or hardened surfaces. This has the effect of preventing natural groundcover from being able to absorb run-off from rainfall and other precipitation, i.e. increased surface run-off with a correspondingly high potential for soil erosion. A robust stormwater management system has the potential to mitigate this impact, but the 'first flush' emanating from run-off directed through a stormwater system carries many contaminants, particularly oils, fuels and heavy metals from roads, vehicle parking areas and general traffic, as well as litter and debris. This has potentially serious consequences for aquatic and terrestrial systems such as wetlands, streams, estuaries and the remaining naturally vegetated coastal areas. Specifically, toxic substances and solid waste can contaminate these areas. Furthermore, without flow attenuation, the 'first flush' or 'pulse' of stormwater input has the potential to alter river flow, erosion and deposition patterns, and ultimately river channel morphology.	Stormwater design needs to ensure that stormwater run-off from the new hardened surfaces is clean and that flows are attenuated prior to reaching the estuary and coastal environment. Creative means of 'scrubbing' and removing litter and debris from the run-off must be implemented. Direct stormwater discharge into the Umhlali Estuary is strongly discouraged, and any potential influences on the natural functioning of the estuary mouth must be prevented.	The developer proposes to re-establish natural vegetation along drainage lines and restore wetland areas. While these systems are not been used to capitalise on the natural ecosystem services of filtration ('polishing' of contaminants) and flood control (slowing flow velocities and promoting percolation) prior to entering the estuary, it is noted that dry flood attenuation ponds have been included linked to the block plan. Sustainable urban drainage principles have been applied in the stormwater management plan.
Soil Erosion	The earth-works and clearing of land associated with construction activity and development in general leads to soil exposure with the potential for erosion and consequent loss of valuable topsoil. While agricultural activity is known to have already depleted the soil component within much of the study area, healthier soils will still exist in the remaining pockets of indigenous vegetation.	Best-practice construction methods must be implemented to reduce erosion, particularly in steep areas. This potential impact is easily and significantly reduced if the following mitigation measures are implemented: • The development layout must take the natural drainage patterns of the site into account, such that buildings and other infrastructure do not concentrate flowing water (especially during high	Sustainable urban drainage principles have been applied in the stormwater management plan. Other issues have been fully incorporated into the landscape guidelines.

Impact	Description	Mitigation	Implementation
	There is potential for eroded material to be transported from the site via surface water run-off into riparian, wetland and coastal areas that has the potential to result in eutrophication and oxygen depletion due to the nutrient-rich nature of this run-off from agricultural activities, as well as the siltation of the estuary. T he potential for erosion is high, given that the land adjacent to the coastal area of the proposed development is currently used for agriculture, in conjunction with its steep topographical nature.	rainfall events); • Changes to the natural topography must be minimised, and the shape of mature dunes and other natural features must be retained at all costs; • Wind-screening and sustainable stormwater control should be implemented to prevent soil loss from the site and reduce the formation of erosion channels (e.g. a network of co-ordinated shallow drains should be constructed during the land clearing phase); • Filter strips (grass buffer strips) must be implemented wherever possible but as a minimum around the perimeter of the each development cluster as soon as construction is initiated; • Sustainable urban drainage methods, such as porous paving techniques and grass swales, must be incorporated into the design concept to assist in flow attenuation; • The removal of vegetation must only be undertaken as it becomes necessary for work to proceed and unnecessary removal of indigenous vegetation (especially in steep areas) should be avoided; • The time that stripped areas are left open to exposure should be minimised wherever possible. Care should be taken to ensure that lead times are not excessive; • Wind screening and stormwater control should be undertaken to prevent soil loss from the site during construction; • Topsoil must be conserved and re-used for rehabilitation purposes; • Procedures that are in place to conserve topsoil during the construction phase of the project are to be applied at the set up phase i.e. topsoil is to be conserved while providing access to the site and setting up the camp; • The removal of vegetation should only occur just prior to construction; • Cleared areas should not be left exposed, and	

Impact	Description	Mitigation	Implementation
		should be promptly rehabilitated/vegetated with indigenous plants; • A stormwater management system adjacent to all arterial / rural roads needs to be implemented to reduce run-off and subsequent erosion; • Landscaping and re-vegetation should take place perpendicular to the slope to reduce flow velocities and minimise erosion; and • Post construction, all areas disturbed by construction, including the site camp area, must be rehabilitated. Run-off velocities can be further reduced through reconstruction / reinstatement / rehabilitation of wetland and riparian habitats as directed by a wetland expert. Suitable flow attenuation must be implemented prior to directed flow entering such wetlands to prevent scouring and exacerbated erosion.	
Coastal Vegetation and Natural Habitats	The proactive identification of coastal risk (sea level rise hazard line, proposed limited development line as well as potential slippage areas), incorporation of above mentioned buffers and the proposed location of development only landward of these lines / areas contributes to the contributes to the mitigation of the potential negative impacts associated with unsustainably located development in the coastal zone associated with this proposed development. This is most visible in the proposed preservation (expansion and rehabilitation) of natural areas which allows for *inter alia* the migration of species and interconnection between terrestrial, freshwater and coastal ecosystems.	Implementation of an operational EMPr to ensure the proposed protection, enhancement, expansion and showcasing of existing dune, estuary, beach and coastal forest vegetation as well as the protection of open views and view sheds of river and ocean.	The updated development concept still includes incorporates as well as buffers sensitive areas identified as well as requiring protection, expansion and rehabilitation.
Use of Natural Resources	While current land use within the study area (i.e. commercial sugarcane cultivation) has undoubtedly had an adverse impact on its biodiversity, the establishment of resorts and residential areas within and adjacent to the coastal area is likely to negatively impact on fauna and flora.	The establishment of buffers around sensitive areas will have a mitigating effect on this impact, but regulations regarding the consumptive use of natural resources (flora and fauna) should be strictly enforced and local controls included into the operational EMPr. Non-consumptive use should be promoted, and particularly sensitive areas, such as marginal dune	Applicable / responsible coastal access has been proposed with access to and within sensitive areas managed / controlled via pedestrian systems and elevated boardwalks, where possible.

Impact	Description	Mitigation	Implementation
	This includes the likely impact on marine living resources, which are likely to be affected by increased pedestrian traffic along the shoreline and estuary.	areas, should be demarcated and access restricted. This can be achieved by managing access points to the shoreline. The management and control of the remaining natural areas and the use of natural resources must be included in an operational EMPr which should include both a monitoring and penalty system.	
Sense of Place	Changes in land use are usually associated with concomitant changes in sense of place. In the case of the proposed development, the sense of place will be significantly altered. Whilst the current sense of place tends towards a rural-agricultural aspect interspersed with remnant natural coastal forest and fragmented natural vegetation, a change in land use to resort development will undoubtedly alter this sense of place towards a more urbanised form.	While changes in sense of place are difficult to quantify and are often subjective, there are mitigation measures that can be applied to ameliorate the aforementioned changes / impacts. These include the promotion of neutral colours that do not contrast with the surrounding landscape, as well as the implementation of indigenous landscaping and the removal of invasive alien plant species. Materials used to construct infrastructure such as decks, boardwalks and footpaths should prioritise the use of sustainably sourced natural materials rather than synthetic materials.	The final layout plan can be deemed to positively impact on sense of place with its emphasis on: • creating a settlement with a unique coastal identity and character; • establishing a functional and visual connection with the sites ecological assets; • incorporating an integrated open space system; and • proposing a range of development nodes, precincts and clusters integrated by the broader and dominant coastal landscape character.
Amenity / Recreational Opportunities	The provision of appropriate beach amenity (facilities that aid and improve recreation activities) is a positive impact associated with sustainable development in the coastal zone. Among others, appropriate beach amenity could include ablution facilities, parking, and facilities that provide managed pedestrian access (including access for disabled persons) while protecting sensitive features.	The establishment of resorts within the study area will result in increased demand for recreational opportunities and amenity. The ecological and social carrying capacity of the study area beach environment and shoreline is however limited, and as such, will be unable to support high intensity usage by large numbers of people.	For this reason, an opportunity exists to improve / establish beach amenity at the nearby Tinley Main Beach and Tinley Manor Launch Site Beach. A public-private partnership between the landowners and the KwaDukuza Municipality to develop and maintain public beach amenity that would benefit local residents and visitors alike is suggested. This would maximise the positive impact of creating beach amenity that emphasises the sustainable, non-consumptive use of the shoreline in this area.

7.7.1 Coastal Access

Access to the coast with this phase of the development is now limited to pedestrian access via paths and elevated wooden boardwalks. Parking is provided at the centrally located low impact mixed-use zone.

It is further noted that a significantly sized medium impact mixed-use zone is proposed to be provided to the north of the existing Tinley Manor providing for the establishment of additional recreational, amenity and beach access at the Tinley Manor Launch Site.

7.7.1.1 Mitigation

With reference to the proposed first phase of development at Tinley Manor Southbanks, the shoreline of the area under study is not suitable for high intensity beach activities, nor is it a safe swimming beach given the exposed nature of the shoreline. Use of this section of coast should be restricted to low intensity activities such as hiking / walking and recreational / subsistence fishing with limited swimming opportunities.

High-intensity beach activities such as a large scale swimming beach, ski-boat launching and others should be concentrated in beach areas that are more suited to this purpose from an ecological and social carrying capacity perspective. To this end, Tinley Main Beach and Tinley Launch Site Beach are considered more appropriate for the aforementioned high intensity activities, with consolidated beach assessment scores of 41 and 39 respectively. This is due to their comparatively better shoreline morphology, beach slope, prevailing surf conditions (linked to the sheltered nature of the shoreline) and accessibility, among others.

It is recommended that the proposed resorts consider the installation of alternative (high intensity) swimming and recreational facilities due to the limited presence of swimming beaches within the Christmas Bay Long Beach Segment. This is because the currently only identified potential swimming beach within the Christmas Bay Long Beach segment is in the extreme south of the segment and is in itself of a size that does not lend itself to a high number of users and/or intense usage.

An additional coastal engineering study is proposed to consider this matter taking finer scale modelling into consideration.

Accessibility is also a challenge at this potential swimming beach due to the neighbouring topography.

Access within sensitive areas that are unable to support high intensity use must focus on managed access points that facilitate sustainable use of coastal resources. In the case of the proposed development, this will be activities such as hiking and walking along the shoreline. Given the importance and sensitivity of the dune environment for protection from dynamic coastal processes, it is therefore recommended that coastal access within the Christmas Bay Long Beach segment be geared towards a strictly managed pedestrian access over the dune environment which does not compromise its ecological integrity.

With reference to the potential biophysical impacts associated with the provision of coastal access, the following recommendations are noted:

- The protection of the existing coastal vegetation on site (as indicated by the proposed development footprint) must be prioritised;
- Beach access points must be managed / controlled and denudation of dune vegetation avoided. Access points should be formalised by means of a raised wooden boardwalk that extends onto the beach, allowing for the re-establishment of the dune vegetation underneath the boardwalk as well as a more managed access to the beach;
- There must be a strong focus on consolidating / limiting the number of access points (informal and informal) onto the beach within the Christmas Bay Long Beach segment;
- Sound and practical architectural guidelines should be applied which take account of the sensitive nature of the surrounding environment;
- Development (detailed design) needs to take cognisance of both the risks and responsibilities associated with developing in the coastal zone;
- Alien invasive species management to be incorporated into routine maintenance and included into the operational EMPr; and

- Vehicular beach access must be restricted except for emergency access and boat launching in line with the Public Boat Launch Site Regulations.

7.7.2 Summary

The proposed development concept has adopted a proactive approach in identifying environmental assets and sensitive areas upfront by means of the environmental asset layers that were derived from the previous coastal feasibility report. A risk aversive approach also characterises the proposed development concept through the identification and incorporation of coastal risk into the proposed location of development. Such an approach is crucial to ensuring sustainability of settlement in a sensitive, dynamic and potentially hazardous natural environment such as the coastal zone. The information available (i.e. the development concept drawings) suggests a development footprint that is not in conflict with identified natural hazards such as slippages or sensitive features such as wetlands or the vegetated dune cordon.

Coastal access, which was identified as a potentially significant issue, has been predominantly resolved. Opportunities exist for an innovative public-private partnership with respect to providing adequate amenity and accessibility at beach locations that are suitable for high intensity activities and can cope with high user numbers. Construction phase impacts can be adequately mitigated through the addition of the proposed mitigation measures to the mandatory EMPr. The development of an operational phase EMPr is strongly recommended in mitigation of the impacts that are anticipated to occur during this phase of the development.

A crucial issue that this assessment attempts to illuminate is the ecological and social carrying capacity of coastal assets. If the mitigation measures described above are adequately implemented the coastal area adjacent to the proposed development (which incorporates the dune cordon, beach, shoreline and estuarine environment) will be able to support the kinds and intensities of uses and users implied by the proposed development concept.

Beach recreation within the shoreline abutting the proposed development will be limited to low impact activities due to inherent biophysical constraints and sensitive environments.

However, the close proximity of beach areas with significantly better opportunities for higher intensity recreation activity represents an opportunity, not only for proposed resort residents/visitors, but for the broader community to enjoy the benefits of the KwaDukuza coastal area, should the proposed public-private partnership be implemented at Tinley Manor Beach.

7.8 Socio-economic Study

7.8.1 Zones of Impact

The surrounding areas to the development are likely to be the most significantly affected areas for the proposed development.

As such, the surrounding nodes of Salt Rock, Sheffield Beach, Shakaskraal, and Ematadeni, Groutville have been identified as the primary impact nodes, as these will experience the greatest socio-economic impact from the development. Areas lying further afield are KwaDukuza (Stanger), Ballito, Blythedale and Princes Grant, and are also anticipated to be affected by the development. These have been identified as secondary impact areas.

The primary and secondary impact areas are illustrated in ***Figure 7-8***.

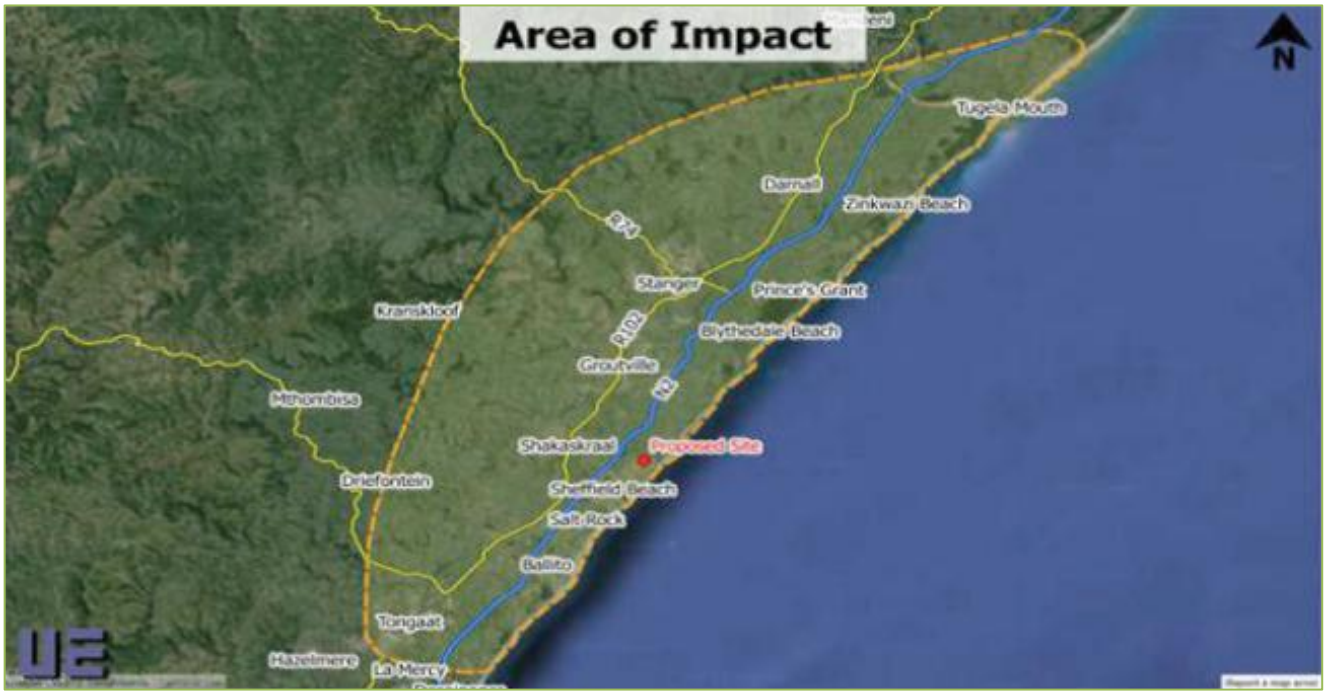

Figure 7-8: Primary and secondary impact areas

7.8.2 Market Trends

The assessment provided a review of the market trends influencing property development in KwaDukuza.

In terms of buildings completed, it is evident to see that the number of completed buildings peaked between 2005 and 2009. Within KwaDukuza a total of 468 buildings were completed in 2012. This was below the average of 566 buildings per annum for this area.

The year on year percentage change in Gross Domestic Product (GDP) for KwaDukuza recovered to 2.3% in 2011, after it was at 4.2 in 2009. The GDP at basic prices of KwaDukuza grew at an annual average of 2.0% during the period of 2001 to 2011.

This indicates that the KwaDukuza Municipality is currently recovering from the recent recession. Such a development will assist in stimulating the local economy further.

7.8.3 Positive Impacts

In terms of economic impact, it is anticipated that the development will assist in reducing unemployment in the region, as long as local labour, service provider, and contractors are used during the construction phase, while local labour must be sourced for maintenance, security, as well as within the resort and residential developments.

It is expected that the proposed Tinley Manor Southbanks will contribute significantly to the economy of the KwaDukuza Municipality by reducing unemployment in the region through the injection of over R12 billion in capital costs as well as through urban renewal and aesthetic improvements.

Furthermore, the proposed development is expected to contribute significantly to the rates base of the KwaDukuza Municipality. The proposed developments' accumulated contribution to municipal rates are estimated to be around R75 million by 2020 and this is expected to increase toR2.9 billion by 2030. This is based in the assumption that rates will not be collected during the first two years due to rebates offered.

The positive economic impact of the capital expenditure that will be injected into the provincial economy during the construction of the proposed development is anticipated to be as follows:

- A total of R14 billion of new business sales will be created directly and indirectly in the regional economy;
- This will translate to a total value addition of R4.8 billion to Gross Geographic Product;

- The households benefitting from economic activity created by the capital expenditure will see their income increase by R2.5 billion;
- The capital expenditure phase will create a total of 40,602 job opportunities throughout the total value chain over the lifetime of the development's construction (i.e. across the construction phases of the development).

Bulk infrastructure is estimated at R291,670,000, which will be injected into the provincial economy during the construction of the bulk infrastructure. The multiplier impact of such an injection is displayed below:

- A total of R323 million of new business sales will be created directly and indirectly in the regional economy;
- This will translate to a total value addition of R220 million to Gross Geographic Product;
- The households benefitting from economic activity created by the capital expenditure will see their income increase by R74 million; and
- The capital expenditure phase will create a total of 200 job opportunities throughout the total value chain over the lifetime of the development's construction.

7.8.4 Concerns / Challenges

Some challenges as a result of the development were documented and assessed.

These include:

- Stress on municipal operations to provide bulk services such as electricity and water supply to the development;
- Congestion and noise impacts in the short-term to medium-term, especially during the construction phase; and
- Loss of income due to a number of competing developments.

7.9 Traffic Impact Assessment[16]

7.9.1 Existing Road Network

The existing road network is illustrated in ***Figure 7-9***.

[16] *The information in this section has been taken from the TIA for Tinley Manor Southbanks (2014) prepared by Aurecon and can be found in Appendix C 9.*

Figure 7-9: The existing road network

7.9.1.1 Road Descriptions

7.9.1.1.1 National Road 2 (N2)

The N2 runs from Cape Town in the south, and it follows the east coast through the Cape Province and KwaZulu-Natal, before terminating at the Swaziland border near Golela.

In the vicinity of the proposed development, the N2 effectively forms the western boundary of the development and the Indian Ocean, some two and a half kilometres (2.5 km) away, forms the eastern boundary.

The N2 is a dual carriageway freeway with 2 lanes in each direction in this area and a speed limit of 120 km/h. It falls under the jurisdiction of the SANRAL.

Of interest to this project are the following diamond interchanges on the N2:

- Salt Rock Road (P330) / Shakaskraal interchange in the south (existing).
- Tinley interchange (P467) in the north (existing).
- P228 interchange towards Sheffield Beach (planned).

The planned future Sheffield Beach diamond interchange is located between the other two interchanges (Salt Rock interchange and Tinley interchange), situated approximately 2.6 km north of the Salt Rock interchange where road P228 crosses over the N2.

7.9.1.1.2 Provincial Road R102

The R102, which was the old national road, generally runs parallel to and west of, the N2 and it passes through villages / towns such as Tongaat, Shakaskraal and Stanger. Although an important route in itself, the R102 will not play a major role in the transport network relating to the Tinley Manor development because it is too far west to have an influence.

7.9.1.1.3 Provincial Road P467

P467 is presently the only external link serving Tinley Beach Village and it runs from the R102 at Shakaskraal in the west, through to Tinley Beach Village in the east. There is a diamond interchange at the N2 where P467 crosses the N2. P467 is a two way two lane road from the N2 to Tinley Beach.

7.9.1.1.4 Seaview Drive

Seaview Drive is the main north south road through the village of Tinley Beach and it runs from P467, through the village, to the Umhlali River in the south. There is no crossing over the Umhlali River except for the N2, further west.

7.9.1.1.5 Provincial Road P330 (Salt Rock Road)

P330, or the Salt Rock Road, lies at the southern end of the greater study area and it runs from the R102 in the west to Salt Rock village in the east. There is a diamond interchange at the N2 where P330 crosses it. P330 terminates as it enters Salt Rock and it runs eastwards to the coast where it becomes Basil Hulett Drive. It then turns south and runs through Umhlali Beach where it becomes Ocean Drive.

7.9.1.1.6 Provincial Road P474

P474 branches off P330, above, and proceeds eastwards to the north end of Salt Rock and the south end of Sheffield Beach. It becomes Colwyn Drive as it travels north through Sheffield Beach where it finally terminates.

7.9.1.1.7 Provincial Road P228

P228 branches off P474 and proceeds northwards parallel to the N2 then it swings west and crosses over the N2 and proceeds westwards to an intersection with P467 at Tinley Manor railway station. P228 is a surfaced road for a few hundred metres from P467 and then it has a gravel surface as it proceeds north and west, crossing the N2. The new diamond interchange is to be constructed at this crossing.

7.9.1.2 North – South Road Link Parallel to N2

Since development in this region of the north coast took off, the KwaDukuza planners have requested that each development, east of the N2, make allowance for a continuous north – south route linking between adjacent developments and providing continuity of movement at a local level, east of the N2. There is a stagger (to the west when heading north) at P330, to the beginning of P474 which it follows until the junction with P228 which it follows northwards to Seaton Delaval where it presently ends.

The roads linkage to the north of the Umhlali River is not dependant or required by this development. The applicant is however willing to provide the opportunity for such a link to be constructed at some point in the future if and when required by the relevant authority.

7.9.1.3 Access to Proposed and Existing Developments from N2

This area of the North Coast is expanding rapidly and numerous upmarket residential estates have been established and/or planned in recent years, shown in ***Figure 7-10***.

Figure 7-10: Adjacent and surrounding developments

Clearly, this number of significantly sized developments will impact on the existing road layout and it is likely that internal and external infrastructure will have to be planned to carry future flows. If we consider these developments from the south, it is clear that Simbithi and Mount Richmore will use either P339 P330 (Salt Rock Road) to get to the N2 and will therefore not affect access to/from the proposed Tinley Manor Southbanks.

Dunkirk, Brettonwood, Croc Farm and Zululami will access the N2 via P474 and P330, again not affecting access to/from Tinley Manor but probably absorbing most of the spare capacity on P330 and its diamond interchange on N2. Thus, to the east of N2, only Seaton Delaval will interface with Tinley Manor, as will Nkwazi and Palm Lakes, both situated west of N2 all as major generators of traffic in the locality that are predicted to access the N2 to and from the proposed new diamond interchange.

7.9.1.4 Planned Changes to local Road Network

The biggest planned changes to the existing road network in the vicinity of the site from approved developments are as follows:

- The upgrade of MR330 to a 4-lane road from the Salt Rock interchange on the N2 to MR228 which is a condition of approval for the Richmont development, the Brettenwood Estate commercial development and for a new shopping centre located at the northeast quadrant of the Salt Rock interchange on the N2.
- The upgrade of MR228 from MR330 to MR474 which is a condition of approval for the Brettenwood Estate commercial development.
- The upgrade of MR228 from MR474 to the Palermo access in the Seaton Delaval Development which is a condition of approval for the first 600 residential units of the Seaton Delaval development.
- The proposed new Sheffield Beach interchange on the N2 located at the existing MR228 bridge over the N2 which is a condition of approval of the remaining 700 residential units of the Seaton Delaval development.

7.9.1.5 Tinley Manor Village

The existing beach village of Tinley Manor, north of the Umhlahi River, is quite small, being approximately two kilometres (2 km) in length and around 300 m in width.

It consists of two primary roads that run parallel to the coastline with Seaview Drive being the closest to the ocean and providing access to sea front properties. Oceanview Drive is situated one block further inland and it serves residential properties along its length.

Both of these roads connect to provincial road P467 in the north which is the only external connector for Tinley Manor, running north-west from the village to a diamond interchange on the N2 and onwards towards the R102 and Shakaskraal.

7.9.2 Existing Traffic Condition

As a starting point, towards documenting existing traffic conditions in the overall area, traffic counts were carried out by Bala Survey and Research on 13 August 2012 at the following locations (***Figure 7-11***) which were deemed as being the critical intersections affecting the efficiency of the local road network.

- N2/Salt Rock interchange (P330) (both intersections);
- N2/Tinley Manor (P467) interchange (both intersections);
- The P330/P474 intersection;
- The P474/P228 intersection; and
- The P228/P467 intersection.

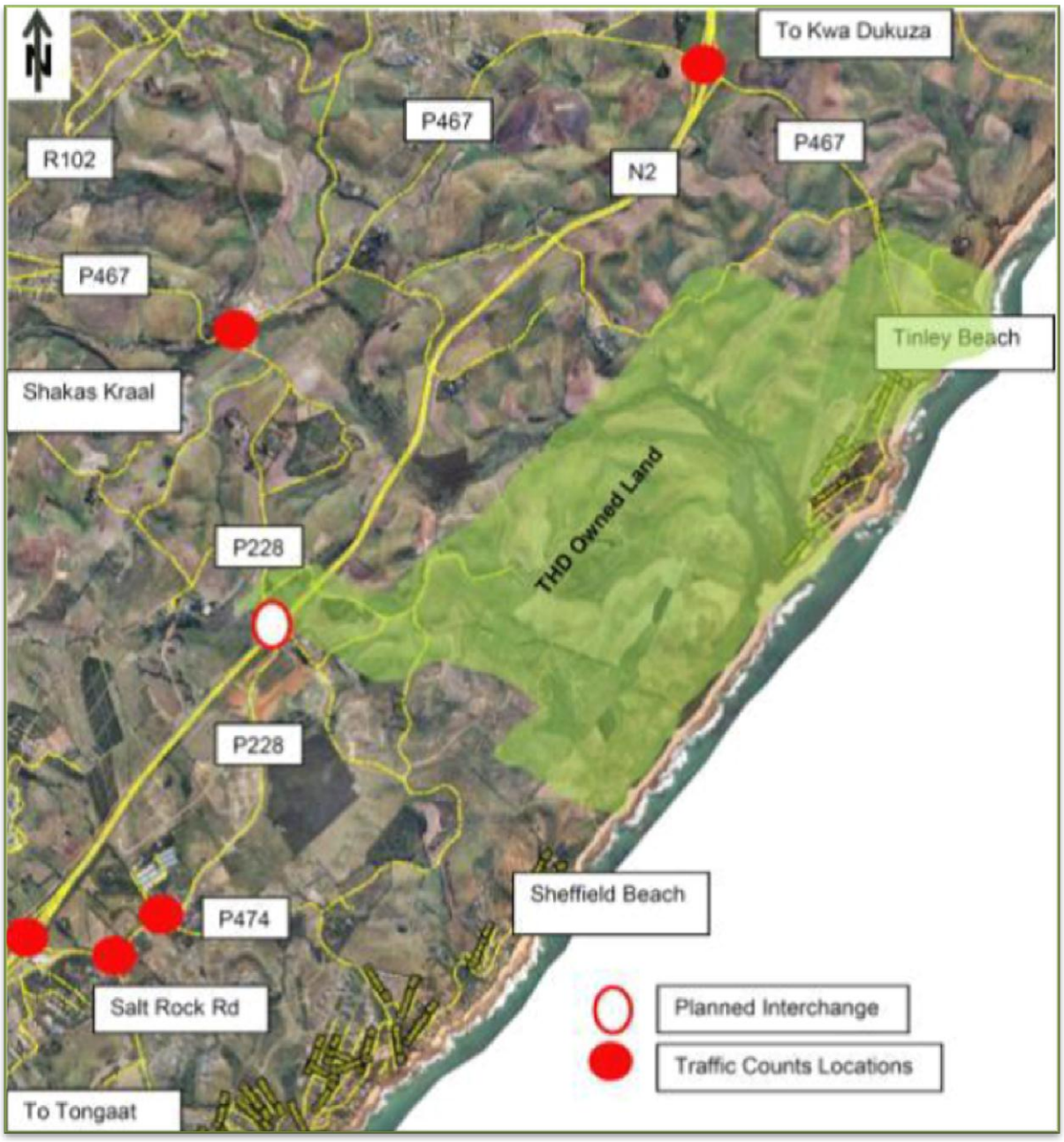

Figure 7-11: Traffic count locations

In addition to the traffic count locations as shown in ***Figure 7-11***, traffic counts on the N2 were extracted from the SANRAL 2011 yearbook at the following locations:

- Salt Rock interchange;
- Umhlali River; and
- Mvoti Toll Plaza.

It must be noted that the information extracted from the SANRAL yearbook sites should be treated with caution as the flows represent highest hourly volume by direction but not hourly volumes that correspond with the counted flows. They are indicative only.

During the analysis of the proposed Sheffield Interchange, it was felt that the traffic counts from 2011 were not an accurate indication of the current volumes of traffic on the N2. Therefore traffic counts were also carried out on the N2 both in the northbound and southbound direction in each lane where the P228 crosses over the N2 by Bala Survey and Research on 16th January 2014.

The AM and PM peak hours were found to be from 07:00 to 08:00 and from 16:15 to 17:15 and the traffic volumes on the local road network during these peak hours are as shown below in ***Figure 7-12***.

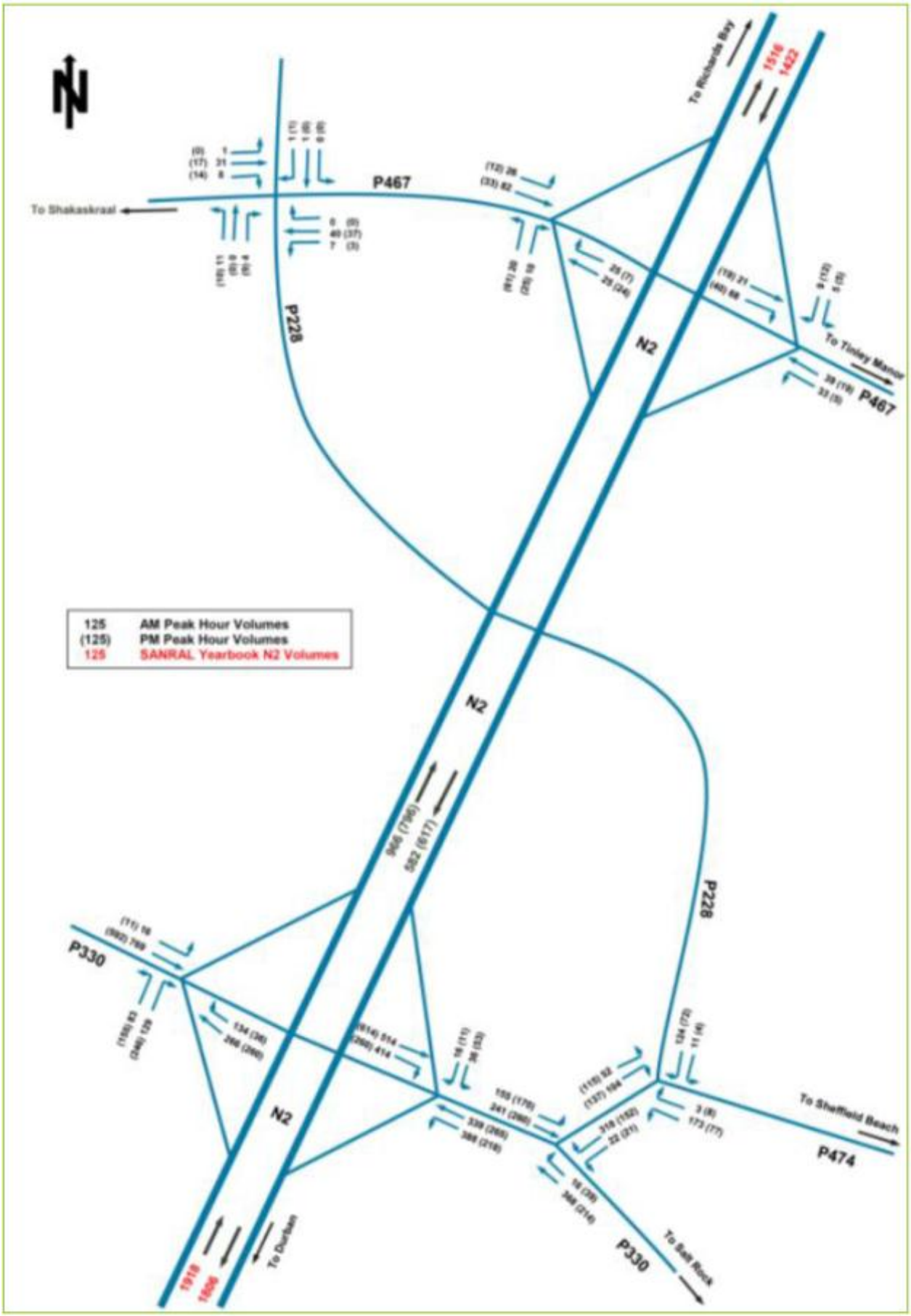

Figure 7-12: Existing peak hour traffic flows

The existing traffic flows were analysed using the computer suite SIDRA to indicate the Level of Service (LOS) of traffic operations on the various elements of the road network.

Level of Service (LOS) is defined as a qualitative measure of the operational conditions within a traffic stream as perceived by road users. This definition generally describes these traffic conditions in terms of speed, travel times, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety.

There are six levels of service used to describe the quality of travel on the road network. Each of these levels is given a letter designation from A to F, with LOS A representing the best (free-flow) operating conditions while LOS F represents the least desirable (severely congested) conditions.

Table 7-13 summarises the existing conditions at the various intersections.

Table 7-13: Existing traffic conditions

Intersection	Operating Conditions (2012)	Worst LOS	
		AM	PM
P330 / N2 ramps Salt Rock Interchange West side of N2	Good conditions on P330 but congestion/delays on off-ramp. Needs signalisation.	F	F
P330 / N2 ramps Salt Rock Interchange East side of N2	Acceptable conditions throughout but ramp movements nearing capacity. Should be signalised at same time as west side.	D	C
P330 / P474	Poor conditions on P474 stop street in AM peak causing delays on minor road. Needs traffic signalisation.	F	D
P474 / P228	Low traffic volumes. Good conditions.	B	B
P467 / N2 ramps Tinley Manor Interchange West side of N2	Low traffic volumes. Good conditions.	B	B
P467 / N2 ramps Tinley Manor Interchange East side of N2	Low traffic volumes. Good conditions.	B	B
P228 / P467	Low traffic volumes. Good conditions.	B	B

From ***Table 7-13***, the following observations can be made:

- High volumes of traffic are witnessed approaching from the south via the N2. The LOS F witnessed is primarily due to this. It is recommended that these critical intersections be addressed due to the high growth rate of the area.
- The high volumes of traffic are primarily witnessed in tidal flow, i.e. outgoing trips from the residential developments in the AM peak hour and inbound trips towards the residential developments in the PM peak hour.
- Congestion and delays at lightly trafficked intersections are likely to increase due to the construction of several new residential estates in the area.

7.9.3 Proposed Access and Movement

7.9.3.1 Vehicular Access

The majority of the Tinley Manor Southbanks lies east of the N2. Most of the traffic generated by the development is predicted to arrive and depart to and from north and south on the N2.

The primary access point to the development is from the proposed Sheffield Beach interchange on the N2 and then east onto the P228. Entrance to the development is on the north end of P228.

A small proportion of the trips generated by this section of the development are also predicted to arrive from Umhlahi and Salt rock in the south. This traffic will use the P330 and P474 traversing eastbound from these towns and then north parallel the N2 on the P228.

A minor number of trips are also expected to arrive from further inland in the west. This traffic will use the P467 and traverse eastbound over the N2 on the P228 and into the development.

A portion of the residential development is located west of the N2. The traffic generated by this portion is also expected to use the proposed Sheffield Beach interchange with the N2, east via the P228 and into the development.

7.9.3.2 Pedestrian Access

The majority of the pedestrian traffic generated by this proposed development is expected to originate from the semi-rural and informal residential areas situated between the town of KwaDukuza and the site. Most of these pedestrians will be arriving from west of the N2.

The proposed Sheffield Beach interchange is to provide a pedestrian walkway. The main pedestrian access is to be alongside the main access road with dedicated pedestrian walk ways provided.

7.9.4 TIA Findings

The TIA predicts realistic volumes of traffic likely to be generated by the proposed Tinley Manor Southbanks. Careful consideration and engineering judgement have been applied to the trip generation rates that are listed in the South African Trip Generation Manual and the "*Trip Generation Manual*", produced by the US Institute of Transportation Engineers (1991). Trip generation rates that were recommended in the TIAs of similar developments in the locality were also used as guidelines and indicators to achieve the most realistic and accurate volume traffic to be generated by Tinley Manor Southbanks.

The TIA predicts traffic volumes both on the internal and external road network within and surrounding Tinley Manor Southbanks as well as the proposed access interchanges.

The following conclusions can be drawn from the TIA:

- The existing traffic conditions on the existing road network are satisfactory.
- The future traffic volumes on the immediately adjacent roads are dependent on proposed major developments which have been included in the analysis.
- The traffic that will be generated by the proposed Tinley Manor Southbanks will, when aggregated with the future traffic due to other major traffic generators of Seaton Delaval, Palm Lakes and Inkwazi, require upgrading of the following intersections:
    - P330/P474;
    - P474/P228;
    - P228/P467; and
    - P228 access to Tinley Manor and Seaton Delaval.
- It is recommended that the analysis of the Salt Rock interchange be carried out as a separate exercise. The scope of the TIA report does not adequately cover this interchange. The analysis of the Tinley Beach Interchange has been carried out in the Traffic Impact Assessment of Palm Lakes. The traffic generated by Tinley Manor Southbanks negligibly impacts on both of these interchanges.
- The analysis of the new proposed interchange as detailed in the TIA has revealed the following:
    - At the full development of the surrounding area the indications are that a four lane crossroad will not be sufficient and a five lane crossroad will be required in the longer term (20+ years) if a conventional diamond interchange is constructed.
    - The analysis of a proposed diverging diamond interchange has been carried out. The results indicate good traffic operating conditions with a four lane cross road over the N2 (2 lanes in each direction) as well as indicating capacity for background traffic growth in the long-term.
    - It is therefore recommended that the geometry of this proposed diverging diamond interchange be such as indicated in tables 35 and 36.
    - It is recommended that a cost sharing agreement with adjacent landowners be entered into in funding the widened crossroad to accommodate the additional traffic over and above that of the Tinley Manor Southbanks.
- Public transport facilities are to be carefully planned at detailed design stage and implemented. The Ilembe Municipality is expected to expand its public transport operations in line with national policy and link to this section of the north coast and reduce traffic.

- Provided the above recommendations are adopted there is no reason of a traffic engineering nature why the development should not be permitted to proceed.

7.10 Stormwater Management Plan[17]

This stormwater management plan has the following objectives:

- To protect all life and property from damage by stormwater and floods;
- To prevent erosion of soil by wind and water;
- To conserve the flora and fauna of the natural environment;
- To protect and enhance water resources in the catchments from pollution and siltation; and
- To protect and enhance the local and downstream watercourses.

7.10.1 Impacts of Development on Existing Catchments

The impacts of the proposed development on the environment will range from negative to positive depending on the degree of planning, design and methods of implementation. Measures put in place should contribute to the mitigation of the naturally negative impacts of development.

Expected consequences of unmitigated development include an increase in hardened areas, reduced infiltration, loss of vegetation and reduced evapo-transpiration potential. There will be an overall increase in surface run-off, an increase in the speed of run-off and peak flow rates in the watercourses.

Two major risks can be expected should stormwater not be appropriately managed. These are the risks of erosion and flooding.

The proposed development will tend to reduce the natural rainfall infiltration and increase storm run-off. Downstream flood damage risks will therefore increase unless adequate attenuation of flood run-off is provided. The design of the stormwater system must address this issue as far as possible and must be designed such that the downstream post-development flood risks are no greater than the pre-development flood risks. As a guide to the degree of run-off attenuation required, pre-development and post-development 5 -year and 10 year flood estimates are provided in the SMP.

Potential impacts and proposed mitigation measures are elaborated on in ***Section 0***.

These mitigation measures presented in the SMP must be carried into the Wetland and Open Space Rehabilitation Plan. The SMP described below lists many practical on site controls to address these fundamentals issues. However, this does not exclude any technology that can be shown to be effective in controlling run-off while supporting the proposed spatial development intensity levels and contributing positively to the environment.

To fully mitigate the negative impacts of development:

- The potential increase in catchment run-off must be balanced against the combined effects of evapotranspiration from catchment vegetation, evaporation from water bodies plus the retention and re-use of both storm run-off and treated wastewater.
- The potential increase in flood peaks must be mitigated to at least pre-development levels by the provision of sufficient stormwater attenuation facilities at micro and macro levels.
- The potential increase in flood volumes must be mitigated where possible by subsoil infiltration, retention of run-off in on site facilities for irrigation use and unsaturated wetland areas where evaporation and infiltration can help to reduce flood run-off rates.
- Installations must be provided to contain pollution as close to source as possible and in a practical location for servicing by Department of Solid Waste.

[17] *The information in this section has been taken from the Stormwater Management Plan for Tinley Manor Southbanks (2015) prepared by SMEC South Africa and can be found in Appendix B 2.*

7.10.2 Critical Aspects

Stormwater drainage is a crucial aspect and will require careful planning, designing and managing. The stormwater detention facilities should be designed for the 50-year storm event and should be located at an appropriately selected site. Site selection must take account the necessary geotechnical, environmental and topographical conditions, including wetland conservation. In addition to macro- stormwater measures, micro-stormwater measures should be implemented.

The form of this attenuation will be dependent on a number of factors such as topography (natural and artificial slopes), the zoning of the site and soil conditions present. A limited stormwater pipe network should be provided for stormwater reticulation to safely convey minor stormwater run-off to the attenuation facility.

To ensure that water quality is not compromised, silt and trash traps will need to be provided within the system. Where conditions permit, open ditches, drains and channels should be used instead of pipes. Attention must be given to the erodibility of channels where flow velocities are high and appropriate lining provided. Forms of lining will vary from natural vegetation to stone pitching and reinforced concrete linings.

The proposed development should not adversely impact on the environments of the development node and surrounding areas in terms of erosion and sediment deposition, but the frequency of flooding and the total run-off volume will increase unless adequate provision can be made to maintain the current natural rate of stormwater retention and infiltration in the sub-catchments.

A stormwater systems model should be developed to determine peak flood flow rates and flood levels and assess the collective impacts of development on run-off patterns. The outputs from the modelling will provide the input data required for the design of culverts, channels and other stormwater infrastructure associated with the proposed developments.

For areas flowing into the development area, potential future development in these sub-catchments should be considered and any requirements for stormwater detention should be identified. Similarly, for stormwater flowing out of the development area may impact on the downstream watercourse and this must be considered and measures taken to ensure any upstream development does not result in an increased flood damage risk downstream.

Areas within the proposed development that bound on stormwater detention areas, near road crossings, watercourse confluences and water features could be subject to flooding. In these situations no development should take place below the outfall levels of water detention areas, plus an appropriate freeboard allowance. Overland flow may be encouraged where possible, but should be avoided in the specific areas identified. These are typically where roads will capture and concentrate cross flows at the local low points in the roads. Plans must take into account probable impact of flow from these points of concentration on the downstream environment.

Steeper stormwater channels will require protection from erosion through the use of appropriate channel lining, or controlled drops to dissipate flow energy.

All natural and unlined channels should be inspected for adequate binding of soil by sustainable ground cover. Stone pitching should be used to reinforce channel inverts on steep slopes. Existing wetlands and stormwater detention areas should be protected from encroachment by the development.

7.10.3 Proposed Stormwater System

Details pertaining to the stormwater management measures proposed are presented in the EMPr (***Appendix B***) and SMP (***Appendix B 2***). At this stage, it is proposed that stormwater is attenuation via dry stormwater attenuation facilities located outside wetlands but within the 30 m wetland buffer (***Figure 7-13***).

In due course, the stormwater systems in each drainage basin will need to be identified and analysed to determine the requirements for new stormwater infrastructure to meet the objectives of this Stormwater Management Plan. The results should be documented in a Stormwater Systems Report that provides the hydraulic capacities of watercourses in the major system and other

The parameters should include:

- Allowable ranges for the impervious percentage for commercial and residential areas.
- Average depression storage values for pervious and impervious areas.
- Initial and final infiltration rates and the appropriate Horton's decay constant.
- Geotechnical data on infiltration rates for infiltration galleries.
- Equivalent Rational Method coefficients and unit area run-offs for developments on the small sites.

It is important that all building designs provide for maximum on site stormwater attenuation and that the developers instruct their professional teams accordingly. It is important that level and near-level areas, such as building roofs and parking areas, are used to best advantage to attenuate storm run-off.

Appropriate provision must be made wherever possible for the removal of trash and litter from the major and minor stormwater systems. Stormwater trash collection stations must be conveniently located to facilitate trash collection and regular maintenance of the station.

The following key aspects will be implemented in doing the detailed design plan:

- All internal storm water reticulation will be designed with due cognisance accordance of the relevant guidelines.
- The use of the proposed road network will act as the primary stormwater collector with controlled discharge to attenuation facilities.
- The secondary system (pipe network) will be designed to accommodate the 1:3 and 1:10 year peak flow at critical points.
- Dry attenuation facilities will be used to reduce run-off into the natural drainage system to the pre-development 1:10 and 1:50 year flood. Excess storm water will be attenuated on site and attenuation ponds will be sized to accommodate the difference in volume between 1:50 pre and post development run-off volumes.

Proposed dry attenuation ponds may be used as storage facilities for the anticipated stormwater run-off. There are a total of seventeen proposed facilities, which have varying areas and an indicative depth of 2 m. The combined attenuation volume of these proposed ponds is approximately 41,500 m^3 which meets the required attenuation volume required from based on the Rational Method calculations.

It is evident from the Rational Method results that one of the negative impacts of the development is a substantial increase in the peak stormwater run-off flows for both the 1 in 10 and 1 in 50 year return periods. The increase in peak run-off will primarily be mitigated by the introduction of stormwater attenuation devices as part of the stormwater network. These devices will be attenuation dams / 'ponds'.

The attenuation measures selected will be required to reduce the post-development peak run-offs for the 1 in 10 and 1 in 50 year storms to pre-development levels. With this in mind, it is recommended that the hydraulic characteristics of the stormwater network is analysed (using EPASWMM or similar software) during the detail design phase of the project. This analysis will accurately determine the attenuation volumes required and the outlet configuration required to reduce the peak outflows to pre-development levels.

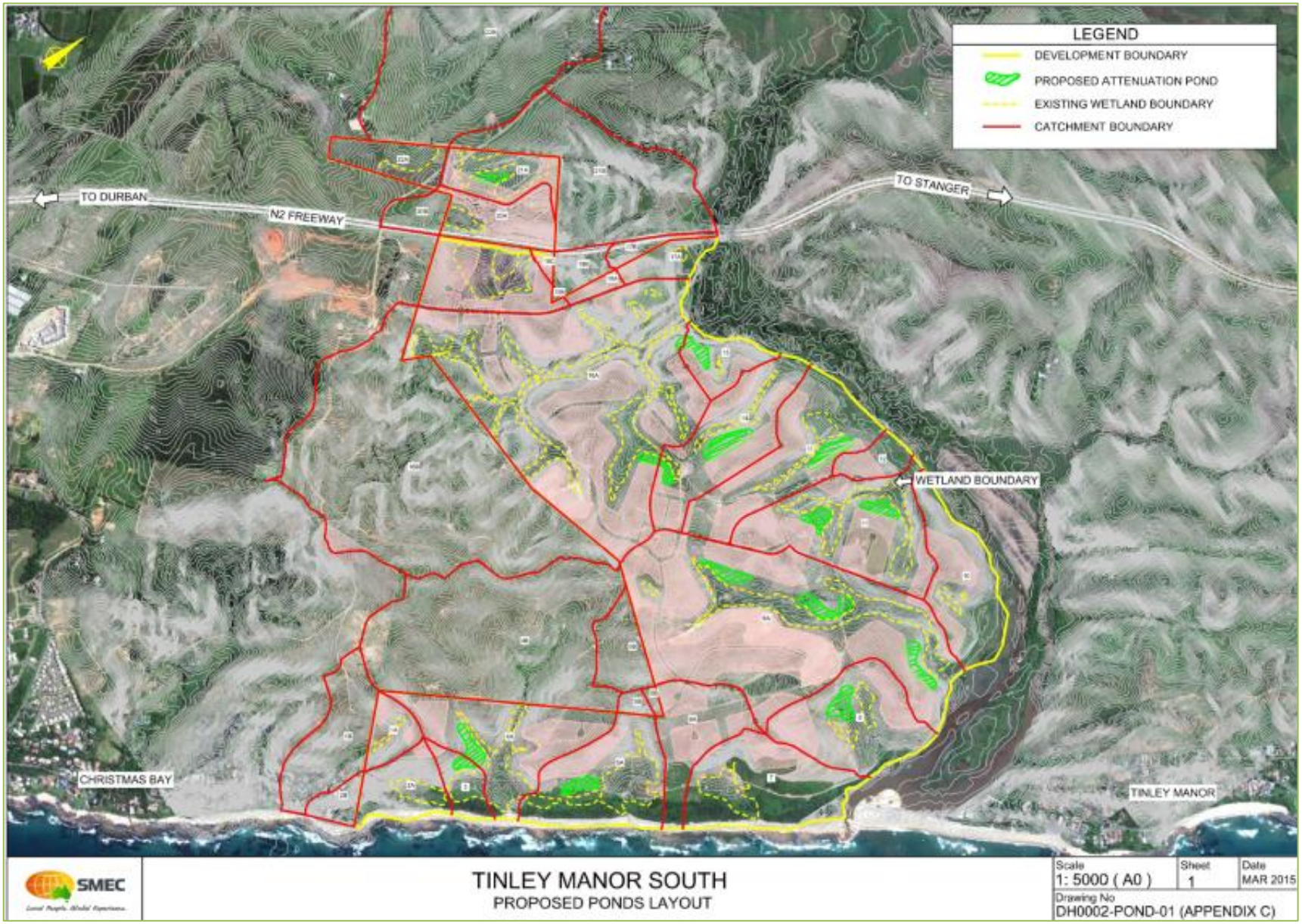

Figure 7-13: Proposed stormwater attenuation facilities

8 PUBLIC PARTICIPATION PROCESS

Public participation is a process that is designed to enable all interested and affected parties (I&APs) to voice their opinion and/or concerns which enables the practitioner to evaluate all aspects of the proposed development, with the objective of improving the project by maximising its benefits while minimising its adverse effects. I&APs include all interested stakeholders, technical specialists, and the various relevant organs of state who work together to produce better decisions.

The primary aims of the public participation process are:

- to inform I&APs and key stakeholders of the proposed application and environmental studies;
- to initiate meaningful and timeous participation of I&APs;
- to identify issues and concerns of key stakeholders and I&APs with regards to the application for the development (i.e. focus on important issues);
- to promote transparency and an understanding of the project and its potential environmental (social and biophysical) impacts (both positive and negative);
- to provide information used for decision-making;
- to provide a structure for liaison and communication with I&APs and key stakeholders;
- to ensure inclusivity (the needs, interests and values of I&APs must be considered in the decision-making process);
- to focus on issues relevant to the project, and issues considered important by I&APs and key stakeholders; and
- to provide responses to I&AP queries.

The public participation process must adhere to the requirements of Regulations (GNR 543) under the NEMA. The public participation process for the Tinley Manor Southbanks Coastal Development EIA process has been, and continues to be undertaken according to the stages outlined below.

Figure 8-1: Responsibilities of I&APs in the different stages of the project

In recent years THD has taken a much more participatory approach to their property development projects, with the understanding that the socio-political and economic context of the times invites this more public approach. Communities that surround the developments are invited to "*inform and be informed*" about developments through the establishment of forums in order to achieve the most positive impacts possible.

It is also noted that engaging stakeholders even before developments are built can achieve the best impacts. It is for this reason that the PPP that forms part of the EIA becomes the basis of a long-term stakeholder engagement process.

For the purposes of the EIA phase, the PPP aims to ensure that the full range of stakeholders is informed about the Tinley Manor Southbanks throughout the period in question. In order to achieve this, a number of key activities have taken place and will continue to take place.

These included the following:

- The identification of stakeholders is a key deliverable at the outset, and it is noted that there are different categories of stakeholders that must be engaged, from the different levels and categories of government, to relevant structures in the NGO sector, to the communities adjacent to the Tinley Manor Southbanks;

- The development of a living and dynamic database that captures details of stakeholders from all sectors;
- The convening of focussed and general meetings with stakeholders at different times throughout the EIA process (and beyond);
- The engagement of public leaders to whom the public generally turn for information, keeping such individuals well informed about process and progress;
- The fielding of queries from I&APs and others, and providing appropriate information;
- The convening of specific stakeholder groupings/forums as the need arises;
- The preparation of reports (both baseline and impact assessment) based on information gathered throughout the EIA via the PPP and feeding that information to the relevant decision-makers;
- The PPP could include distribution of various types of pamphlets and other information packs; and
- Where appropriate site visits may be organised, as well as targeted coverage by the media.

Specifically the Tinley Manor Southbanks PPP has entailed the following activities.

8.1 Authority Consultation

The competent authority which is the KZN EDTEA is required to provide an environmental authorisation (either positive or negative) for the project. The KZN EDTEA was consulted from the outset of this study, and has been engaged throughout the project process.

The competent authorities issuing decisions regarding the project as well as consultation to date are presented in ***Table 8-1*** below.

Table 8-1: Competent authorities and other relevant authorities associated with the project

Authority	Role	Licence/Approval	Consultation to date
KZN Department of Economic Development, Tourism and Environmental Affairs Environmental Impact Assessment Branch	Competent Authority for Environmental Authorisation process	Environmental Authorisation	• Submission of an application for environmental authorisation in terms of Section 26 of the EIA Regulations (2010) on 08 August 2011. • Approval of the application documentation by KZN EDTEA was received on 17 August 2011 with the following reference numbers DC29/0019/2011 and KZN/EIA/0000340/2011. • Submission of a final ESR to KZN EDTEA Environmental Impact Assessment Branch on 18 January 2012. • Site visit conducted and acceptance of the final ESR by the KZN EDTEA Environmental Impact Assessment Branch on 24 February 2012. • Requests to keep application on file made on the following dates 09 April 2013, 06 November 2013, 12 Match 2014, 01 August 2014 and 05 November 2014.
Department of Water and Sanitation	Competent Authority for Water Use Licence Application process	Water Use Licence	• Pre-application meeting for the Water Use Licence Application is to be held with the DWS Regional Office in the coming weeks. • Interim comments received on 24 October 2011 (***Appendix H***). • Additional comments received on 08 December 2011 (***Appendix H***).

Authority	Role	Licence/Approval	Consultation to date
Department of Agriculture, Forestry and Fisheries	Competent Authority for the licence to remove / relocate protected tree species	Commenting Authority	Site Visit undertaken. Interim comment received on 22 November 2011 (***Appendix H***).
Ezemvelo KZN Wildlife	Competent Authority for the permit to remove / relocate protected indigenous plants	Commenting Authority	Interim comment received on 01 December 2011 (***Appendix H***).
Amafa aKwaZulu-Natali	Heritage Authority	Approval indicating that the application fulfils the requirements of the relevant heritage resources authority as described in Chapter II, Section 38(8) of the NHRA, Act 25 of 1999	Interim comment received on 11 January 2012 (***Appendix H***).
Department of Agriculture	Competent Authority for the release of land from agriculture	Act No. 70 of 70	Interim comment received on 05 December 2011 (***Appendix H***).

8.2 Consultation with Other Relevant Stakeholders

Consultation with other relevant key stakeholders were and will continue to be undertaken through telephone calls and written correspondence in order to actively engage these stakeholders from the outset and to provide background information about the project.

These stakeholders are included in ***Table 8-2***.

Table 8-2: Key stakeholders contacted as part of the public participation process

OWNERS AND OCCUPIERS OF LAND ADJACENT TO THE SITE	
Refer to detailed database in Appendix H	
LOCAL AUTHORITY	
Innocent Ngumalo	Ward 11 Councillor
Nogubonga Kunene	KwaDukuza Municipality
Masupha Mathenjwa	Ilembe Municipality
PROVINCIAL AUTHORITY	
Dominic Wieners	Ezemvelo KZN Wildlife
Carolyn Schwegman	WESSA KZN
STATE DEPARTMENTS	
Roy Ryan	Department of Transport

8.3 Overview of the Scoping Phase PPP

The PPP undertaken during the Scoping Phase is presented in ***Figure 8-2***.

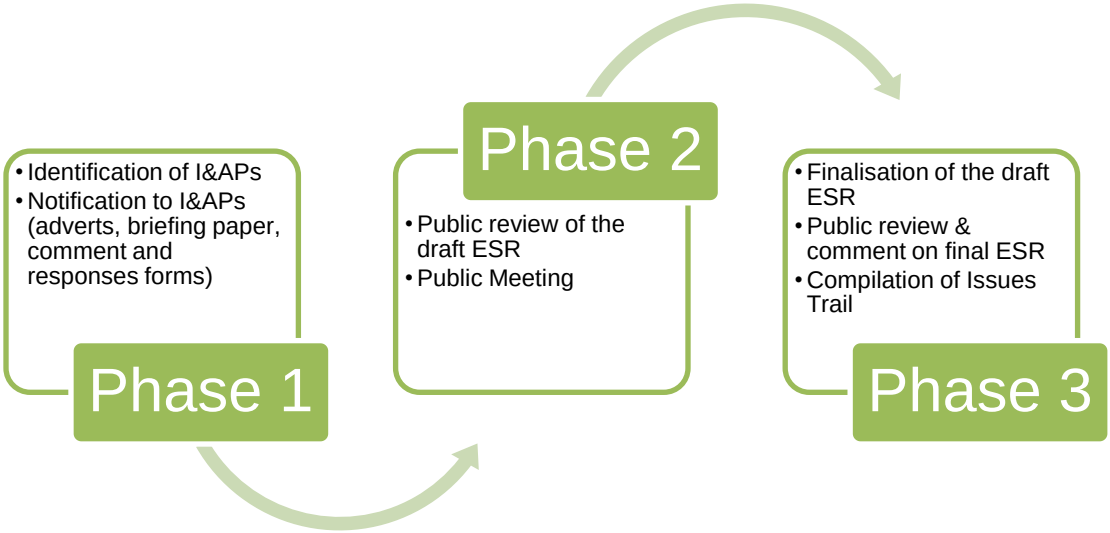

Figure 8-2: Key Phases in the PPP Undertaken During the Scoping Phase

8.3.1 Identification of Interested and Affected Parties

Prior to commencement of the PPP a detailed understanding of the project description was attained from the Applicant. Upon receiving the description a site visit was undertaken, this process was used to identify the following:

- Identify key areas of concern.
- Identify sites for the placing of the site notices.
- Attain a visual understanding of the project.
- Identify possible sites to undertake Focus Group Meeting / Public Meetings.
- Identify areas most impacted by the proposed development.

The first step in the PPP entailed the identification of key I&APs and Stakeholders, including:

- Local and provincial government;
- Local businesses;
- Residents;
- Affected and neighbouring landowners;
- Environmental Non-Governmental Organisations; and
- Community Based Organisations.

An I&AP Database was compiled which has been maintained and updated throughout the duration of the EIA process.

I&APs were identified primarily through an existing database as well as from responses received from the notice boards mentioned above. Electronic notification was sent to key stakeholders and other I&APs on the existing database, informing them of the application for the project, the availability of the draft ESR for review and indicating how they could become involved in the project.

The contact details of all identified I&APs are updated on the project database, which is included in ***Appendix H***.

8.3.2 Other Scoping Phase PPP Activities

The following tasks were also undertaken as part of the scoping phase PPP and details pertaining to each task can be found in the PPP Summary report included as ***Appendix H***:

- Site notification;
- Briefing paper / Background Information Document (BID);
- Advertisements;
- Public Meetings;
- Public Review of Draft Environmental Scoping Report;
- Issues Trail; and
- Final Environmental Scoping Report.

8.4 Overview of the EIA Phase PPP

The PPP undertaken / to be undertaken during the Scoping Phase is presented in ***Figure 8-3***.

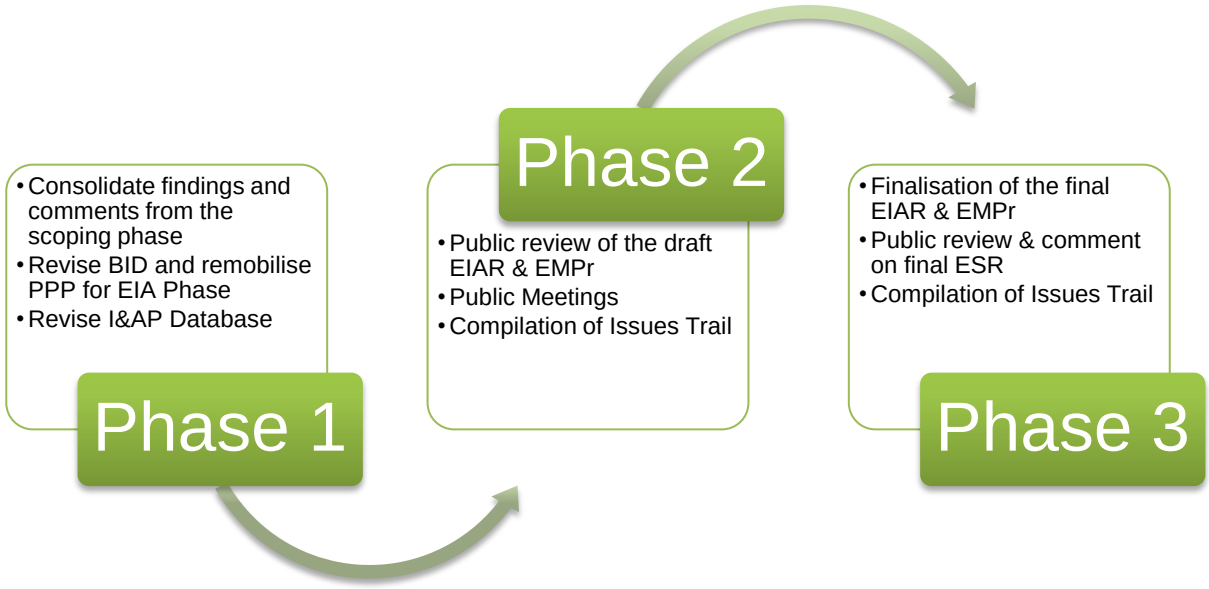

Figure 8-3: Key Phases in the PPP Undertaken During the EIA Phase

8.4.1 Revised Site Notices

Due to the time lag between the scoping and EIA phases and in the interest of ensuring a robust and transparent PPP, the site notices for the project was revised in February 2015 and placed at strategic locations on the perimeter of the site. The revised site notice is presented in ***Appendix H***.

8.4.2 Revised BID

Due to the time lag between the scoping and EIA phases and in the interest of ensuring a robust and transparent PPP, the briefing paper / BID for the project was revised in February 2015 and circulated to all registered I&APs, together with a registration/comment sheet inviting I&APs to submit details of any issues, concerns or inputs they might have with regards to the project. The revised BIDs were also distributed to all neighbouring landowners in the Tinley Manor and Sheffield Beach towns. The revised BID is presented in ***Appendix H***.

8.4.3 Advertising

In compliance with the EIA Regulations (2010), notification of the EIA Phase public meetings and availability of the draft EIAR was advertised in the following newspaper as follows:

- The Northcoast Courier Newspaper (27.03.2015).

8.4.4 Public Meetings

The primary aim of the public meetings is to:

- provide I&APs and stakeholders with information regarding the proposed project and associated infrastructure;
- provide I&APs and stakeholders with information regarding the EIA process;
- provide an opportunity for I&APs and stakeholders to seek clarity on the project;
- record issues and concerns raised; and
- provide a forum for interaction with the project team.

A public meeting will be held as follows:

- Regal Inn Ballito (23.04.2015 – 17h30).

8.4.5 Public and Authority Review of the Draft Environmental Impact Assessment Report

The draft EIAR has been made available for authority and public review for a total of 40 days from 30 March 2015 to 18 May 2015.

The report has been made available at the following public locations within the study area, which are all readily accessible to I&APs:

- Impulse by the Sea Restaurant: 167 Seaview Drive, Tinley Manor
- Tongaat Hulett Developments: Zimbali Resort Offices – Zimbali (Adjacent to Sales centre just before northern gatehouse)
- Royal HaskoningDHV Website: www.rhdhv.co.za/pages/services/environmental.php

8.4.6 Issues Trail

Issues and concerns raised during the PPP will continue to be compiled into an Issues Trail.

The Issues Trail to date, attached as ***Appendix H***, in which all comments received and responses provided have been captured.

8.5 Environmental Authorisation

On receipt of environmental authorisation (positive or negative) for the project, I&APs registered on the project database will be informed of this authorisation and its associated terms and conditions by correspondence and advertisement.

9 ENVIRONMENTAL IMPACT ASSESSMENT

9.1 Introduction

Impact assessment must take account of the nature, scale and duration of effects on the environment, whether such effects are positive (beneficial) or negative (detrimental). Each issue/impact is also assessed according to the project stages from planning, through construction and operation to the decommissioning phase. Where necessary, the proposal for mitigation or optimisation of an impact is noted. A brief discussion of the impact and the rationale behind the assessment of its significance is provided in this Section. The EIA of the project activities is determined by identifying the environmental aspects and then undertaking an environmental risk assessment to determine the significant environmental aspects. The environmental impact assessment is focussed on the following phases of the project namely:

- Construction Phase; and
- Operational Phase.

Due to the nature of Tinley Manor Southbanks it is anticipated that the infrastructure would be permanent, thus, not requiring decommissioning or rehabilitation. Maintenance of infrastructure will be addressed under the operational phase.

9.2 Impact Assessment Methodology

The potential environmental impacts associated with the project will be evaluated according to it nature, extent, duration, intensity, probability and significance of the impacts, whereby:

- ***Nature:*** A brief written statement of the environmental aspect being impacted upon by a particular action or activity;
- ***Extent:*** The area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact. For example, high at a local scale, but low at a regional scale;
- ***Duration:*** Indicates what the lifetime of the impact will be;
- ***Intensity:*** Describes whether an impact is destructive or benign;
- ***Probability:*** Describes the likelihood of an impact actually occurring; and
- ***Cumulative:*** In relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Table 9-1: Criteria to be used for the rating of impacts

Criteria	Description			
EXTENT	**National (4)** The whole of South Africa	**Regional (3)** Provincial and parts of neighbouring provinces	**Local (2)** Within a radius of 2 km of the construction site	**Site (1)** Within the construction site
DURATION	**Permanent (4)** Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient	**Long-term (3)** The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter. The only class of impact which will be non-	**Medium-term (2)** The impact will last for the period of the construction phase, where after it will be entirely negated	**Short-term (1)** The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase

Criteria	Description			
		transitory		
INTENSITY	**Very High (4)** Natural, cultural and social functions and processes are altered to extent that they permanently cease	**High (3)** Natural, cultural and social functions and processes are altered to extent that they temporarily cease	**Moderate (2)** Affected environment is altered, but natural, cultural and social functions and processes continue albeit in a modified way	**Low (1)** Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected
PROBABILTY OF OCCURANCE	**Definite (4)** Impact will certainly occur	**Highly Probable (3)** Most likely that the impact will occur	**Possible (2)** The impact may occur	**Improbable (1)** Likelihood of the impact materialising is very low

Significance is determined through a synthesis of impact characteristics. Significance is also an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Table 9-2: Criteria for the rating of classified impacts

Class		Description
+	**Any value**	Any positive / beneficial 'impact', i.e. where no harm will occur due to the activity being undertaken.
–	**Low impact (4 -6 points)**	A low impact has no permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction or operating procedure.
	Medium impact (7 -9 points)	Mitigation is possible with additional design and construction inputs.
	High impact (10 -12 points)	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment.
	Very high impact (12 - 14 points)	Permanent and important impacts. The design of the site may be affected. Intensive remediation is needed during construction and/or operational phases. Any activity which results in a "very high impact" is likely to be a fatal flaw.
Status		Denotes the perceived effect of the impact on the affected area.
Positive (+)		Beneficial impact.
Negative (-)		Deleterious or adverse impact.
Neutral (/)		Impact is neither beneficial nor adverse.
It is important to note that the status of an impact is assigned based on the status quo – i.e. should the project not proceed. Therefore, not all negative impacts are equally significant.		

The suitability and feasibility of all proposed mitigation measures will be included in the assessment of significant impacts. This will be achieved through the comparison of the significance of the impact before and after the proposed mitigation measure is implemented. Mitigation measures identified as necessary will be included in an EMPr.

9.3 Potential Impacts and Significance

The following sections will provide a description of the potential impacts as identified by the specialists, EAP and through the PPP as well as the assessment according to the criteria described in Table 9-1 and Table 9-2. All potential impacts associated by the proposed development through the construction and operation of the development life-cycle have been considered and assessed in the following sections. As the infrastructure is expected to be permanent, the decommissioning phase impacts have not been considered.

9.3.1 Soils and Agricultural Potential

Table 9-3: Tinley Manor Southbanks earth-works soils and agricultural potential impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities (site clearing). **Impact:** Physical degradation due to the removal and compaction of soil during construction activities.	**Without**	2	3	3	3	-11	**High**
		With	1	1	2	2	-6	**Low**
		Mitigation measures: ▪ Strip topsoil prior to any construction activities. ▪ Re-use topsoil as per the options presented in the Soil Management Framework Strategy (***Appendix B 3***). ▪ Topsoil must be kept separate from overburden and must not be mixed with other layer of soil and sub-soil.						
	Aspect: Construction activities (site clearing). **Impact:** Physical degradation due to soil erosion as a result of exposed soil and topsoil.	**Without**	3	4	3	4	-14	**Very high**
		With	1	1	2	3	-7	**Medium**
		Mitigation measures: ▪ Soil erosion is related to the water velocity and volume as well as the presence of well-established vegetation. Mitigation measures therefore include the development of velocity barriers for stormwater run-off and ensuring exposed areas are rehabilitated as detailed in the EMPr. ▪ The SMP must be complied with.						
	Aspect: Establishment of contractor laydown area (camp). **Impact:** Impact on land use and land capability – disturbance of soils and/or agricultural land use potential due to the location of the construction camp and associated infrastructure.	**Without**	3	4	3	4	-14	**Very high**
		With	1	1	2	3	-7	**Medium**
		Mitigation measures: ▪ The contractor laydown area must be placed in an area where erven will be developed and not in an area that will be utilised in future as an open space or commercial. ▪ The contractor laydown area may not be placed in or in close proximity to the wetland habitat on-site. ▪ No material may be stored or equipment repaired beyond the boundaries of the contractor laydown area.						
Cumulative	Impact on food security due to loss of agricultural land.	**Without**	3	4	3	4	-14	**Very high**
		With	1	1	2	3	-7	**Medium**
		Mitigation measures: ▪ THD have submitted a plan to address loss of agricultural land as a result of their developments to the Department of Agriculture and other areas have been identified with good agricultural potential.						

9.3.2 Geology and Topography

Table 9-4: Tinley Manor Southbanks geological impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Foundations. **Impact:** Disturbance of surface geology for development foundations resulting in site instability due to inadequate drainage and/or inappropriate engineering planning and interventions.	**Without**	1	2	3	3	-9	**Medium**
		With	1	2	1	2	-6	**Low**
		Mitigation measures: ▪ It is important to allow for on-site inspections and evaluations by an experienced engineering geologist / geotechnical engineer so that stability problems can be timeously identified and remedied. ▪ It is important to ensure that the design of the development promotes stable development. ▪ All earth-works should be carried out in a manner to promote stable development of all infrastructure. It is recommended that earth-works be carried out along the guidelines given in SANS 1200 (current version). ▪ Where necessary, subsoil drains must also be provided particularly if fills are constructed over water logged / marshy areas and drainage courses. ▪ Earth-works and drainage measures should be designed in such a way as to prevent ponding of, or high concentrations of, stormwater or groundwater anywhere on the sites. ▪ The terrace should be shaped to a gradient to prevent water ponding on the surface and should be graded to direct water away from the fill edges and foundations. ▪ Where possible, individual dwelling plots on the steeper slopes should be designed to have their axes orientated in an up-downslope direction, rather than along the contours. Therewith, associated cut and fill slopes can be contained within individual plot boundaries. ▪ Cuts: - Permanent cut slopes in all unconsolidated colluvial, residual and wind blown sediment should be restricted to a maximum slope batter of 1:2 (26°). Temporary slopes in these materials can be steepened to 1:1,75 (30°) at the discretion of a responsible engineer. - Cuts in firmly bedded, favourably dipping (into the slope) sandstone, siltstone or shale, or dolerite bedrock, may be laid back to a batter of 1:1,5 (33°). Cut slopes should not exceed a maximum height of 3 m without being assessed by a responsible engineer or suitably retained if necessary. - All cut embankments must be protected against surface erosion by planting of vegetation after construction. - Should the above mentioned slope dimensions be not possible due to space restrictions the embankment will need to be adequately retained. In additions, within the loose sandy aeolian sediment, Berea Formation and sandy colluvium, excavations greater than 1.2 m where not battered back should be suitably shored. ▪ Fills: - Fill platforms should not be engineered into any unstable materials or where instability is likely to be induced by the placement of the fill. Prior to their placement all vegetation should be grubbed clear. Where fills are placed on side slopes with colluvial and residual clayey material rock fill toes will be						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
		necessary (and/or geogrids for thick clay areas) in addition to benching into the underlying in-situ material to increase the stability of the fill and slope as a whole. - Fills should be constructed in layers of maximum 300 mm loose thickness and compacted to 93% and 95% of the materials maximum Mod AASHTO identity for more clayey and sandy materials respectively prior to the placement of the next layer. The maximum particle size within the fill should not exceed two thirds of the layer thickness. - Permanent fill batters should be laid back to a slope angle of 1:2 (26°) and should not exceed a maximum height of 3 m without being suitably retained. Once complete the fill embankment should be vegetated to minimise surface erosion. - For generally well constructed engineered fills, settlement of up to 1% of the fill thickness should be anticipated. As such settlement across the cut to fill line should be anticipated during the planning of the proposed development. ▪ Founding: - Where the depth to weathered bedrock is less than about 1.5 m, normal strip or column base foundations are considered feasible provided the foundations are taken through the clayey residual and colluvial soils to bear into firmly bedded shale or sandstone or firm dolerite bedrock. - Where deep colluvial and residual clayey soils occur overlying weathered bedrock, or on cut/fill platforms where deep fills occur, deep founding measures will be required. In this regard, we recommend that structures be supported on reinforced ground beams spanning deep column base (<2.5 m to bedrock) or end bearing pile foundations (>2.5 m to bedrock) taken into firm weathered bedrock. - Similarly for areas underlain by loose aeolian dune sand and/or Berea Formation sands and clayey sands, it is recommended strictures be supported on reinforced ground beams spanning friction piles taken to the required depth. - Alternatively, for compact structures, where deep clayey soils or loose sandy soils occur, structures may be supported on suitably designed reinforced concrete raft foundations. - With the exception of the raft foundations, given the clayey potentially active soils and sandy potentially collapsible soils present, the ground floor slabs of all structures supported on piles, strips or column bases should be isolated from all walls, columns and foundations and incorporate suitable articulation and joints to accommodate any potential differential settlement that may occur. - Notwithstanding the above, it is necessary that detailed geotechnical investigations are carried out for the individual developments proposed in the area once the details of these developments are made available.					
	Aspect: Construction activities (site clearing). **Impact:** Gully or donga erosion by	**Without**	1	2	2	2	-7	**Medium**
		With	1	1	1	1	-4	**Low**
		Mitigation measures: ▪ Cut embankments must be protected against surface erosion by the establishment of vegetation immediately after construction. ▪ Suitable subsoil drainage, stormwater control and preventable solutions to avoid soil erosion will be						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	concentrated, uncontrolled water-flow.	essential for most development into the loose sands in the south eastern area. ▪ Adequate stormwater surface drainage as per the stormwater management plan must be adopted.						
	Aspect: Surplus fill material stockpiles. **Impact:** Large quantities of surplus fill material generated as a result of extensive cutting that cannot be used as back-fill will need to be stockpiled on site thereby altering the topography.	**Without**	2	4	3	4	-13	**Very high**
		With	2	2	2	3	-9	**Medium**
		Mitigation measures: ▪ All temporary stockpiles must be restricted to designated areas. ▪ Stockpiles created during the construction phase are not to remain during the operational phase. ▪ The contractor must be limited to clearly defined access routes to ensure that sensitive and undisturbed areas are not disturbed. ▪ Potential to mix poor quality material with lime and/or good quality material to obtain a suitable quality that can be sandwiched in earth-works between layers of good material (where possible). ▪ It is important to allow for on-site inspections and evaluations by an experienced engineering geologist/geotechnical engineer so that material can be classified and an appropriate use identified timeously. ▪ It is important to ensure material is classified and separated timeously so as to avoid mixing of good quality material with poor quality material. ▪ Suitable erosion control and rehabilitation measures must be implemented at stockpiles and surplus fill material sites as detailed in the EMPr and Soil Management Framework Strategy.						

9.3.3 Geohydrology

Table 9-5: Tinley Manor Southbanks geohydrological impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** ▪ Improper storage of fuels, chemical etc. ▪ Construction equipment, vehicles, workshop and wash bay areas ▪ Inadequate ablutions. **Impact:** Groundwater contamination as a result of: ▪ Spillage of fuels, lubricants and other chemicals. ▪ Construction equipment,	**Without**	1	1	3	3	-8	**Medium**
		With	1	2	1	2	-6	**Low**
		Mitigation measures: ▪ Potentially hazardous substances must be stored on an impervious surface in a designated bunded area, able to contain 110% of the total volume of materials stored at any given time. ▪ Material safety data sheets (MSDSs) are to be clearly displayed for all hazardous materials. ▪ The integrity of the impervious surface and bunded area must be inspected regularly and any maintenance work conducted must be recorded in a maintenance report. ▪ Employees should be provided with absorbent spill kits and disposal containers to handle spillages. ▪ Train employees and contractors on the correct handling of spillages and precautionary measures that need to be implemented to minimise potential spillages. ▪ All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability. No repairs may be undertaken beyond the contractor laydown area. ▪ Immediate reporting and rectification of any incident that might lead to pollution. Implementation of best						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	vehicles, workshop and wash bay areas will be a likely source of pollution as a non-point source. ▪ Lack of provision of ablutions that may lead to the creation of informal ablutions.	practice methods to prevent potential incidents from occurring e.g. an Environmental Management System (EMS) reporting and monitoring system. ▪ An Emergency Preparedness and Response Plan will be developed and implemented should and incident occur. ▪ Access to storage areas on-site must be restricted to authorised employees only. ▪ Contractors will be held liable for any environmental damages caused by spillages. ▪ The construction workforce must have adequate sanitation facilities. ▪ The sanitation facilities should be on-site before the extended workforce is employed to ensure that no unauthorised sanitation practices are implemented on-site. ▪ Potential construction practices that might lead to groundwater contamination should be conducted on areas with impervious surfaces to avoid infiltration of contaminated substances into the groundwater aquifer. ▪ All contaminated stormwater should be treated before being discharged into the surrounding natural environment.						
	Aspect: Construction routes through wetland systems. **Impact:** Compacting of soils may lead to changes in subsurface water flow.	**Without**	3	3	4	3	-13	**Very high**
		With	2	2	2	2	-8	**Medium**
		Mitigation measures: ▪ Construction routes, through wetland systems should have adequate drainage to avoid the damming of water and the hindering of natural sub-surface water flow.						
Operational	**Aspect:** Gravitation of sewage to WWTWs. **Impact:** Leaks of untreated water and sewage from pipelines may occur and impact on the shallow groundwater quality.	**Without**	2	1	2	1	-6	**Low**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ All sewage will be gravitated to appropriate WWTWs. Any leaks should be fixed immediately and areas rehabilitated as needed.						

9.3.4 Hydrology

Table 9-6: Tinley Manor Southbanks hydrological impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Clearing of vegetation and topsoil. **Impact:** Cleared vegetation and topsoil placed near drainage areas can divert clean water into dirty water areas, cause waterlogging of adjacent areas or pollute water resources.	**Without**	2	3	3	3	-11	**High**
		With	1	1	2	2	-6	**Low**
		Mitigation measures: ▪ Place all removed / excavated vegetation and topsoil in demarcated overburden stockpile areas to prevent obstruction of natural drainage paths.						
	Aspect: Waste generation during construction. **Impact:** Builders' rubble, packaging and other waste generated in the construction process can contaminate surface water resources.	**Without**	3	3	3	3	-12	**High**
		With	2	1	2	2	-7	**Medium**
		Mitigation measures: ▪ An adequate number of general waste receptacles, including bins must be arranged around the site to collect all domestic refuse, and to minimise littering. ▪ Bins should be clearly marked and lined for efficient control and safe disposal of waste. ▪ A fenced area must be allocated for waste sorting and disposal on the site. ▪ General waste produced on-site is to be collected in skips for disposal at the Buffelsdraai Landfill Site. Hazardous waste is not to be mixed or combined with general waste. ▪ Under no circumstances is waste to be burnt or buried on-site. ▪ Waste bins should be cleaned out on a regular basis to prevent any windblown waste and/or visual disturbance. ▪ All general waste must be removed from the site at regular intervals and disposed of in suitable waste receptacle. ▪ Hazardous waste is to be disposed at a Permitted Hazardous Waste Landfill Site. The Environmental Officer (EO) must have as part of his/her records the waste manifest for each batch based disposal. ▪ Hazardous waste bins must be clearly marked, stored in a contained area (or have a drip tray) and covered (either stored under a roof or the top of the container must be covered with a lid). ▪ A hazardous waste disposal certificate must be obtained from the waste removal company as evidence of correct disposal. ▪ In the case of a spill of hydrocarbons, chemicals or bituminous, the spill should be contained and cleaned up and the material together with any contaminated soil collected and bioremediated.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	Aspects: ▪ Storage of fuels, lubricants and chemicals. ▪ Construction-related activities such as cement batching. ▪ Construction equipment, vehicles and workshop areas. ▪ Inadequate ablutions. **Impact:** Contaminated run-off due to: ▪ Spillage of fuels, lubricants and other chemicals; ▪ Inadequate stormwater management around the site; the dumping of construction material, including fill or excavated material into, or close to surface water features that may then be washed into these features; ▪ Construction equipment, vehicles and workshop areas will be a likely source of pollution as a non-point source; and ▪ Lack of provision of ablutions that may lead to the creation of 'informal ablutions' within or close to a surface water resource.	**Without**	3	2	3	2	-10	**High**
		With	2	2	2	1	-7	**Medium**
		Mitigation measures: ▪ Appropriate design of facilities to handle fuels and toxic waste. Chemical storage areas to be bunded so that if a spill occurs the chemical will be contained. ▪ Ensure that all spills are immediately cleaned up as per the requirements of the EMPr (***Appendix B***). ▪ Keep construction activities away from the surface water resources. ▪ Adequate provision of ablutions for construction employees. ▪ Wastewater must not be allowed to come into direct contact with exposed soils or run across the site. ▪ Vehicles and machinery may not be washed on-site. ▪ All wastewater must be collected in a sealed container and disposed of by an approved waste contractor. Waybills must be retained for inspection.						
	Aspect: Development of hardened surfaces (platforms etc.). **Impact:** Increased stormwater run-off	**Without**	2	2	2	1	-7	**Medium**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ Land disturbance must be minimised in order to prevent erosion and run-off – this includes leaving exposed soils open for a prolonged period of time.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	due to hardened surfaces.	▪ As soon as vegetation is cleared (including alien) the area must be re-vegetated if it is not to be developed on in future. ▪ The SMP must be complied with.						
	Aspect: Land use changes. **Impact:** Alteration of surface water resources due to land use changes.	**Without**	3	2	3	2	-10	**High**
		With	2	2	2	1	-7	**Medium**
		Mitigation measures: ▪ A Wetland and Open Space Rehabilitation Plan must be compiled to provide detailed recommendations regarding off-sets and rehabilitation.						
	Aspect: Abstraction of water from the Umhlali River. **Impact:** Consumption and use of surface water for construction purposes (i.e. water tankers for dust suppression).	**Without**	3	2	1	1	+7	**Medium**
		With	3	2	1	1	+7	**Medium**
		Mitigation measures: ▪ Responsible abstraction methods are employed as required by the DWS's WUL.						
Operational	**Aspect:** Gravitation of sewage to WWTWs. **Impact:** Leaks of untreated water and/or sewage from pipelines may occur that will impact on the shallow groundwater quality.	**Without**	2	1	2	1	-6	**Low**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ All sewage will be gravitated to appropriate WWTWs. Any leaks should be fixed immediately and areas rehabilitated as needed.						
Cumulative	Increased stormwater run-off from urban infrastructure and roads and risk of flooding.	**Without**	2	2	3	4	-11	**High**
		With	2	1	1	2	-6	**Low**
		Mitigation measures: ▪ The SMP must be implemented. ▪ Improved wetland functionality and zero net-loss approach regarding wetland areas. ▪ Protection of the natural watercourses to prevent pollution, erosion and retain run-off. ▪ Promotion of subsoil infiltration where possible. ▪ Provision of indigenous vegetation along watercourses and stabilisation of banks. ▪ Attention to development of on-site use rainfall attenuation and provisions for reducing run-off by in-catchment and on-site evaporation and evapo-transpiration.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
		▪ Local flood risk reduction by selection of appropriate design standards for road bridges, culverts and stormwater attenuation facilities. ▪ Implementation of adequate on-site and localised stormwater management practices. ▪ Attenuation of flood peaks to predevelopment levels at the 2% (50-year) and the 10% (10-year) risk level. ▪ Providing new impermeable areas with sufficient flood attenuation and evaporation provisions. ▪ Rehabilitation and upgrading of open spaces following conversion from sugarcane.					

9.3.5 River and Estuary

Table 9-7: Tinley Manor Southbanks river and estuarine impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Earth-works, installation of infrastructure and surplus fill material sites. **Impact:** Erosion and sedimentation impact on water quality and clarity of the system leading to a change in the biotic communities and reducing the functionality and aesthetics of the system leading to an irreversible change in estuarine status.	**Without**	3	3	4	2	-12	**High**
		With	1	2	2	2	-7	**Medium**
		Mitigation measures: ▪ Management of the Surplus Fill Material Site must be done in accordance with the EMPr (***Appendix B***) and Soil Management Framework Strategy (***Appendix B 3***). ▪ Significant erosion control measures needed and site clearing done in a phased manner. ▪ Monitoring of in situ turbidity and total suspended solids pre-construction, during construction and for life of development. ▪ Wind-screening and sustainable stormwater control should be implemented to prevent soil loss from the site and reduce erosion channels forming (e.g. A network of co-ordinated shallow drains should be constructed during the land clearing phase). ▪ Filter strips (grass buffer strips) must be implemented wherever possible but as a minimum around the perimeter of the each development cluster as soon as construction is initiated. ▪ Sustainable urban drainage methods, such as porous paving techniques and grass swales, must be incorporated into the design concept to assist in flow attenuation. ▪ Topsoil must be conserved and re-used for rehabilitation purposes. ▪ Soil stockpiles must be positioned at least 50 m away from the estuary, watercourse and stormwater drains, and not on steep slopes. ▪ Unnecessary removal of indigenous vegetation, especially on steep areas, should be avoided. ▪ The removal of vegetation should only occur just prior to construction. ▪ Cleared areas should not be left exposed, and should be promptly rehabilitated / vegetated with indigenous plants. ▪ Landscaping and re-vegetation should take place perpendicular to the slope to reduce flow velocities and minimise erosion. ▪ Post construction, all areas disturbed by construction, including the site camp area, must be						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		rehabilitated. ▪ No development should be constructed below the 1:100 year floodline or the recommended 10 m amsl contour (whichever is intercepted first from the point of development), as these areas are susceptible to erosion during storm events, flooding, and natural back flooding of the estuary. ▪ No indigenous vegetation along the estuary margin must be removed.						
	Aspect: Establishment of surplus fill material sites. **Impact:** Impact on water quality and physical characteristics of the estuary resulting in a disruption of ecological function due to construction activities and surplus fill material sites.	**Without**	3	3	4	3	-13	**Very high**
		With	2	2	2	2	-8	**Medium**
		Mitigation measures: ▪ Reduction of pulsed water returns to the estuary using only essential stormwater attenuation measures. ▪ 'Scrubbing' of excess nutrients and biological filtering of the water prior to it reaching the Umhlali Estuary or any of its tributaries i.e. creative solutions regarding the attenuation of stormwater. ▪ Return water to the estuary post-development should emulate as far as possible the virgin MAR. ▪ The Stormwater Management Plan must be adhered to (***Appendix B 2***). ▪ All buildings and infrastructure, such as sewer pipelines and roadways of the proposed development, must be setback from the 5 m contour as an absolute minimum. ▪ Artificial environments such as lawns and sports grounds should also be restricted by the estuary boundary. ▪ Any clearing of vegetation within this area for improved vistas should not take place, and should require approval if considered necessary. ▪ Areas that were previously planted with sugarcane within the estuarine functional zone should be rehabilitated to reflect the natural supporting habitats of the estuary (e.g. swamp forest, reed beds, wetlands, riverine habitats). ▪ The infilling of wetlands and estuarine habitat, and any other methods to reduce such environments, cannot be supported. ▪ Although the boardwalks may be constructed within the estuarine boundary, the design must ensure the unobstructed/unimpeded flow of water, the least disturbance to sensitive habitats, the shortest span, and that the least harmful materials and methods are used, to ensure minimal impact on the aquatic environment. ▪ The construction of solid concrete jetties and slipways, and other hard edges, on the estuary must not be allowed. In addition, the number of access points and wooden structures (boardwalks, jetties, bird hides) should be kept to a minimum. ▪ Rehabilitation of the watercourse is undertaken immediately when disturbance to the estuarine functional zone first becomes apparent.						
	Aspect: Improper disposal of sewerage and solid waste. **Impact:** Sanitation / sewerage / solid	**Without**	3	2	2	2	-9	**Medium**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ Adequate facilities provided to construction staff. ▪ Siting of construction camps far from estuary and tributary catchment areas. ▪ Detailed methods for solid waste disposal are outlined in the EMPr (***Appendix B***) and must be adhered						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	waste disposal into the river influencing water quality, health of biota and the aesthetics of the estuary.	to.						
Operational	**Aspect:** Improper disposal of sewerage and solid waste. **Impact:** Sanitation / sewerage / solid waste disposal into the river influencing water quality, health of biota and the aesthetics of the estuary.	**Without**	3	2	2	2	-9	**Medium**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ Adequate facilities to be provided to the community. ▪ Community to be educated regarding the ecological importance of the river and estuary.						
	Aspect: Inadequate stormwater management and water contamination. **Impact:** Impact on water quality and physical characteristics of the estuary resulting in a disruption of ecological function due to contaminated stormwater and groundwater run-off.	**Without**	2	3	2	2	-9	**Medium**
		With	1	2	2	2	-7	**Medium**
		Mitigation measures: ▪ Direct stormwater discharge into the Umhlali Estuary is strongly discouraged, and any potential influences on the natural functioning of the estuary mouth must be prevented. ▪ The SMP (***Appendix B 2***) must be adhered to. ▪ Pesticides should not be applied to the grounds of the proposed development. If the use of chemicals is deemed necessary, a trained aquatic scientist and horticulturalist should be consulted in order to determine what chemicals can be used, in what quantities and during which seasons. ▪ The use of fertilisers in proposed market gardens should be kept to a minimum, as contaminated run-off will contribute to nutrient enrichment and potential eutrophication if it reaches the estuary.						
Cumulative	Disturbance and utilisation of the estuary as a result of an increase in the number of people.	**Without**	3	4	4	2	-13	**Very high**
		With	2	3	3	2	-10	**High**
		Mitigation measures: ▪ A suitable buffer must be maintained to the Umhlali Estuary. 50 m is suggested unless otherwise authorised. ▪ Corridor and buffer areas need to be designed to facilitate movement and linkages between the open space areas and the estuary. ▪ Corridor and buffer areas also need to be designed to minimise negative impacts both direct and indirect which may result from run-off and disturbance; and ▪ Methods for restoration of the buffer to be drawn up by a specialist and form part of the EMPr. ▪ No fence should be erected between the development and the estuary. ▪ It is vitally important that an Estuary Management Plan be developed for the Umhlali Estuary to regulate the use of resources and activities within the system, to minimise user conflict and to ensure sustained						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		estuarine health. While this is a legislative requirement in terms of the ICM Act, it is the responsibility of the Municipality.						
	Rehabilitation of the buffer and conservation areas and the provision of ecological corridors leading to increased biodiversity value of the river and estuary and protection of the estuary from associated land based activities.	**Without**	2	2	2	2	+8	**Medium**
		With	3	3	3	4	+13	**Very high**
		Mitigation measures: ▪ Corridor areas designed for movement and linkages between the open space areas and the upper river catchment and the coast. ▪ No fences should be erected which will as a barrier to this movement. ▪ Rehabilitation to be done according to a Wetland and Open Space Rehabilitation Plan. ▪ The design of the development perimeter fencing should consider the movement of animals (e.g. antelope) between the estuary and the conservation areas.						

9.3.6 Wetlands

Table 9-8: Tinley Manor Southbanks wetland impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Construction lay-down areas. **Impact:** ▪ Impacts related to worker ingress and potential degradation of wetlands. ▪ Potential contamination and pollution impacts from stored oils, fuels, and other hazardous substances or materials are also a possibility. ▪ Site clearing may be required in the wetland in order for the lay-down area to be established, this will result in the clearance / removal of vegetation at the surface leaving the wetlands vulnerable to	**Without**	1	2	2	2	-7	**Medium**
		With	1	1	2	2	-6	**Low**
		Mitigation measures: ▪ Construction should ideally be scheduled to take place during winter when flows are lowest (preferably May and August). ▪ Lay-down areas must not be situated in any wetlands or associated buffer zones. ▪ All wetlands must be clearly demarcated for the duration of the pre-construction and construction phases. ▪ Utilisation of Bonnox fencing or wooden stakes at sufficient height that is visible from a distance must be used. ▪ Storage of materials, liquids or solid / hazardous and non-hazardous are not to be located in any of the wetlands or the associated buffer zones. ▪ Vehicles must be kept at least 100 m from any of the wetlands. ▪ Operational fire extinguishers are to be available in the case of a fire emergency. ▪ It is recommended that a fire management and emergency plan be compiled by a suitably qualified health and safety officer and implemented for the development.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	erosion and sedimentation impacts.							
	Aspect: Construction of earth-worked platforms, roads, pipelines and other infrastructure (including stormwater attenuation facilities where proposed). **Impact:** Potential loss of wetland area and increased surface run-off.	**Without**	2	4	2	4	-12	**High**
		With	1	1	2	2	-6	**Low**
		Mitigation measures: ▪ No vehicles are allowed in the demarcated wetlands areas unless authorisation from the DWS and the relevant environmental authorities has been applied for and granted. ▪ Existing roads are to be used where possible. ▪ New roads must be planned to avoid all wetlands. Additionally, road designs must integrate adequate measures to prevent the generation of increased run-off for temporary access areas (dirt roads) as well as roads that will be developed for the operational phase of the proposed development. ▪ The SMP must be complied with. ▪ No culvert bridges are to be established. However, only where this is completely unavoidable and authorisation has been granted from the relevant environmental and water authorities, any bridges that will be constructed must be designed so as to limit the disruption, constriction or canalisation of flow under them. ▪ Disturbance to the wetland soils along the road crossing footprint should be restricted to an established construction ROW corridor. The ROW corridor within the wetland should be as narrow as practically possible and should be demarcated and fenced off during the site setup phase to the satisfaction of the ECO. The construction ROW should comprise the road and embankment footprint only. All wetland areas outside of the demarcated ROW must be considered no-go areas. ▪ All vehicles and machinery are to be checked for oil, fuel or any other fluid leaks before entering the construction areas. All vehicles and machinery must be regularly serviced and maintained. ▪ No fuelling, re-fuelling, vehicle and machinery servicing or maintenance is to take place within 100 m of any of the wetlands. ▪ The construction site is to contain sufficient safety measures throughout the construction process to deal with accidental spills. These include, but are not limited to, oil spill kits, fire extinguishers, fuel, oil or hazardous substances storage areas must be bunded to 110% volume to prevent oil or fuel contamination of the ground and/or nearby surface water resource or associated buffer zone. ▪ No hazardous materials are to be stored or brought within 100 m of any of the wetlands. Should a designated storage area be required, the storage area must be placed at the furthest location from the sensitive areas. Appropriate safety measures as stipulated above must be implemented.						
	Aspect: Clearing of vegetation for platforms and infrastructure. **Impact:** Increased erosion, sedimentation and scouring into	**Without**	2	2	3	3	-10	**High**
		With	1	1	2	1	-5	**Low**
		Mitigation measures: ▪ Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	remaining wetlands.	▪ If possible, construction activities should be scheduled to minimise the duration of exposure to bare soils on site, especially steep slopes. The full extent of works shall not be stripped of vegetation prior to commencing other activities. ▪ A row of silt fences and sandbags must be established along the wetland buffer edge prior to construction commencing. These silt fences and sandbags must be regularly checked and maintained and should only be removed once vegetation has successfully colonised the embankments. ▪ Any steep or large embankments expected to be exposed during the 'rainy' months should either be armoured with fascine like structures / silt fences or grassed immediately with strip sods established at regular intervals (50-100 cm) down the bank with hydro-seeding between the strip sods. ▪ Where the bare surface of platforms slope towards the edge of an embankment, silt fences and sandbags must be established along the crest of the embankment. ▪ If preferential flow routes on the sloped platform occur, these flow routes must be intercepted with a series of sandbags. ▪ All platforms above buffer zones must have a slight back-fall to divert run-off away from the fill embankments. Platform run-off must be diverted away from the platforms *via* some sort of diversion structure, preferably a grassed swale or open drain. This run-off must be diverted into the formal stormwater network where possible. If no formal stormwater system is possible, the diverted run-off must be diverted to a temporary detention pond or temporary outlets armoured against erosion. ▪ Once the roads and platform formal stormwater reticulation network are established, silt traps and sand bags should be used throughout the construction site to prevent eroded sediment from being washed into the wetlands from un-grassed, bare/exposed areas. This applies particularly to areas where earth-works occur directly above or in the vicinity of the wetlands. ▪ After every rainfall event, the contractor must check the site for erosion damage and rehabilitate this damage immediately. ▪ Erosion rills and gullies must be filled-in with appropriate material and silt fences or fascine work must be established along the gulley for additional protection until grass has re-colonised the rehabilitated area. ▪ It is important that all of the above-listed mitigation measures are costed for in the construction phase financial planning and budget so that the contractor and/or developer cannot give financial budget constraints as reasons for non-compliance. Proof of financial provision of these mitigation measures must be submitted to the ECO prior to construction commencing.						
Operational	**Aspect:** Stormwater run-off as a result of hardened infrastructure. **Impact:** Siltation of wetland as a result of stormwater attenuation facilities proposed.	**Without**	2	2	2	2	-8	**Medium**
		With	2	1	2	1	-6	**Low**
		Mitigation measures: ▪ An operational SMP must be designed. This plan must consider the use of energy dissipation structures in the overall design. Importantly, all discharge points must make use of energy dissipation structures. It may be required that an attenuation pond is necessary to assist with storm water management. ▪ It is likely that the position of the attenuation pond will need to be situated in a low lying valley bottom area. However, the position of the attenuation pond must not be located in a wetland area but rather outside of it.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		▪ Additionally, every effort must be made so that run-off levels are adequately calculated so as not to completely obstruct flows to wetlands that rely on water inputs. ▪ Natural run-off levels will therefore need to be calculated and taken into consideration when designing attenuation structures.						
Cumulative	Improvement in the health of wetlands as a result of rehabilitation of the wetland and buffer zones.	**Without**	2	1	1	2	+6	**Low**
		With	2	3	3	4	+12	**Very high**
		Mitigation measures: ▪ A Wetland and Open Space Rehabilitation Plan must be compiled. ▪ The public must be educated on the importance of wetland preservation.						

9.3.7 Biodiversity

Table 9-9: Tinley Manor Southbanks biodiversity impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Construction of roads and development of fill embankments and site clearing. **Impact:** Loss of indigenous vegetation and proliferation of alien invasive species, as there are many areas surrounding the site that have high infestations of alien plant species, and will provide seed for dispersal by the various vectors, such as birds, bats and small mammals.	**Without**	1	1	1	3	-6	**Low**
		With	1	1	1	1	-4	**Low**
		Mitigation measures: ▪ Continued control of alien invasive species during the construction phase as per the requirements of the EMPr. ▪ Planting of “desirable” plant species immediately after the construction phase so that these species can establish and thus prevent large stands of infestations which become difficult to control and manage. ▪ 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.						

9.3.8 Coastal

Table 9-10: Tinley Manor Southbanks coastal impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Vulnerability to climate change. **Impact:** Increased risk of flooding and erosion.	**Without**	2	3	3	3	-11	**High**
		With	1	3	1	1	-6	**Low**
		Mitigation measures: ▪ Adherence to the limited development line (i.e. setting back any proposed development from the coast) and the maintenance (and potentially rehabilitation/re-establishment) of natural coastal vegetation.						
	Aspect: Pollution of dune forests and coastal zones. **Impact:** Dumping of waste and litter. Contaminated run-off due to: ▪ Spillage of fuels, lubricants and other chemicals; ▪ Inadequate stormwater management around the site; the dumping of construction material, including fill or excavated material into, or close to surface water features that may then be washed into these features; ▪ Construction equipment, vehicles and workshop areas will be a likely source of pollution as a non-point source; and ▪ Lack of provision of ablutions that may lead to the creation of 'informal ablutions' within or close to the coastal zone.	**Without**	2	3	3	3	-11	**High**
		With	1	3	2	1	-7	**Medium**
		Mitigation measures: ▪ The establishment of site construction camps should be kept to a minimum. ▪ All site camps and storage areas for any development must be sited away from drainage lines, wetlands, steep slopes and other environmentally sensitive areas. ▪ Most importantly, construction and associated activities must be undertaken according to the EMPr and must be monitored daily by an on-site environmental officer. ▪ All solid waste must be removed as soon as possible from each construction point and the broader development site to an appropriate disposal facility. ▪ Dumping of vegetation off-cuts in aquatic habitats is not recommended. ▪ Regular monitoring of the periphery of construction camps must be undertaken and any accumulated waste removed and disposed of at an appropriate disposal facility. ▪ A method statement in respect to the use, handling, storage and disposal of all chemical and contaminated waste must be compiled and submitted as part of any EMPr. ▪ All chemicals must be stored in specifically demarcated and secured areas, which are suitably lined to avoid any contamination. ▪ An Emergency Response Plan for accidental spillages of chemical substances must also be developed. ▪ Every effort must be made to prevent the discharge of any pollutants, such as fuels, cements, concrete, lime, and chemicals into any aquatic or coastal habitats. ▪ Regular water quality monitoring of all waster courses and wetlands must be undertaken for the early detection of harmful substances. ▪ In the event of a spill from any construction contractor, resident or hotel operator, a penalty should be issued and the 'polluter pays' principle should be applied for clean-up operations and rehabilitation, if necessary. ▪ Waterborne sanitation infrastructure must be prioritised over discrete infrastructure such as septic tanks, soak pits and French drains. Under no circumstances must stormwater and sanitation infrastructure be linked such that sewage and stormwater are mixed.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		▪ Pesticides should not be applied to the grounds of the proposed development. If the use of chemicals is deemed necessary, a trained aquatic scientist and horticulturalist should be consulted in order to determine what chemicals may be used, in what quantities and during which seasons. ▪ The use of fertilizers in proposed market gardens should be kept to a minimum, as contaminated run-off will contribute to nutrient enrichment and potential eutrophication if it reaches the estuary.						
	Aspect: Clearing of vegetation for platforms and infrastructure. **Impact:** Increased erosion, sedimentation and scouring.	**Without**	2	3	3	3	-11	**High**
		With	1	2	2	1	-6	**Low**
		Mitigation measures: ▪ Best-practice construction methods must be implemented to reduce erosion, particularly in steep areas. This potential impact is easily and significantly reduced if the following mitigation measures are implemented: - The development layout must take the natural drainage patterns of the site into account, such that buildings and other infrastructure do not concentrate flowing water (especially during high rainfall events); - Changes to the natural topography must be minimised, and the shape of mature dunes and other natural features must be retained at all costs; - Wind-screening and sustainable stormwater control should be implemented to prevent soil loss from the site and reduce the formation of erosion channels (e.g. a network of co-ordinated shallow drains should be constructed during the land clearing phase); - Filter strips (grass buffer strips) must be implemented wherever possible but as a minimum around the perimeter of the each development cluster as soon as construction is initiated; - Sustainable urban drainage methods, such as porous paving techniques and grass swales, must be incorporated into the design concept to assist in flow attenuation; - The removal of vegetation must only be undertaken as it becomes necessary for work to proceed and unnecessary removal of indigenous vegetation (especially in steep areas) should be avoided; - The time that stripped areas are left open to exposure should be minimised wherever possible. Care should be taken to ensure that lead times are not excessive; - Wind screening and storm water control should be undertaken to prevent soil loss from the site during construction; - Topsoil must be conserved and re-used for rehabilitation purposes; - Procedures that are in place to conserve topsoil during the construction phase of the project are to be applied at the set up phase i.e. topsoil is to be conserved while providing access to the site and setting up the camp; - The removal of vegetation should only occur just prior to construction; - Cleared areas should not be left exposed, and should be promptly rehabilitated/vegetated with indigenous plants; - A storm water management system adjacent to all arterial/rural roads needs to be implemented to reduce run-off and subsequent erosion; - Landscaping and re-vegetation should take place perpendicular to the slope to reduce flow velocities						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		and minimise erosion; and - Post construction, all areas disturbed by construction, including the site camp area, must be rehabilitated. ▪ Run-off velocities can be further reduced through reconstruction/reinstatement/rehabilitation of wetland and riparian habitats as directed by a wetland expert. Suitable flow attenuation must be implemented prior to directed flow entering such wetlands to prevent scouring and exacerbated erosion.						
Operational	**Aspect:** Use of natural resources **Impact:** Depletion of natural resources as a result of increased pedestrian traffic.	**Without**	3	2	3	2	-10	**High**
		With	2	2	2	1	-7	**Medium**
		Mitigation measures: ▪ The establishment of buffers around sensitive areas will have a mitigating effect on this impact, but regulations regarding the consumptive use of natural resources (flora and fauna) should be strictly enforced and local controls included into the operational EMPr. ▪ Non-consumptive use should be promoted, and particularly sensitive areas, such as marginal dune areas, should be demarcated and access restricted. This can be achieved by managing access points to the shoreline. ▪ The management and control of the remaining natural areas and the use of natural resources must be included in an operational EMPr which should include both a monitoring and penalty system.						
	Aspect: Access to the beach. **Impact:** Restricted public access to beaches.	**Without**	2	3	3	3	-11	**High**
		With	2	3	2	3	+10	**High**
		Mitigation measures: ▪ Implementation of an operational EMPr to ensure the proposed protection, enhancement, expansion and showcasing of existing dune, estuary, beach and coastal forest vegetation as well as the protection of open views and view sheds of river and ocean.						
Cumulative	Alterations in sense of place as a result in a change to the urban landscape.	**Without**						
		With	2	3	3	2	+10	**High**
		Mitigation measures: ▪ The final layout plan can be deemed to positively impact on sense of place with its emphasis on: - creating a settlement with a unique coastal identity and character; - establishing a functional and visual connection with the sites ecological assets; - incorporating an integrated open space system; and - proposing a range of development nodes, precincts and clusters integrated by the broader and dominant coastal landscape character.						
	The provision of appropriate beach amenities and recreational opportunities.	**Without**	2	2	2	2	+8	**Medium**
		With	3	3	2	3	+11	**High**
		Mitigation measures: A public-private partnership between the landowners and the KwaDukuza Municipality to develop and						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		maintain public beach amenity that would benefit local residents and visitors alike is suggested.						
	Improvement in the health status of coastal vegetation and natural habitats.	**Without**						
		With	2	3	3	4	+12	**Very high**
		Mitigation measures: ▪ Implementation of an operational EMPr to ensure the proposed protection, enhancement, expansion and showcasing of existing dune, estuary, beach and coastal forest vegetation as well as the protection of open views and view sheds of river and ocean. ▪ The public must be educated on the importance of coastal zone preservation.						

9.3.9 Air Quality and Odour

Table 9-11: Tinley Manor Southbanks air quality and odour impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities (site clearing; operation of vehicles, equipment etc.). **Impact:** Fugitive dust emissions from debris handling and debris piles; bulldozers and general construction activities.	**Without**	2	2	2	3	-9	**Medium**
		With	1	1	1	2	-5	**Low**
		Mitigation measures: ▪ Dust must be suppressed on the construction-site during dry periods by the regular application of water. ▪ Water used for this purpose must be used in quantities that will not result in the generation of run-off. ▪ Dust dispersion from construction activities, roads, spoil dumps and other construction locations will be limited and suppressed to the maximum extent practical. ▪ Surplus fill material sites and stockpiles will be positioned such that they are not vulnerable to wind erosion. ▪ Cover skips and trucks which are loaded with construction materials. All piles should be maintained for as short a time as possible and should be enclosed by wind-breaking enclosures of similar height to the pile. ▪ Stockpiles should be situated away from the site boundary, watercourses and nearby receptors and should take into account the predominant wind direction. ▪ A speed limit of 40 km/hr should be set for all vehicles travelling over exposed areas or near stockpiles. ▪ Dust and mud should be controlled at vehicle exit and entry points to prevent the dispersion of dust and mud beyond the site boundary.						
	Aspect: Construction activities (site clearing; operation of vehicles, equipment etc.). **Impact:** Generation of fumes from	**Without**	2	1	3	3	-9	**Medium**
		With	2	1	2	2	-7	**Medium**
		Mitigation measures: ▪ All earth moving vehicles and equipment must be in good working order.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	vehicle emissions may pollute the air.							
	Aspect: Chemical toilets. **Impact:** Release of odours as a result of the chemical toilets on-site.	**Without**	1	2	3	2	-8	**Medium**
		With	1	1	1	2	-5	**Low**
		Mitigation measures: ▪ Chemical toilets must be provided and cleaned on a regular (weekly) basis.						
Cumulative	As construction activities increase with neighbouring developments, emissions from construction vehicles may cause a nuisance.	**Without**	3	2	3	3	-11	**High**
		With	3	1	1	2	-7	**Medium**
		Mitigation measures: ▪ All earth moving vehicles and equipment must be in good working order.						

9.3.10 Noise

Table 9-12: Tinley Manor Southbanks noise impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Constructions staff, vehicles and equipment. **Impact:** Increase in noise pollution from construction vehicles and construction staff.	**Without**	1	1	3	3	-8	**Medium**
		With	1	1	1	2	-5	**Low**
		Mitigation measures: ▪ All construction activities should be undertaken according to daylight working hours. ▪ Provide all equipment with standard silencers. Maintain silencer units in vehicles and equipment in good working order. ▪ All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability. ▪ Construction staff working in area where the 8-hour ambient noise levels exceed 85 dBA must have the appropriate Personal Protective Equipment (PPE). ▪ All operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993). ▪ Surrounding communities and adjacent landowners are to be notified upfront of noisy construction activities (blasting and excavations). ▪ A Complaints Register is to be kept at the Site Office at all times.						
Cumulative	As construction activities increase at neighbouring developments, noise pollution will increase.	**Without**	2	2	3	3	-10	**High**
		With	1	1	1	2	-5	**Low**
		Mitigation measures: ▪ Mitigation measures as per construction phase above.						

9.3.11 Heritage

Table 9-13: Tinley Manor Southbanks heritage impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities (site clearing etc.). **Impact:** Disturbance of sites of archaeological, historical and cultural significance.	**Without**	1	1	3	3	-8	**Medium**
		With	1	1	1	2	-5	**Low**
		Mitigation measures: ▪ There are two occurrences of graves as described in ***Section 7.3***. These areas are to be marked as 'No-Go' Areas and a 20 m buffer to the graves is to be established. ▪ All graves must be accorded the highest level of protection and may not be disturbed without both family consent and a permit from Amafa. ▪ There are no other objects of archaeological, historical and cultural significance identified, however, if during construction any possible finds are made, the operations must be stopped and a qualified archaeologist be contacted for an assessment of the find. ▪ Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site. ▪ Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or paleontological artefacts, as set out in the National Heritage Resources Act (Act No. 25 of 1999), Section 51(1). ▪ It is advisable that an information section on cultural resources be included in the Environmental Induction training given to contractors involved in surface earthmoving activities. These sections must include basic information on: - Heritage; - Graves; - Archaeological finds; and - Historical Structures. - The archaeologist needs to evaluate the finds on-site and make recommendations towards possible mitigation measures.						

9.3.12 Visual

Table 9-14: Tinley Manor Southbanks visual impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities. **Impact:**	**Without**	1	2	1	2	-6	**Low**
		With	1	2	1	1	-5	**Low**
		Mitigation measures:						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	Construction activities may result in visual pollution as cranes and other machinery are utilised for construction.	▪ Limited clearing of vegetation on the development site. This will retain the screening function of natural vegetation.						
Operational	**Aspect:** Permanent structures. **Impact:** Permanent structures associated with the proposed development could create temporary un-vegetated areas in the landscape that could create a visual contrast with the natural vegetation.	**Without**	1	1	1	2	-5	Low
		With	1	1	1	1	-4	Low
		Mitigation measures: ▪ The ultimate development of THD's Tinley Manor landholdings will see the entire area developed.						
Cumulative	The ultimate development will alter the visual landscape.	**Without**	2	4	1	2	+9	Medium
		With	2	4	1	2	+9	Medium
		Mitigation measures: ▪ Once complete, the Tinley Manor Northbanks and Southbanks will create an appealing visual landscape for an urban environment.						

9.3.13 Traffic

Table 9-15: Tinley Manor Southbanks traffic impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities. **Impact:** Increase in traffic from construction vehicles.	**Without**	1	2	2	3	-8	Medium
		With	1	1	1	2	-5	Low
		Mitigation measures: ▪ Construction vehicles are to avoid main roads during peak traffic hours. ▪ All vehicles entering the site are to be roadworthy. ▪ Seatbelts are to be worn at all times. ▪ When using heavy or large vehicles / equipment, "spotters" are to be present to assist the driver with his blind spots. ▪ Any incident or damage to a vehicle must be reported immediately.						
	Aspect: Construction of access points and/or associated interchanges.	**Without**	2	2	4	4	-12	High
		With	2	1	2	2	-7	Medium

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	Impact: Increase in traffic congestion during the construction phase.	**Mitigation measures:** ▪ A Traffic Management Plan should be developed by the Contractor for existing traffic during the construction phase.						
Operational	**Aspect:** Day-to-day traffic. **Impact:** Traffic congestion.	**Without**	2	3	3	4	-12	**High**
		With	2	3	2	2	+9	**Medium**
		Mitigation measures: ▪ All future proposals for road networks as outlined in the TIA must be implemented for existing and new roads. ▪ The recommendations in the TIA is expected to reduce traffic congestion in the area through upgrades to the surrounding road network.						
Cumulative	Traffic in the region will increase as the residential portion of Tinley Manor Southbanks is developed.	**Without**	2	3	3	4	-12	**High**
		With	2	3	2	2	+9	**Medium**
		Mitigation measures: ▪ Same mitigation measures as proposed for the Operational Phase above.						

9.3.14 Socio-economic and Health

Table 9-16: Tinley Manor Southbanks socio-economic and health impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities. **Impact:** Expected to provide in excess of 200 jobs sustained over the value-chain of the development.	**Without**	2	3	3	4	+12	**High**
		With	3	3	3	4	+13	**Very High**
		Mitigation measures: ▪ All labour (skilled and unskilled) and Contractors should be sourced locally where possible. ▪ A labour and recruitment policy will be developed, displayed and implemented by the contractor. ▪ Recruitment at the construction site will not be allowed. ▪ Where possible, labour intensive practices (as opposed to mechanised) should be practiced. ▪ The principles of equality, BEE, gender equality and non-discrimination will be implemented.						
	Aspect: Construction activities. **Impact:** Job creation during the construction phase could result in the influx of people to the area.	**Without**	2	2	2	2	-8	**Medium**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ If possible all labour should be sourced locally. ▪ Contractors and their families may not stay on-site. ▪ No informal settlements will be allowed.						
	Aspect: Construction activities.	**Without**	2	2	3	2	-9	**Medium**
		With	2	2	1	1	-6	**Medium**

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	Impact: Contractors, the influx of people and potential job creation will result in the proliferation of social ills and issues such as crime, prostitution, the spread of HIV/AIDS, informal settlements etc. Lack of provision of ablutions that may lead to the creation of 'informal ablutions' within or close to a surface water resource.	**Mitigation measures:** ▪ The developers need to be actively involved in the prevention of social ills associated with contractors. ▪ If possible all labour should be sourced locally. ▪ Contractors and their families may not stay on-site. ▪ No informal settlements will be allowed. ▪ Contractors must be educated about the risk of prostitution and spread of HIV and AIDS. ▪ Strict penalties will be built into tenders to deal with issues such as petty crime, stock theft, fence cutting, trespassing etc. ▪ No poaching of wildlife or selling of firewood will be allowed.						
	Aspect: Construction activities. **Impact:** Public safety during construction.	**Without**	2	2	2	1	-7	**Medium**
		With	1	2	1	1	-5	**Low**
		Mitigation measures: ▪ Members of the public adjacent to the construction-site should be notified of construction activities in order to limit unnecessary disturbance or interference. ▪ Construction activities will be undertaken during daylight hours.						
	Aspect: Construction activities. **Impact:** Contractor's staff safety during construction.	**Without**	1	2	3	2	-8	**Medium**
		With	1	2	1	1	-5	**Low**
		Mitigation measures: ▪ Ensure the appointment of a Safety Officer to continuously monitor the safety conditions during construction. ▪ All construction staff must have the appropriate PPE. ▪ The construction staff handling chemicals or hazardous materials must be trained in the use of the substances and the environmental, health and safety consequences of incidents. ▪ Report and record any environmental, health and safety incidents to the responsible person.						
Operational	**Aspect:** Access to housing and social facilities. **Impact:** Improved standard of living and access to houses and social facilities.	**Without**	1	3	2	4	+10	**High**
		With						
		Mitigation measures: ▪ No mitigation measures specified as a benefit.						
	Aspect: Economic Growth.	**Without**	2	2	3	3	+10	**High**
		With	3	2	3	3	+11	**High**

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	Impact: The development will result in job creation and economic growth.	**Mitigation measures:** ▪ The principles of gender equality, maximising local employment should be implemented in the provision and establishment of jobs. ▪ Jobs for the maintenance of infrastructure and services will be created following the completion of the development. These jobs might be made available to existing labour there creating long-term employment. ▪ Service contractors could have access to other developments or projects in the area thereby creating long-term employment. ▪ All stakeholders must work together to enhance the opportunities established.						
	Aspect: Establishment of the different land uses (i.e. residential, retail, social facilities etc.). **Impact:** Increased energy consumption.	**Without**	3	4	3	3	-13	**Very high**
		With	2	2	3	1	-8	**Medium**
		Mitigation measures: ▪ It is recommended that renewable energy options and/or alternative energy sources be listed as the preferred options under the conditions of establishment.						
	Aspect: Provision of basic services (i.e. water, sanitation, electricity etc.). **Impact:** Increased operational phase maintenance requirements,	**Without**	2	3	3	3	-11	**High**
		With	2	2	3	1	-8	**Medium**
		Mitigation measures: ▪ The KwaDukuza Municipality is to ensure service infrastructure is maintained.						
Cumulative	Substantial increase in housing which will assist with the eTM's backlog and transformation agenda.	**Without**	3	4	4	4	+15	**Very high**
		With						
		Mitigation measures: ▪ No mitigation measures.						
	Influx of people to surrounding informal settlements in the hope of acquiring a house.	**Without**	2	2	2	2	-8	**Medium**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ No new informal settlements will be allowed. ▪ Housing policy guidelines to be clearly articulated.						
	Increase in VAT and rates.	**Without**	2	3	2	3	+10	**High**
		With						
		Mitigation measures: ▪ No mitigation measures.						
	Increased crime and social ills due to the establishment of a new	**Without**	2	3	3	2	-10	**High**
		With	2	1	1	2	-6	**Low**

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	community, congestion and noise.	**Mitigation measures:** ▪ Police stations to be established.						
	Improved access to social facilities such as education, public transport, play grounds, clinics and so forth.	**Without**	2	3	3	2	+10	**High**
		With	2	3	3	2	+10	**High**
		Mitigation measures: ▪ eTM to commit finances to the provision of social facilities.						
	Increased sense of place and urban renewal due to social facilities and community court yards.	**Without**	2	2	3	2	+9	**Medium**
		With	2	2	3	2	+9	**Medium**
		Mitigation measures: ▪ eTM to commit finances to the provision of social facilities.						
	Increase in tourism as a result of increased leisure accommodation.	**Without**	2	2	3	2	+8	**Medium**
		With						
		Mitigation measures: ▪ None						
	Loss of income due to competing developments.	**Without**	2	2	2	2	-8	**Medium**
		With						
		Mitigation measures: ▪ None.						
	Opportunities for new business and/or business expansion.	**Without**	3	4	2	3	+12	**Very high**
		With						
		Mitigation measures: ▪ Not mitigation measures.						

9.3.15 Stormwater Attenuation

Table 9-17: Tinley Manor Southbanks stormwater attenuation facilities impacts – Initial Option (within wetlands)

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Development of attenuation features within wetlands. **Impact:** Lower ratio of area to be disturbed (in wetlands) and quantities of earth-works and consequently	**Without**	2	3	3	3	-11	**High**
		With	1	2	2	3	-8	**Medium**
		Mitigation measures: ▪ Wetland loss will need to be off-set via an off-set plan and DWS will need to issue a WUL for the loss of wetland area.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
	surplus fill material are less resulting in lower capital costs. Direct loss of wetland area to accommodate attenuation facilities within wetlands.						

Table 9-18: Tinley Manor Southbanks stormwater attenuation facilities impacts – Revised Option (outside wetlands)

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Development of attenuation facilities within wetland buffers. **Impact:** High ratio of area to be disturbed (outside wetlands but in wetland buffers) and quantities of earth-works and consequently surplus fill material leading to higher capital costs.	**Without**	2	3	3	3	-11	**High**
		With	1	2	2	1	-6	**Low**
		Mitigation measures: ▪ To be installed according to the requirements of the EMPr. ▪ The Soil Management Framework Strategy for surplus fill material must be implemented.						

9.3.16 Surplus Fill Material Sites

Table 9-19: Tinley Manor Southbanks surplus fill material site impacts – temporary sites

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Location of surplus fill material sites away from the 1:100 year floodline. **Impact:** Flooding potential due to sites location of sites.	**Without**	2	2	2	2	-8	**Medium**
		With	2	2	1	1	-6	**Low**
		Mitigation measures: ▪ The SMP (***Appendix B 2***) must be implemented. ▪ Improved wetland functionality and zero nett-loss approach regarding wetland areas. ▪ Protection of the natural watercourses to prevent pollution, erosion and retain run-off. ▪ Promotion of subsoil infiltration where possible. ▪ Provision of indigenous vegetation along watercourses and stabilisation of banks. ▪ Attention to development of on-site use rainfall attenuation and provisions for reducing run-off by in-catchment and on-site evaporation and evapo-transpiration. ▪ Local flood risk reduction by selection of appropriate design standards for the sites. ▪ Implementation of adequate on-site and localised stormwater management practices.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		▪ Attenuation of flood peaks to predevelopment levels at the 2% (50-year) and the 10% (10-year) risk level. ▪ Providing new impermeable areas with sufficient flood attenuation and evaporation provisions. ▪ Rehabilitation and upgrading of open spaces following closure of the site.						
	Aspect: Establishment of surplus fill material sites. **Impact:** Sedimentation from the Surplus Fill Material Sites may impact on water quality and clarity of the system leading to a change in the biotic communities and reducing the functionality and aesthetics of the system leading to an irreversible change in estuarine status.	**Without**	2	2	2	2	-8	Medium
		With	1	2	2	1	-6	Low
		Mitigation measures: ▪ Management of the Surplus Fill Material Site must be done in accordance with the EMPr (***Appendix B***) and Soil Management Framework Strategy (***Appendix B 3***). ▪ Rehabilitation of the Surplus Fill Material Sites to be done according an approved Wetland and Open Space Rehabilitation Plan. ▪ Significant erosion control measures needed and site clearing done in a phased manner. ▪ Monitoring of in situ turbidity and total suspended solids pre-construction, during construction and for life of development.						
	Aspect: Establishment of surplus fill material sites. **Impact:** Potential impact on the riparian vegetation during the haulage of surplus material.	**Without**	3	2	4	2	-1	High
		With	2	1	2	2	-7	Medium
		Mitigation measures: ▪ Haulage to be done according to an approved Method Statement and as per the requirements of the EMPr (***Appendix B***). ▪ Haulage vehicles to only use existing sugarcane tracks. Labour to be educated on the penalties of transgressing off these roads. ▪ The remainder of the open space network to be a strict 'no-go' area.						
Operational	Rehabilitation of riparian edges, wetland and the provision of ecological corridors leading to increased biodiversity value of the river and estuary and protection of the estuary from associated land based activities.	**Without**	2	2	2	2	+8	Medium
		With	3	3	3	4	+13	Very high
		Mitigation measures: ▪ Corridor areas designed for movement and linkages between the open space areas and the upper river catchment and the coast. ▪ No fences should be erected which as a barrier to this movement. ▪ Rehabilitation to be done according an approved Wetland and Open Space Rehabilitation Plan.						
Cumulative	Beneficial end-use to the surplus fill material as opposed to being hauled off-site to a landfill as a 'waste'.	**Without**	3	4	3	3	-13	Very high
		With	2	2	2	2	+8	Medium
		Mitigation measures: ▪ Alternative uses to be investigated as per the Soil Management Framework Strategy (***Appendix B 3***).						

10 ENVIRONMENTAL IMPACT STATEMENT

10.1 Comparative Assessment of Alternatives and Implications of the Proposed Activity

10.1.1 Tinley Manor Southbanks Concept Plan and the 'No-Go' Alternative

Based on the Impact Assessment presented in ***Section 9.3***, a number of potentially negative and positive impacts have been identified and assessed across the life-cycle of the project. The Comparative Assessment of Alternatives presented in ***Table 10-1*** further provides the advantages and disadvantages of the Tinley Manor Southbanks Concept Plan in comparison to the No-Go Alternative.

Table 10-1: Advantages and disadvantages of the Tinley Manor Southbanks Concept Plan in relation to the 'No-Go' alternative

	Tinley Manor Southbanks Concept Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
Agricultural Potential and Land use	▪ The Tinley Manor Southbanks site and its soils offer limited agricultural potential in the long-term due to limited irrigation opportunities and poor soil quality. ▪ As part of the Concept Plan, production spaces and urban agriculture is being proposed in certain areas.	▪ Loss of land with limited agricultural potential. ▪ Tongaat Hulett have committed to an action plan to address loss of agricultural land as a result of their developments.	▪ The agricultural land capability of the Tinley Manor Southbanks can be classed as limited to poor long-term potential necessitating the transformation of the site.	▪ The Status Quo land use (i.e. sugarcane farming) is not a long-term viable option.
Soils	▪ A Soil Management Framework Strategy for Tinley Manor Southbanks (refer to EMPr) has been developed that will look at potential alternatives for the re-use and recycling of surplus soil generated by construction activities. This to an extent will prevent the disposal of soil at landfills and the sustainable beneficiation of soil resources. ▪ The formulation of a Soil Management Framework Strategy is as a response to	▪ The impact on soils due to construction is deemed an impact of medium significance after mitigation. The mitigation measures proposed in the EMPr in response to the physical disturbance to soils, erosion control, location of laydown areas, and site clearing activities are to be adhered. ▪ Significant quantities of surplus soil material (i.e. otherwise surplus fill material) are expected to be produced during construction activities for Tinley Manor Southbanks, due to a number of factors. These factors include, *inter alia*,	▪ The Status Quo will remain.	▪ Whilst the challenge of surplus fill material will not be encountered, it is also noted that the employment and beneficiation opportunities considered for surplus soil (fill) material will not be realised.

	Tinley Manor Southbanks Concept Plan		No-Go (Status Quo)	
	Advantages	Disadvantages and Responding Mitigation	Advantages	Disadvantages and Responding Mitigation
	lessons learnt from challenges encountered at other large-scale mixed-use developments. This indicates that the Developer and their professional team are building on the lessons learnt from previous developments and pro-actively responding as necessary.	the topography and poor soil quality (for construction purposes) within the area.		
Geology and Topography	▪ The proposed development will see the changes in the topography of the area with extensive cut and fill activities. This however, will allow the Tinley Manor Southbanks (once complete) to align with the changing landscape of the surrounding areas. ▪ Practical lessons learnt from similar developments have been incorporated into the EMPr to minimise geological and topographical impacts, most specifically those pertaining to erosion control.	▪ Developing the site will result in disturbance to surface geology for the development foundations. Platforms will be created by cutting the hill tops and spurs and creating fill embankments on the lower slopes. Furthermore, the Concept Plan has taken cognisance of the underlying geology and topography and is therefore sensitive to slope limitations. ▪ Slope stability, subsoil seepage, excavatability and founding conditions may present challenges during construction.	▪ The Status Quo will remain.	▪ Not applicable.
Geohydrology and Hydrology	▪ The maintenance of the open space network as well as the on-going rehabilitation activities of riparian areas will ensure that the Umhlali River and Estuary as well as its buffer are indicated as a 'no-go' area unless approved for specific and controlled uses. ▪ The implementation of an approved Wetland and Open Space Rehabilitation Plan could have a positive impact on the Umhlali River and Estuary in the	▪ Shallow groundwater contamination through the spillage of fuels, lubricants, lack of provision of ablutions and other aspects such as construction equipment, vehicles and workshop and wash bay areas exist and the mitigation measures listed in the EMPr, needs to complied with to reduce the impact on groundwater resources during the construction phase. ▪ Run-off from the construction area into groundwater or surface water resources will need to be managed. Potential	▪ The Status Quo will remain.	▪ The Umhlali River and Estuary is presently under strain. Not only is the river in oversupply, there is a WWTW which directly impacts on the quality of water within the Umhlali River and Estuary.

	Tinley Manor Southbanks Concept Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
	long-term.	impacts during operations include discharge of run-off from dirty areas such as workshop areas, roads and chemical storage areas as well as potential flooding and sedimentation affecting water quality of the Umhlali River and Estuary. ▪ The establishment of a stormwater management system will ensure that all surface water run-off from the site is managed appropriately and directed to the natural wetlands on site or attenuated on site. ▪ The SMP must be adhered to and the open space network preserved as far as possible.		
Coastal	▪ Improved access to the coastal areas and improved management and rehabilitation initiatives.	▪ The coastal location of the proposed development means that it is inherently exposed to risks associated with natural and dynamic coastal processes. This is exacerbated by the study area's proximity to the Umhlali Estuary which adds the additional risk factor of terrestrial flooding. ▪ The proactive identification of coastal risk (sea level rise hazard line, proposed limited development line as well as potential slippage areas), incorporation of buffers and the proposed location of development only landward of these lines / areas contributes to the mitigation of the potential negative impacts associated with unsustainably located development in the coastal zone associated with this proposed development. ▪ The facilitated and controlled access to the coastal zone.	▪ The Status Quo will remain.	▪ Limited access and continued deterioration of the coastal zone and its natural resources.

	Tinley Manor Southbanks Concept Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
Vegetation	▪ An alien invasive eradication programme is to be implemented. ▪ Rehabilitation of public open space with indigenous vegetation is required as per an approved Wetland and Open Space Rehabilitation Plan. ▪ Protection of Coastal Forest, identified threatened ecosystem and likely to be included as a critical biodiversity area	▪ 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 WWTW. 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.	▪ Status quo will remain.	▪ Much of the land is presently degraded due to extensive sugarcane farming. ▪ Most of the site is presently infested with alien invasive vegetation.
Wetlands	▪ The Concept Plan layout has taken cognisance of the wetlands on site and as far as is practically possible, all development has been located outside the wetland area to ensure minimal loss of wetland. ▪ Given the extremely degraded state of most of the wetland units across the site, it is envisaged that the rehabilitation of the remaining wetlands on site will lead to a significant improvement in the ecological goods and services being provided by the wetlands in the long-term. The loss of some degraded wetland, in order to unlock the development potential of the site and thus the funding for rehabilitation of the greater proportion of wetland, is considered acceptable in this instance.	▪ Minimal loss of wetland units due to infilling of wetlands for the construction of the platforms, roads, pipelines and sewer crossings. ▪ Potential increase in siltation of the remaining wetlands due to the proposed urban development, however, provided mitigation measures are implemented, this impact will be minimal.	▪ The floodplain wetland, the highest scoring ecosystem services which were assessed at a moderately high level included maintenance of biodiversity, sediment trapping, phosphate trapping, nitrate removal, toxicant removal, erosion control and as well as tourism and recreation. At an intermediate level, ecosystems services included carbon storage and flood attenuation. Below intermediate level of ecosystems services provided include streamflow regulation, water supply for human use, natural resources, cultivated foods and, education and research. The lowest scoring ecosystem services provided by the floodplain wetland is cultural significance. Therefore, the status quo of this watercourse will remain.	▪ The general PES of the channelled valley bottom wetlands was found to be largely (Category D) to greatly modified (Category E). ▪ The general PES of the unchannelled valley bottom wetlands was found to be moderately (Category C) to greatly modified (Category E). ▪ The general PES of the hillslope seep wetlands was found to range between a Category A (Unmodified/natural) to a Category E (Greatly modified). ▪ Lastly, the general PES of the floodplain wetland is a Category C (Moderately modified). ▪ Therefore, the majority of

	Tinley Manor Southbanks Concept Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
	▪ Detailed management plans for Tinley Manor Southbanks (e.g. SMP, EMPr) which seek to reduce the negative impacts of stormwater run-off and by implication erosion and sedimentation.			wetlands and drainage lines at Tinley Manor Southbanks are presently in a degraded state and offering limited functionality. The poor functionality of the wetlands (to a greater or lesser extent) is primarily affected by current impacts relating to the transformation of the wetlands for sugarcane production.
Air Quality, Noise and Odours	▪ No advantages are imminent, although the measures proposed in the EMPr will help mitigate the negative impacts associated with construction and decommissioning activities.	▪ During construction and decommissioning, the pollutants likely to be emitted are particulate matter generated by vehicle movement and exposed soil to wind erosion. This is most likely to be a nuisance. ▪ The construction will see an increase in noise in the study area. ▪ The mitigation measures included in the EMPr must be adhered to.	▪ The Status Quo will remain.	▪ Not applicable.
Heritage	▪ Not applicable.	▪ At least two grave clusters have been identified on the site, which are to be accommodated by the Development and located in zones not ear-marked for development. The impact is deemed to be of low significance.	▪ Not applicable.	▪ Not applicable.
Visual and Sense of place	▪ The proposed development will see the changes in the topography of the area. ▪ A change in land use to residential / mixed-use resort development will alter this sense of place towards a more urbanised form.	▪ Temporary visual pollution during the construction period. ▪ Permanent structures associated with the proposed development could create temporary un-vegetated areas in the landscape that could create a visual contrast with the natural vegetation which is predominantly sugarcane.	▪ The Status Quo will remain. ▪ The current sense of place tends towards a rural-agricultural aspect interspersed with remnant natural coastal forest and fragmented natural vegetation.	▪ The final layout plan can be deemed to positively impact on sense of place with its emphasis on: ○ creating a settlement with a unique coastal identity and character; ○ establishing a functional and visual connection

	Tinley Manor Southbanks Concept Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
				with the sites ecological assets; ○ incorporating an integrated open space system; and ○ proposing a range of development nodes, precincts and clusters integrated by the broader and dominant coastal landscape character.
Social and Socio-economic	▪ The location of the site is in prime position to promote and foster economic opportunity, diversification and tourism. ▪ Economic benefits through the injection of R12 billion in capital costs include: ○ 200 jobs created through the value-chain of the development; ○ Urban renewal; and ○ Increased rates base of the Municipality.	▪ As could be expected, the construction phase is characterised by a number of negative social impacts (viz. arrival of construction workers; inflow of job seekers, additional demand on services, crime, etc.) which is mainly due to the nature of the activities that take place during this phase. ▪ Although the expected social impacts associated with the construction phase are mostly negative, these impacts are for the most part only temporary in nature and as such are expected to only last over the construction period. ▪ Even though all of the identified social impacts can be mitigated or enhanced successfully, it can only be done if THD or their appointed contractor(s), commit to the responsibility of ensuring that the level of disturbance brought about to the social environment by the more negative aspects of the project, is minimised as far as possible.	▪ No foreseen advantages.	▪ The land is ideally situated for Tourism within a number of development corridors or growth areas identified in provincial and local government plans and strategies in recent years.
Traffic Accommodation	▪ There will be upgrades of the current road network as well as proposed new roads and	▪ Due to construction activities there is the possibility of disruptions to traffic flow in the area, especially along existing routes	▪ The Status Quo will remain.	▪ The current haulage sugarcane roads or tracks will remain within Tinley

	Tinley Manor Southbanks Concept Plan		No-Go (Status Quo)	
	Advantages	Disadvantages and Responding Mitigation	Advantages	Disadvantages and Responding Mitigation
	interchanges.	when the proposed interchanges are constructed. ▪ Furthermore, the proposed development will see an increase in traffic in an already congested area, although it is noted that this congestion is in the short-term until the ultimate development of all transport networks proposed.		Manor Southbanks. Current infrastructure on site i.e. culverts, low level bridges etc. are not maintained and are highly impacted by erosion and sedimentation into existing wetlands and drainage lines. Furthermore, these roads are prone to stormwater flooding. ▪ Existing traffic congestion in and around Tinley Manor.
Access	▪ Tinley Manor Southbanks will be a publically accessible resort centred, lifestyle and mixed-use village theme which includes a mix of residential and leisure development supported by a range of commercial and social facilities. ▪ Residential and leisure oriented neighbourhoods are proposed to be integrated around village nodes and a high quality, well managed network of public spaces featuring leisure and recreation areas, along with major new beach resort developments and conservation zones.	▪ Potential disturbance to the coastal zone and dune forests. However, access to the coast with this phase of the development is proposed to be controlled and now limited to pedestrian access via paths and elevated wooden boardwalks.	▪ The Status Quo will remain.	▪ Currently, access to the coastal area adjacent to the proposed development site is limited to access along the shoreline from the neighbouring areas of Tinley Manor Beach and Sheffield Beach / Christmas Bay. ▪ Current access to the coast is further hindered by the topography and existence of the vegetated dune cordon and the wetland areas immediately landward of the vegetated dune cordon. ▪ The dune vegetation and wetland areas are both natural barriers to access as well as important environmental assets that play a vital role in mitigating risk from a marine sea level

	Tinley Manor Southbanks Concept Plan		No-Go (Status Quo)	
	Advantages	Disadvantages and Responding Mitigation	Advantages	Disadvantages and Responding Mitigation
				rise/storm surge perspective.

10.1.2 Stormwater Attenuation

Table 10-2 provides a comparative assessment of the stormwater attenuation facilities alternatives presented – i.e. **Initial Option** which is attenuation facilities within wetlands and **Revised Option** which is attenuation facilities outside wetlands but within the 30 m wetland buffers. The comparative assessment below takes into account the impact assessment provided in ***Section 9.3.15.*** The table further provides a summary of the positive and negative impacts.

Table 10-2: Advantages and disadvantages of the stormwater attenuation facilities alternatives

	Attenuation Facilities Within Wetlands – Initial Option		Attenuation Facilities Outside Wetlands – Revised Option	
	Advantages	Disadvantages and Responding Mitigation	Advantages	Disadvantages and Responding Mitigation
Location of stormwater attenuation facilities	**-8 after mitigation**		**-6 after mitigation**	
	▪ Lower ratio of area to be disturbed (in wetlands) and quantities of earth-works and consequently surplus fill material are less resulting in lower capital costs.	▪ Loss of wetland area to accommodate the installation of stormwater attenuation facilities within wetlands.	▪ High ratio of area to be disturbed (outside wetlands but in wetland buffers) and quantities of earth-works and consequently surplus fill material leading to higher capital costs.	▪ Long-term the health of the wetland is considered to be preserved offering better functionality due to no loss of wetland area.

10.2 Key Findings of the EIA

A considerable amount of planning has gone into the formulation of the Tinley Manor Southbanks Concept Plan which has been informed by rigorous scientific assessments and strategic discussions with many stakeholders. The most notable potential impacts as a result of the proposed development are on the Umhlali Estuary and the Coastal Zone, both of which required careful consideration.

The proposed development concept has adopted a proactive approach in identifying environmental assets and sensitive areas upfront, by means of the environmental asset layers that were derived from the rigorous scientific and feasibility assessments. A risk aversive approach also characterises the proposed development concept, through the identification and incorporation of coastal risk into the proposed location of the development. Such an approach is crucial to ensuring sustainability of the settlement in a sensitive, dynamic and potentially hazardous natural environment such as the coastal zone. The Concept Plan proposes a development footprint that is not in conflict with identified natural hazards such as slippages, or, sensitive features such as wetlands or the vegetated dune cordon and take cognisance of predicted sea level rise and other impacts of global climate change.

Furthermore, despite the high significance of some of the predicated impacts resulting from the proposed the development on the Umhlali Estuary, all of the identified potential impacts can be reduced to low disturbance and/or avoided, if the mitigation measures detailed are implemented.

Given the national conservation importance of the Umhlali Estuary, a strong opportunity exists to reverse, to some degree, the past maltreatments of the surrounding landscape (sugarcane plantations, salt weir, etc.) and current impacts on the system. This would contribute to the improved ecological state of the Umhlali Estuary. Furthermore, the design concept of the proposed development accommodates the preservation of the estuary and its supporting habitats. This essentially denotes the first step to achieving some form of conservancy / stewardship status, with the greater goal of achieving formal protected area status in future. In light of the above, the proposed development can be beneficial for the ecological functioning and conservation status of the Umhlali Estuary.

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. The abundance of alien invasive vegetation has resulted in the reduction in indigenous cover and thus the overall value of the remaining vegetation and its contribution to the goals of conserving conservation worthy areas. 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.

Three areas of significance exist on the site in terms of vegetation, and these are (i) the Umhlali River and associated Estuary area, (ii) the Primary Dune and Coastal Dune Scrub / Forest, and (iii) 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. Furthermore, through the development, the formalised protection of these areas can be assured.

Given the responsible planning that has been undertaken, and the associated reduction in biophysical impacts through the realignment and removal of infrastructure from wetland areas and the coastal zone, the proposed development of the Tinley Manor Southbanks should have minimal negative impacts on the biophysical environment.

It is presented that the proposed layout will lead to a significant positive impact for the wetlands on site through the rehabilitation of systems that have previously been heavily degraded. Furthermore, the connectivity of the wetlands has been retained, and will be further enhanced through the removal of unnecessary sugarcane tracks, and thus their functionality will be greatly improved. Where wetland areas cannot be avoided and a minimal loss of wetland will be required, this will be negotiated with the DWS via the WULA process and a suitable off-set plan will be developed.

A crucial issue that this assessment attempts to illuminate is the ecological and social carrying capacity of coastal assets linked to the facilitation of and provision of coastal access. If the mitigation measures described above are adequately implemented the coastal area adjacent to the proposed development (which incorporates the dune cordon, beach, shoreline and estuarine environment) will be able to support the kinds and intensities of uses and users implied by the proposed development concept. Beach recreation within the shoreline abutting the proposed development will be limited to low impact activities due to inherent biophysical constraints and sensitive environments. However, the close proximity of beach areas with significantly better opportunities for higher intensity recreation activity represents an opportunity, not only for proposed resort residents/visitors, but for the broader community to enjoy the benefits of the KwaDukuza coastal area, should the proposed public-private partnership be implemented at Tinley Manor Beach.

Stormwater management and attenuation also remains a high priority for a development of this nature. The specialist studies have shown that mitigation of the potentially negative effects of the proposed development with regard to storm events can be successfully mitigated through the implementation of the policy, regulations and guidelines contained in the SMP, as well as the specific recommendations given in the specialist reports.

The case for the placement of stormwater attenuation measures within wetlands or within the wetland buffers have been assessed. Whilst the location of stormwater attenuation facilities within wetland units are more viable in terms of reduced earth-works and lower capital costs, it has been found that this option would result in a loss of wetland area. Therefore, in aligning with the recent stance of the DWS, the Concept Plan presented and SMP have allowed for the location of stormwater attenuation facilities to be located outside of wetland areas, but within the 30 m wetland buffers.

An additional challenge for the project will be the re-use and recycling of surplus fill material. In an effort to address the matter in a strategic and practical manner, the Developer, together with their specialist team, have embarked on the formulation of a management plan for the surplus fill material. Whilst the level of detail required for such a plan is not available at the pre-construction phase, the formulation of the Soil Management Framework Strategy presented in this EIA is a positive step towards this. Whilst many options have been presented in the Strategy, to ensure the beneficial end-use of surplus fill material, surplus fill material sites are required and cannot be avoided due to the nature of the soils and topography of the site.

Two occurrences of unmarked ancestral graves are recorded on the Tongaat Hulett Estates' database and are located within non-development zones of the current proposal due to steepness of slope and the underlying lithography. All graves are to be accorded the highest level of protection and may not be disturbed without both family consent and a permit from Amafa. Having assessed the site, it is found that the potential impact to heritage resources through implementation of the proposed Tinley Manor Southbanks is very low.

10.3 EAP Opinion

As detailed earlier, it is noted that the various iterations of the Concept Plan presented in this EIA with accompanying landscape guidelines was fully informed by the scientific and feasibility assessments thus presenting an ecologically responsible Concept which has afforded respect to the biophysical and legislative environment and ensured conversation is an overarching principle of the development.

The EMPr including the various plans presented (Stormwater Management Plan and the Soil Management Framework Strategy), thus becomes the overarching implementation document during the project life-cycle ensuring that the environmental sensitivities highlighted in this report are afforded protection and where not possible to avoid, undergo the appropriate licensing process.

The findings therefore, conclude that the proposed Tinley Manor Southbanks Coastal development should go ahead provided that the recommended mitigation and management measures contained in the preceding chapter and the accompanying EMPr are implemented. Should the proposed mitigation measures be implemented correctly, Tinley Manor Southbanks will be a viable development.

11 CONCLUSION AND CONDITIONS OF AUTHORISATION

The EIA process for the Tinley Manor Southbanks Coastal Development and associated infrastructural requirements for the three interchanges has been undertaken in accordance with the EIA Regulations published in Government Notice No. R. 543, R.544 and R. 545 of 2010 in terms of Section 24 (5) of the National Environmental Management Act (Act No 107 of 1998) (as amended).

In order to protect the environment and ensure that Tinley Manor Southbanks is constructed and operate in an environmentally responsible manner, there are a number of significant pieces of environmental legislation that have been taken into account during this study. These include:

APPLICABLE NATIONAL LEGISLATION
The Constitution of South Africa (No. 108 of 1996)
National Environmental Management Act (Act No. 107 of 1998) (as amended)
National Environmental Management: Waste Act (No. 59 of 2008) (as amended)
National Environmental Management Biodiversity Act (Act No. 10 of 2004)
National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008)
National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
National Environmental Management: Air Quality Act (Act No. 39 of 2004)
National Water Act (Act No. 36 of 1998) (as amended)
Conservation of Agricultural Resources Act (Act No.43 of 1983)
KZN Nature Conservation Ordinance (Ordinance No.15 of 1974)
National Heritage Resources Act (Act No. 25 of 1999)
National Veld and Forest Act (Act No. 101 of 1998)
Hazardous Substance Act (Act No. 15 of 1973) and Regulations
National Building Regulations and Building Standards Act (Act No. 103 of 1997)
Occupational Health and Safety Act (Act No. 85 of 1993)

This relevant legislation has informed the identification and development of appropriate management and mitigation measures that should be implemented in order to minimise potentially significant impacts associated with the project.

The conclusions of this draft EIAR including comments and concerns from I&APs are as a result of a comprehensive EIA study. These studies are based on issues identified in the Environmental Scoping Study and the parallel process of public participation through to the EIA phase. The public consultation process has been inclusive, and every effort has been made to include representatives of all stakeholders within the process.

11.1 Concluding Remarks

This draft EIAR provides an assessment of both the benefits and potential negative impacts anticipated as a result of the project. It further provides a description of the affected environment and alternatives proposed for the stormwater attenuation facilities and management of surplus fill material.

The Concept Plan has evolved over several iterations after lengthy discussions and negotiations between the specialist teams. Given the responsible planning that has been undertaken, and the associated reduction in biophysical impacts through the realignment and removal of infrastructure from wetland areas and the coastal zone, the proposed development of the Tinley Manor Southbanks should have minimal negative impacts on the biophysical environment. It is the opinion of this specialist team and the EAP that the proposed layout will lead to a significant positive impact for the wetlands on site through the rehabilitation of systems that have previously been heavily degraded.

The developer should be commended for a proposed development layout that has gone to great lengths to reduce encroachment and placement of services within sensitive wetland environments, and the promotion of these contiguous landscape features with rehabilitation will see a significant increase in the delivery of ecosystem goods and services.

As a point of departure, it should be stressed that whilst there are some unavoidable impacts to the receiving environment as with any development of this nature, the option to proceed with Tinley Manor Southbanks as proposed in the Tinley Manor Southbanks Concept Plan outweighs the 'no-go' option which would prevent diversification and economic growth.

11.2 Assumptions, Uncertainties or Gaps in Knowledge

- All information provided by THD and their specialist consultants to the EAP was correct and valid at the time it was provided.
- The EAP does not accept any responsibility in the event that additional information comes to light at a later stage of the process.
- All data from unpublished research is valid and accurate.
- The scope of this investigation is limited to assessing the potential environmental impacts associated with Tinley Manor Southbanks.

In addition to the assumptions above, the following assumptions and limitations were noted by the specialist team:

11.2.1 Vegetation Assessment

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 PES and the 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.

11.2.2 Wetland Assessment

The study only focused on the functional, ecological importance and sensitivity, and ecosystem services assessment of wetlands. A wetland delineation study has previously been conducted (SiVEST, 2013) and does not fall within the scope of the assessment. Aquatic studies of fish, invertebrates, amphibians, etc. have not been included in the report. Hydrological or groundwater studies have also not been included.

All shapefiles of the previous wetland assessment were provided.

The classification exercise of the wetland HGM units was undertaken based on the wetland shapefiles that were provided.

As the study was limited to the study area (boundaries of the property), some wetlands may have extended further than the boundary of the study site where delineation did not take place, and therefore did not form part of the functional assessment.

An assessment of wetlands in the wider areas was not undertaken.

A thorough vegetation identification exercise was not undertaken. Recorded vegetation species was based on general observation during the field survey.

No alternatives were supplied for assessment. As such, no alternatives evaluation has been provided in this report.

11.3 Conditions

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the recommendations from this EIA study are included within an EMPr (refer to ***Appendix B***). The EMPr must be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for the life cycle phases of the project is considered to be vital in achieving the appropriate environmental management standards as detailed for this project.

In addition, the following key conditions should be included as part of the authorisation:

a) The Developer is not negated from complying with any other statutory requirements that is applicable to the undertaking of the activity. Relevant key legislation that must be complied with by the proponent includes *inter alia*:
   - Provisions of the National Environmental Management Waste Act (No. 59 of 2008)(as amended)
   - Provisions of the National Environmental Management Integrated Coastal Management Act (Act No. 24 of 2008)
   - Provisions of the National Water Act, 1998 (Act No. 36 of 1998)(as amended)
   - Provisions of the National Forests Act (Act No. 84 of 1998)
   - Provisions KwaZulu-Natal Nature Conservation Ordinance (Ordinance No. 15 of 1974)
   - Provisions of the National Heritage Resources Act, 1999 (Act No. 25 of 1999)
   - SANS 10103

b) The Developer must appoint, on their respective properties, a suitably experienced (independent) Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the mitigation/rehabilitation measures and recommendations are implemented and to ensure compliance with the provisions of the EMPr.

c) The Stormwater Management Plan must be complied with.

d) A Wetland and Open Space and Rehabilitation Plan must be compiled and complied with.

e) All necessary permits, licences and approvals must be obtained prior to the commencement of construction.

Appendix A

Acceptance of ESR

Appendix B

Environmental Management Programme

Appendix C

Specialist Studies

Appendix D

Royal HaskoningDHV Service Line Profile and EAP CVs

Appendix E

Similar Activities 2010 to 2014

Appendix F

Layout Plans

Appendix G

Service Level Agreements

Appendix H

Public Participation Summary Report and Comments & Responses Report

Royal HaskoningDHV

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