Royal HaskoningDHV
Enhancing Society Together

Tinley Manor Southbanks Coastal Development

Amended Draft Environmental Impact Assessment Report

March 2017

KZN EDTEA Reference No.: DC29/0019/2011

Tongaat Hulett DEVELOPMENTS

Document Description

Client:

Tongaat Hulett Developments

Project Name:

Environmental Impact Assessment for the Proposed Tinley Manor Southbanks Coastal Development, KwaDukuza Municipality, KwaZulu-Natal

Royal HaskoningDHV Reference Number:

MD1275

Authority Reference Number:

DC29/0019/2011

KZN/EIA/000034/2011

Compiled by:

Humayrah Bassa *(Pr.Sci.Nat.)*

Date:

March 2017

Location:

Durban

Reviewed by: Signature:

Bronwen Griffiths *(Pr.Sci.Nat.)*

Approved by: Signature:

Malcolm Roods *(EAPSA)*

AMENDED DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Royal HaskoningDHV would like to thank all Interested and Affected Parties (I&APs) for their continued participation and input into this **Environmental Impact Assessment** (EIA) process. The comments received to date have proven invaluable to this process and we do appreciate your time and effort.

The Draft Environmental Impact Assessment Report (EIAR) was made available for comment from 30 March 2015 until 18 May 2015. The Final EIAR has been made available for review and comment for a further 21 days running from Friday, 26 February 2016 to Friday, 18 March 2016. The Final EIAR was rejected by the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (EDTEA) in June 2016. Notification of the rejection and reasons for the rejection were communicated to all registered I&APs.

All comments which were received have been critical in the finalisation of this Amended Draft EIAR. The comments received to date are included in an Issues Trail which is provided in ***Appendix H***.

The Amended Draft EIAR is now available for public review and comment for a period of 40 days from Wednesday, 29 March 2017 to Monday, 08 May 2017 at the following locations:

Beach Home Properties offices situated below Impulse By The Sea restaurant – 167 Sea View Drive, Tinley Manor Beach
KwaDukuza Library – Corner of Gizenga Street and Balcomb Street
Salt Rock Library – Ocean Drive, Dolphin Coast, 4391
Tongaat Hulett Developments – Zimbali Resort Offices, Zimbali (adjacent to Sales centre, just before northern gatehouse)
Royal HaskoningDHV Website – www.rhdhv.co.za

Please submit all comments to the Environmental Assessment Practitioner (EAP):

Humayrah Bassa

Royal HaskoningDHV

The Boulevard Umhlanga, 19 Park Lane, Umhlanga Rocks

Tel: 087 350 6760

E-mail: humayrah.bassa@rhdhv.com

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 485 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' 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 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 3 Project Description	Includes a description of the proposed activities and engineering services proposed
Chapter 4 Project Alternatives	Consideration of alternatives (design/layout, site and do-nothing) for the project
Chapter 5 Environmental Legal Requirements	Provides the environmental legal framework and the approach to the integrated regulatory process
Chapter 6 Description of the Receiving Environment	A description of the biophysical and social environment
Chapter 7 Findings of the Specialist Assessments	An overview of the findings of the various specialist reports undertaken for this project
Chapter 8 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 9 Public Participation Process	Overview of the public participation process conducted to date

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

Rejection of the final EIA Report

The final EIA Report was submitted to the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs for decision-making on 25 February 2016. An Addendum to the final EIAR Report was submitted on 07 April 2016.

The final EIAR was rejected by the KZN EDTEA on 08 June 2016.

In reaching its decision, the KZN EDTEA took *inter alia*, the following into consideration:

- The information contained in the Final EIA Report dated 25 February 2016 and all associated specialist studies as well as an Addendum to the Final EIA Report dated 07 April 2016;
- The comments received from the Organs of State and Interested and Affected Parties as included in the EIA Report dated 25 February 2016 as well as Addendum to the Final EIA Report dated 07 April 2016; and
- The objectives and requirements of relevant legislation, policies, guidelines, including section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (as amended).

After consideration of the information and factors listed above the KZN EDTEA rejected the final EIAR, requesting the following:

- Amendment to and further elaboration to the list of activities applied for;
- Additional detail with regard to:
    - wetland crossing points and construction method;
    - abstraction from the Umhlali River;
    - cumulative estuarine impacts and management;
- Additional clarification and/or elaboration on the impact assessment;
- Revisions to the EMPr;
- Additional consultation with the Department of Agriculture, Forestry and Fisheries (DAFF) regarding the Coastal Dune Forest buffer area;
- Revisions and/or clarification on the:
    - Traffic Impact Assessment (TIA);
    - Urban Planning Report;
- Provision of a phasing plan for the sub-phases of the development; and
- Additional public participation as a result of the rejection.

Following receipt of the rejection of the final EIAR, a meeting was held with the KZN EDTEA on 12 July 2016 to discuss the rejection letter and the way forward for this application. To this end, the EAP provided a proposed programme to the KZN EDTEA and requested the application is kept open enabling the EAP and specialist team to address the requests made by the KZN EDTEA. The KZN EDTEA agreed to keep the application open provided the final amended EIAR is submitted for decision by the end of May 2017.

This amended draft EIAR has addressed the specific items of the rejection letter received from the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs, dated 08 June 2016, as detailed in ***Table 1-2***.

Note: Changes from the final EIA report dated February 2016 to the amended draft EIA report dated March 2017 (i.e. document at hand) have been underlined for ease of reference. Furthermore, the chapter order has been revisited to improve the flow of the report due to the lengthy nature of the report.

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) (Act 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.

It is noted that the applicable activities applied for are as per GNR. 544 – GNR. 546 of the EIA Regulations (2010) (as amended), as the Application for Environmental Authorisation 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) of the 2014 Regulations, 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 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, a full comparison of the 2010 and 2014 EIA Regulations, has been provided 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.

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.

On the whole, almost all neighbouring communities likely to be affected are supportive of the Tinley Manor Southbanks development, noting the positive socio-economic potential thereof.

During the Public Participation Process a number of concerns and questions were however posed. The following are the major issues, questions and concerns that have been raised:

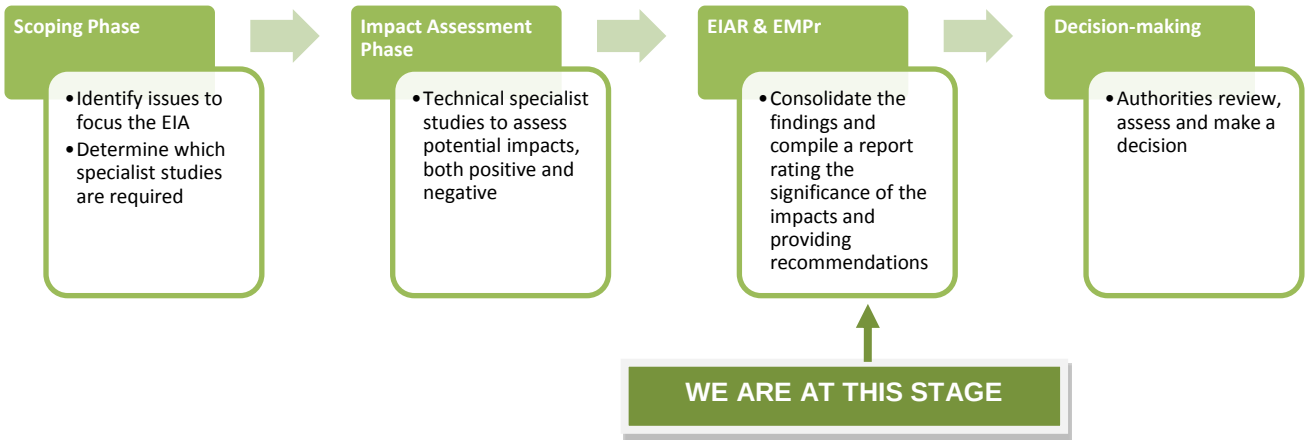
- Overall there is significant concern relating to beach and estuary access. Tongaat Hulett Developments have been proactive in ensuring public beach access is provided for, although, given the sensitivities of the coastal dune system, will need to be carefully managed to ensure protection of the coastal zone.

- Traffic Management and congestion was a concern for neighbouring communities as well as accessibility and linkages and a comprehensive TIA has been completed and appropriate linkages made where practical.
- Estuary Management has raised some discussion with the mandate for an Estuary Management Plan falling to the KwaDukuza Municipality.
- Increased pressure on existing services was raised as a concern, including sewers, water resources, electricity provision, telecommunications and waste transfer facility sites and detailed services reports have been completed.
- The Department of Agriculture originally raised concern relating to the transformation of agricultural land, however, the Department of Agriculture released the land from agriculture in 2015. It is further confirmed that Tongaat Hulett remains committed to agriculture and agricultural processing in the province and continues to increase the quantum of new agriculture in the rural hinterland where its sustainability is assured.
- Wetland management and loss has been a concern raised by a number of parties. This amended EIA Report seeks to address these concerns.
- The direct neighbour has raised a number of concerns relating to (i) access to the beach and estuary via horseback; (ii) access to his property, and, (iii) downstream impacts on his dam to name but a few. Detailed comments and responses are provided in the Issues Trail.

Detailed comments and responses are provided in the Issues Trail presented in ***Appendix H***.

Environmental Impact Assessment Report and Purpose of the Report

In line with the requirements of the National Environmental Management Act (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 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 amended Environmental Impact Assessment Report:

Specialist Study	Organisation
Agricultural Potential Assessment	Mottram and Associates
Geotechnical Investigation	Drennan, Maud & Partners
Heritage Assessments	eThembeni Cultural Heritage
Vegetation Assessment	SiVEST / Kinvig & Associates Environmental Consulting
Wetland Assessment	SiVEST
Estuarine Assessment	Royal HaskoningDHV and peer-reviewed by Source to Sea, now Coastwise Consulting
Coastal Assessment	Royal HaskoningDHV and peer-reviewed by Source to Sea, now undertaken by Coastwise Consulting
Socio-economic Study	Urban Econ
Traffic Impact Assessment	Aurecon
Visual Assessment	SiVEST

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

Specialist Study	Organisation
Urban Planning Report	The Markewitz Redman Partnership
Engineering Services Report	SMEC South Africa
Electrical Services Report	Bosch, now Admastor Consulting CC
Stormwater Management Plan	SMEC South Africa
Soil Management Framework Strategy	Royal HaskoningDHV
Wetland and Open Space Rehabilitation Plan	SiVEST
Traffic Management Plan	Aurecon

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 mixed-use development with 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, hence site alternative options are limited.

During the early stages of the Environmental Scoping Study that culminated into the compilation of the final ESR, it was proposed that layout alternatives would be considered which would explore several options and proposals for the land use of the site. However, due to the existing constraints including wetlands, estuary, coastal dune forest, sensitive pockets of vegetation, roads and topography, the options to consider alternative layouts were limited.

Through many meetings between the Developer, engineers, urban planners, various technical specialists and scientists and various service providers, the Tinley Manor Southbanks Concept Plan was developed over time with the ultimate intention of creating a sustainable development taking cognisance of the property's environmental asset base.

Several concept layout alternatives were considered by the multi-disciplinary team with further optimisation at each iteration process, resulting in the current proposed Concept Plan of 2017. It should be noted that the Concept Plan should not be seen as the final detailed design layout or the final approved plan in terms of the town planning process for the development, but is only to be used a guideline to create an understanding of the conceptual framework for the ultimate development and detailed planning of Tinley Manor Southbanks.

Revisions to the Tinley Manor Southbanks Concept Plan have centred around the following key aspects:

Layout Alternative One – Assess Coastal and Development Access

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 (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 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 thus 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, 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. 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.

Therefore, Layout Alternative One presents two (2) options:

- **Layout Alternative 1(a)** – Gated residential estate – 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.
- **Layout Alternative 1(b)** – Public access mixed-use development – 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.

Layout Alternative Two – Assess Stormwater Management Alternatives

The original Stormwater Management Plan and Concept Plan allowed for the attenuation of stormwater to be done via dry stormwater management 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 the majority of stormwater management facilities outside of wetland areas but within the 30 m wetland buffers.

Therefore, Layout Alternative Two presents two (2) options:

- **Layout Alternative 2(a)** – The original Concept Plan considered stormwater management facilities to be located within wetlands.
- **Layout Alternative 2(b)** – The revised Concept Plan presented in this EIA allows for stormwater attenuation facilities to be located largely outside of wetlands.

Layout Alternative Three – Assess Irrigation Dam Alternatives

In order to ensure the Wetland and Open Space Rehabilitation Plan is realised, water for irrigation of the large open space network is required. It is necessary to store this water for utilisation.

Therefore, Layout Alternative Three presents three (3) potential locations for the irrigation dam:

- **Layout Alternative 3(a)** – Irrigation Dam at location (a).
- **Layout Alternative 3(b)** – Irrigation Dam at location (b).
- **Layout Alternative 3(c)** – Irrigation Dam at location (c).

Layout Alternative Four – Assess development options for 'Area 9'

The revised Concept Plan (2017) sees the development footprint run adjacent to the Coastal Dune Forest. The Vegetation Assessment identified an area of concern referred to as 'Area 9' (***Figure 4-6***). 'Area 9' consists of sensitive woody vegetation.

Therefore, Layout Alternative Four presents two (2) potential development options:

- **Layout Alternative 4(a)** – Development footprint within Woody Vegetation.
- **Layout Alternative 4(b)** – Development footprint outside of Woody Vegetation.

In addition to the layout alternatives, activity alternatives for the source of water for irrigation have been considered as follows:

- ***Activity Alternative 1*** – Potable Water.
- ***Activity Alternative 2*** – Use of Sheffield WWTW Borehole.
- ***Activity Alternative 3*** – Abstracting water from the Umhlali River and Estuary.
- ***Activity Alternative 4*** – Use of treated wastewater from the Sheffield WWTW.

'No Go' Alternative

Finally, the No-Go option is considered. This alternative 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.

Alternatives – Additional considerations

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.

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 averse 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.

Coastal access, which was identified as a potentially significant issue, has been resolved. The Concept Plan which promoted a public access mixed-use development is recommended for authorisation. 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.

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.

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.

It is not anticipated that any significant impacts will arise from a vegetation perspective, as the vegetation that will be lost due to the proposed project footprint is all secondary in nature and provides limited ecological services and function.

The Open Space Network is well connected and will ensure that ecological processes are able to proceed and develop as the rehabilitation of the Open Space Network progresses. The opportunity exists to establish a heterogeneous Open Space Network that will incorporate, grasslands, wetlands, floodplains and back of beach areas which will contribute at a significantly higher ecological and functional level than they currently are.

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. The proposed development layout that has gone to great lengths to conform to the mitigation hierarchy (***Figure 10-1***) in order 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.

Stormwater management 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 management facilities within wetlands or within the wetland buffers have been assessed. Whilst the location of stormwater management 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 management facilities to be located predominantly outside of wetland areas, but within the 30 m wetland buffers, unless where unavoidable to be located within wetlands due to constraints such as topography or catchment hydraulics. The shift to locating stormwater management facilities outside of wetlands has resulted in the introduction of several swales into the stormwater design for the site.

The option of sourcing water for irrigation from various sources was considered. Potable water is not a feasible option considering the water strain and drought conditions presently being experienced. Furthermore, the assessment has found that abstracting water from the Umhlali River and Estuary is not an environmentally sound solution. Therefore, the option of utilising water from the Sheffield WWTW's borehole and/or treated wastewater from the Sheffield WWTW has been assessed.

Water for rehabilitation irrigation would need to be collected, thus the inclusion of a dam to store water for irrigation purposes. A number of dam sites were assessed for their ability to provide the appropriate water volumes required for irrigating the rehabilitation works. Layout Alternative 3(a) could unfortunately not supply the required amount of water for the irrigation demand, and was thus deemed unfeasible, as it would have required additional dams at other sites. While Layout Alternative 3(b) and Layout Alternative 3(c) could store an adequate amount of water for irrigation demands, it was decided that the larger dam (Layout Alternative 3(c)) would be preferable to ensure that enough water was stored to hedge against the drought conditions that have prevailed over the coastal area in the past few years.

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. These sites must be located within the approved development footprint.

From a geological perspective, the proposed development of the Tinley Manor Southbanks area is considered feasible as no catastrophic geological flaws exist that would exclude the entire area from development, although some areas should be avoided in terms of slope stability and problem soils. Notwithstanding the above the development of the area should be considered as challenging due to the geological constraints associated with the prevailing subsoil and ground water conditions present on site. As such for planning and construction of the proposed development, the recommendations provided in ***Section 0*** must be strictly

adhered to. These amount to no more than sound building practices appropriate for the geotechnical constraints associated with the on-site subsoils conditions. Site specific geotechnical investigation will be required at a later date and should include provisions for regular supervision by a geological engineering professional during development.

The Visual Impact Assessment (VIA) conducted for the proposed Tinley Manor South Banks development has demonstrated that the visual character within the study area varies. It includes areas with scenic views of the Indian Ocean and Umhlali River, distinct pastoral areas with rolling green hills and more transformed settings near urban areas and coastal towns. Although the Indian Ocean has attracted several leisure based tourism facilities into the area, very few visually sensitive receptors were identified within the study area as these are mostly located within coastal towns where urban form is already present. As such the proposed development would not alter the sense of place, compromise the scenic quality of views or impact on these facilities in any way.

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.

Amendments to the Concept Plan

Following the rejection of the final EIA Report (February 2016) and the presentation of this amended draft EIA Report (March 2017), a number of changes to the concept plan and engineering services layout have been necessitated. These changes have occurred through a detailed iterative design process in consultation with the entire specialist team.

Summary of amendments are as follows:

- Road reserves for all major roads widened to accommodate latest road designs, particularly planning to align with future KwaDukuza District Municipality extensions.
- The road reserve in the south-east corner amended to provide for future access, pedestrian access and/or emergency access point to adjacent existing development.
- The coastal access road northwards from P228 through the site has been classified as a Class 3 road, therefore no access is permitted to adjacent sites. Accordingly, the Retail 1 site at corner of this access road and the proposed Primary Spine Road has been expanded southwards to accommodate road access off the Spine Road.
- Provision of additional indicative future road and/or pedestrian access and/or emergency access options to adjacent land or development.
- Coastal portion of the Secondary Spine Road widened and realigned to accommodate latest road designs.
- Minor refinements to concept block outline based on preliminary design of roads and/or services networks.
- Education site inland of N2 now called "Community" site.
- The bulk waterline alignment changed from the Seaton Delaval Reservoir to the Tafeni Reservoir. The bulk water main will follow the alignment of the P228 and will be constructed within the road reserve. The bulk water main does not form part of this application.
- The number of sewer pump stations required was reduced from four (4) to three (3) pump stations as requested by SSW. Subsequently, slight changes in the sewer network layout were made.
- An irrigation network and dam have been added to the application.
- Yields amended to reflect more detailed work undertaken during the course of 2016 – the number of units therefore increases from 4,336 to 4,532 units.
- The stormwater management facilities layout was changed completely. Alternative solutions had to be found in order to minimise wetland losses. A number of swales have been included in the Stormwater Management Plan.

It is noted that the overall concept continues to propose, as previously, the optimal development of the site without compromising its environmental character and function. The updated design continues to capitalise on

the undulating landscape, wetland areas and coastal vegetation as part of an eco-centric design concept, which includes both direct and indirect interactions with the Umhlali Estuary, through the numerous drainage lines, wetland areas, estuary and the shoreline.

Conclusion

In line with the requirements of the National Environmental Management Act (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 presented in this amended EIA Report 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. 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.

Table of Contents

List of Tables

Table of Figures

List of Appendices

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.
Coastal Setback Line	The coastal setback line demarcates the proposed coastal management line, still to be determined, and is delineated taking consideration of coastal risk (sea level rise and coastal slippages).
Coastal Management Line	A line determined by an MEC in accordance with section 25 of the National Environmental Management Integrated Coastal Development Act (Act No. 24 of 2008)(as amended) in order to demarcate an area within which development will be prohibited or controlled in order to achieve the objects of the Act or coastal management objectives.
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.
Cultural Landscape	A representation of the combined worlds of nature and of man illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal.
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) and (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.
Limited Development Line	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. The limited development line is deemed to equate to the coastal protection zone in terms of the National Environmental Management Integrated Coastal Act (Act No. 24 of 2008)(as amended).
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.
Sense of Place	The unique quality or character of a place, whether natural, rural or urban. It relates to uniqueness, distinctiveness or strong identity.
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.

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.
Visual Character	The physical elements and forms and land use related characteristics that make up a landscape and elicit a specific visual quality or nature. Visual character can be defined based on the level of change or transformation from a completely natural setting.
Visual Contrast	The degree to which the development would be congruent with the surrounding environment. It is based on whether or not the development would conform with the land use, settlement density, forms and patterns of elements that define the structure of the surrounding landscape.
Visual Impact	The effect of an aspect of the proposed development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.
Visual Sensitivity	The inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (visual character), spatial distribution of potential receptors, and the likely value judgements of these receptors towards the new development, which are usually based on the perceived aesthetic appeal of the area.
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
ADF	Average Daily Flow
AMSL	Above Mean Sea Level
CMA	Catchment Management Agency
CML	Coastal Management Line
CMP	Coastal Management Plan
CV	Curriculum Vitae
CvB	Channelled Valley Bottom
DAFF	Department of Agriculture, Fisheries and Forestry
DEA	National Department of Environmental Affairs
DEDTEA	KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (previously known as Department of Agriculture and Environmental Affairs (DAEA))
DMR	Department of Mineral Resources
DoT	Department of Transport
DTM	Digital Terrain Model
DSEDS	District Spatial Economic Development Strategy
DWA	Department of Water Affairs (now known as the Department of Water and Sanitation (DWS))
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
ESR	Environmental Scoping Report
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
KDE	KwaDukuza Electricity
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
masl	Meter Above Sea Level
MSL	Mean Sea Level
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act (Act No 107 of 1998)

NEM:ICMA	National Environmental Management Integrated Coastal Management Act (Act No. 24 of 2008)
NEM:WA	National Environmental Management – Waste Act (Act No .59 of 2008)
NFA	National Forests Act (Act No. 84 of 1998)
NWA	National Water Act (Act No. 36 of 1998)
PAH	Poly-Aromatic Hydrocarbons
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
SMF	Stormwater Management Facility
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
VIA	Visual Impact Assessment
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 485 ha site, located between the coastal towns of Tinley Manor and Sheffield Beach, within the KwaDukuza Municipality, KwaZulu-Natal (***Figure 1-1***).

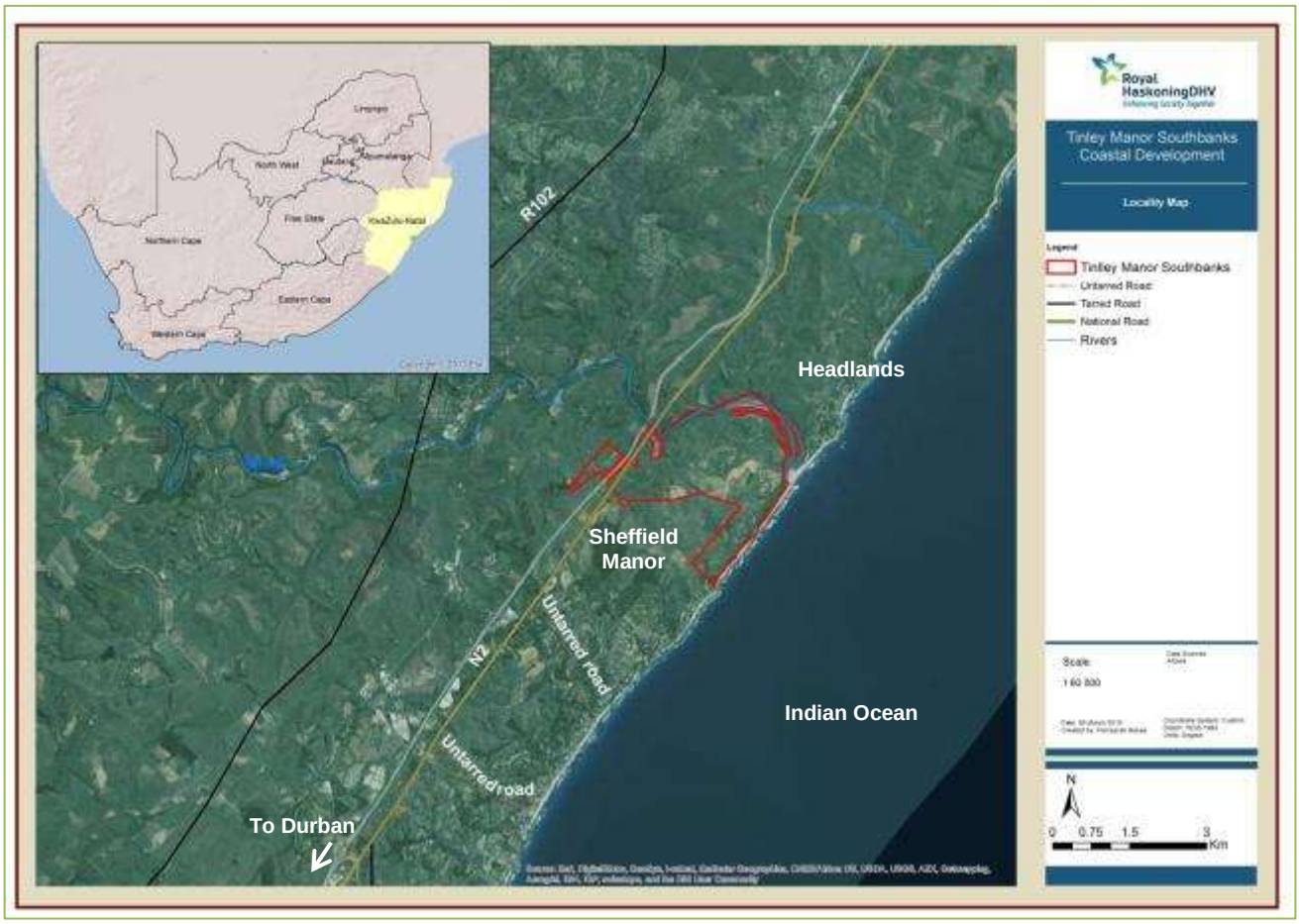


Figure 1-1: Location of the proposed Tinley Manor Southbanks Coastal Development

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***).

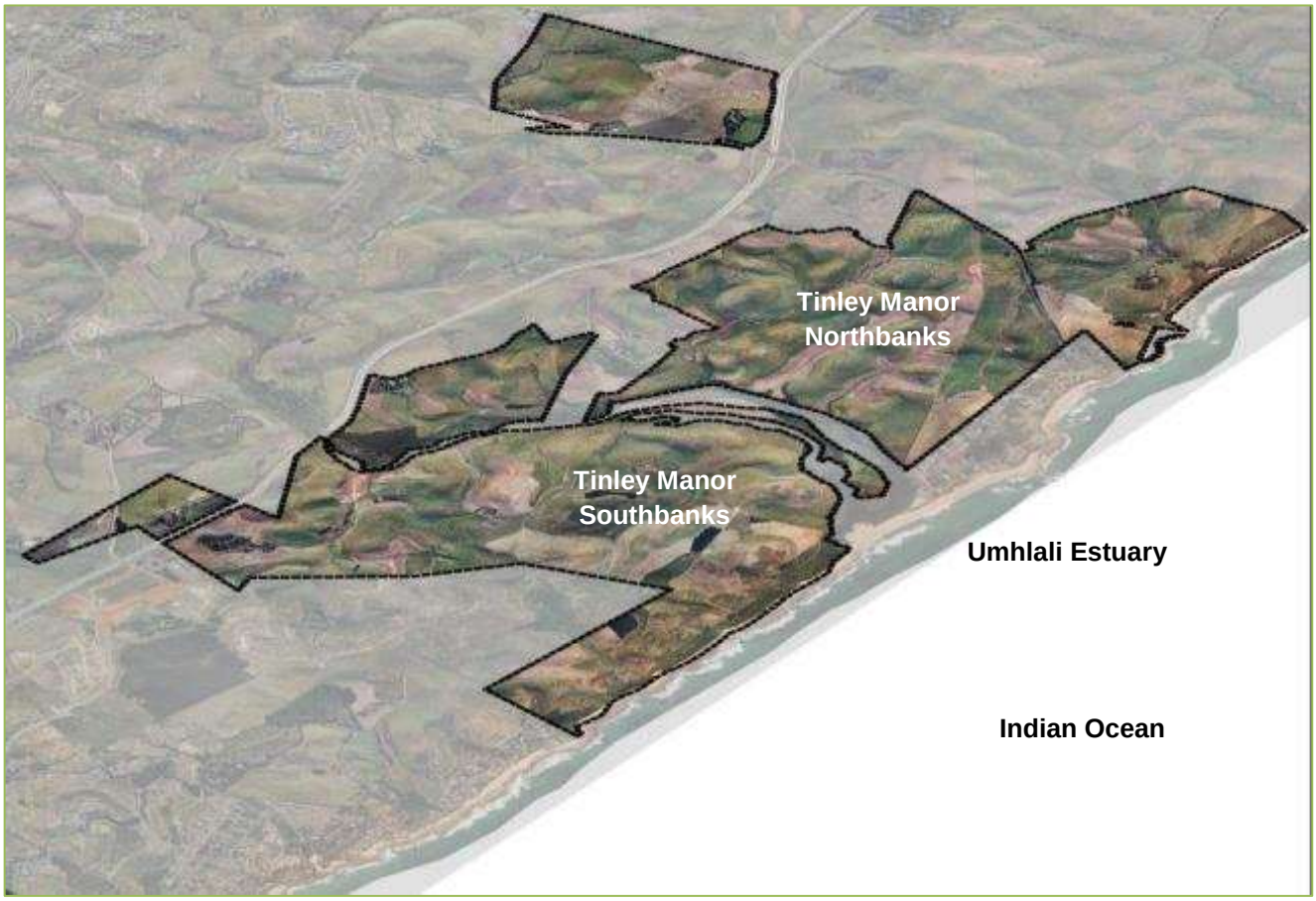


Figure 1-2: THD's proposed Northbanks and Southbanks landholdings

THD's Tinley Manor Estates have substantial potential for development emanating predominantly from the location of the KwaDukuza Municipality 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. 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 in ***Figure 1-3***).

Figure 1-3: Aerial photographs of the site

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 a recreational and natural amenity, also requires appropriate and carefully planned and designed beach access for both residents and tourists to utilise.

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 the following phases (***Figure 1-4***):

- Phase 1 – Compilation of an **Environmental Scoping Report** (ESR) including **Plan of Study** (PoS) for EIA – *complete (refer to acceptance of the ESR in Appendix A)*;
- Phase 2 (a) – Compilation of an **Environmental Impact Assessment Report** (EIAR) and **Environmental Management Programme** (EMPr) – *submitted for decision-making and documents rejected (refer to rejection letter in Appendix A);* and
- Phase 2 (b) – Compilation of an **amended Environmental Impact Assessment Report** (aEIAR) and **Environmental Management Programme** (EMPr) – *current.*

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 and decision-making – *current*.

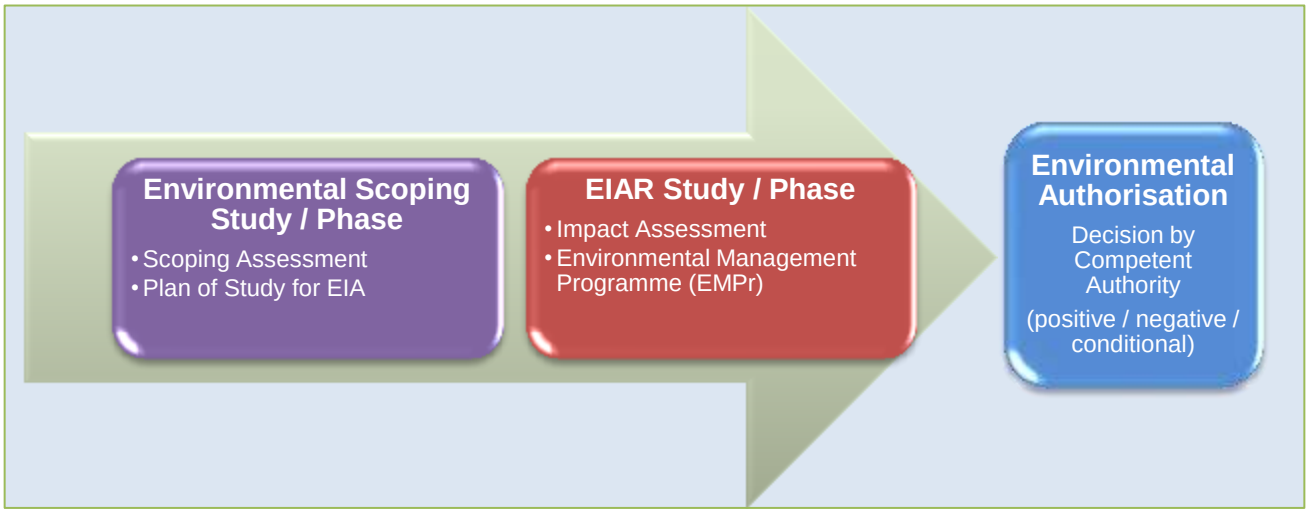


Figure 1-4: Environmental studies flow chart

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. This request committed to the circulation of the draft EIAR for public review and comment by the end of March 2015.

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 changes.

1.2.2 Environmental Impact Study

This final EIAR aimed 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 final EIAR was 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.

The **final EIAR** was submitted to the KZN EDTEA for decision-making on **25 February 2016**. An **Addendum** to the final EIAR was submitted to the KZN EDTEA on **07 April 2016** for decision-making.

1.2.3.1 Rejection of the Final Environmental Impact Assessment Report

The final EIAR was rejected by the KZN EDTEA on 08 June 2016.

In reaching its decision, the KZN EDTEA took *inter alia*, the following into consideration:

- The information contained in the Final EIA Report dated 25 February 2016 and all associated specialist studies as well as an Addendum to the Final EIA Report dated 07 April 2016;
- The comments received from the Organs of State and Interested and Affected Parties as included in the EIA Report dated 25 February 2016 as well as Addendum to the Final EIA Report dated 07 April 2016; and
- The objectives and requirements of relevant legislation, policies, guidelines, including section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (as amended).

After consideration of the information and factors listed above the KZN EDTEA rejected the final EIAR, requesting the following:

- Amendment to and further elaboration to the list of activities applied for;
- Additional detail with regard to:
  - wetland crossing points and construction method;
  - abstraction from the Umhlali River;
  - cumulative estuarine impacts and management;
- Additional clarification and/or elaboration on the impact assessment;
- Revisions to the EMPr;
- Additional consultation with the Department of Agriculture, Forestry and Fisheries (DAFF) regarding the Coastal Dune Forest buffer area;
- Revisions and/or clarification on the:
  - Traffic Impact Assessment (TIA);
  - Urban Planning Report;
- Provision of a phasing plan for the sub-phases of the development; and
- Additional public participation as a result of the rejection.

A copy of the rejection letter is included in ***Appendix A***.

1.2.3.2 Amendment to the Environmental Impact Assessment Report

Following receipt of the rejection of the final EIAR, a meeting was held with the KZN EDTEA on 12 July 2016 to discuss the rejection letter and the way forward for this application. Minutes of this meeting are included in ***Appendix A***. Further to this, the EAP provided a proposed programme to the KZN EDTEA and requested the application is kept open enabling the EAP and specialist team to address the requests made by the KZN EDTEA. The KZN EDTEA agreed to keep the application open provided the final amended EIAR is submitted for decision-making by the end of May 2017.

Correspondence from the KZN EDTEA is included in ***Appendix A***.

This amended 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 GNR.543

EIAR Requirements according to Section 31 of GNR. 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	**3**
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	**2.1 & 2.2**
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	**6**
31(2)(e) Details of the public participation process conducted	**9**
31(2)(f) A description of the need and desirability of the proposed activity	**2.3**
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	**4 & 10.1**
31(2)(h) An indication of the methodology used in determining the significance of potential environmental impacts	**8**
31(2)(i) A description and comparative assessment of all alternatives identified during the environmental impact assessment process	**10**

EIAR Requirements according to Section 31 of GNR. 543	Section in report
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	**8**
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	**8**
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**
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**

Furthermore the amended draft EIAR has addressed the specific items of the rejection letter received from the KZN EDTEA, dated 08 June 2016, as detailed in ***Table 1-2***.

Table 1-2: EAP Response to the Rejection Letter

Letter Ref.	Description	EAP Response
1	The above mentioned report received on 25 February 2016 and the additional information received on 07 April 2016 has reference.	Noted.
2	The report and additional information has been reviewed by the Department and has been rejected for the following reasons:	Noted.
2.1	Page 11, Listed activities triggered according to Listing Notice 1, 2 and 3 of the EIA Regulations 2010; please identify only the activity that will be triggered. For example: Activity 16 *(LN1)* which states: The construction or earth moving activities in the sea, an estuary, or within the littoral active zone or a distance of 100 metres inland of the high-water mark of the or a 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 or structures covering 50 m^2 or more.	The List of Activities applied for has been updated and the required detail provided in ***Table 5-1*** as well as a comparison of the activities applied for in terms of the EIA Regulations (2010) and the "now applicable" EIA Regulations (2014) in ***Appendix E***. Furthermore, the application for EA has been revised accordingly and will be submitted to the KZN EDTEA with the amended final EIAR.

Letter Ref.	Description	EAP Response
	If all the activities are likely to be triggered, please detail how these activities will be triggered, alternatively, remove those activities that are not applicable.	
2.2	Activity 9 *(LN1)*, please confirm pipeline diameters and the maximum diameter of the pipeline. Details of the pipeline servitudes (trench depths and widths) in sensitive areas and non-sensitive areas must be detailed.	The List of Activities applied for has been updated and the required detail provided in ***Table 5-1***. Pipeline diameters are provided in ***Figure 7-14*** and ***Figure 7-15***. Furthermore, detail of all pipeline infrastructure in sensitive areas (i.e. those crossing wetlands) are provided in ***Figure 7-13***. The working servitudes will be to a maximum of 10 m on either side of the approved trench depth in sensitive areas and 20 m in non-sensitive areas. The trench depth and widths vary depending on the size of the pipeline. Maximum trench depths will be 2 m and maximum trench widths will be 5 m.
2.3	Activity 11 *(LN1)*, please include all triggers.	The List of Activities applied for has been updated and the required detail provided in ***Table 5-1*** as well as a comparison of the activities applied for in terms of the EIA Regulations (2010) and the now applicable EIA Regulations (2014) in ***Appendix E***. Furthermore the application for EA has been revised accordingly and will be submitted to the KZN EDTEA with the amended final EIAR.
2.4	Activity 13 *(LN1)*, please provide all details related to this activity, a detailed inventory and the capacity that will be required.	This Activity is no longer applied for and the List of Activities applied for has been updated accordingly in ***Table 5-1*** as well as a comparison of the activities applied for in terms of the EIA Regulations (2010) and the now applicable EIA Regulations (2014) in ***Appendix E***. Furthermore the application for EA has been revised accordingly and will be submitted to the KZN EDTEA with the amended final EIAR. Activity 13 is not deemed applicable as the volume of hazardous substances stored on site during the construction phase at any given time will not exceed 80 m^3. Any storage of hazardous substances during the operational phase (e.g. fuel filling stations) will be applied for by the end-use Developer – that is, they will be considered as amendments to the documentation at hand or stand-alone applications to EDTEA with separate EAs.
2.5	Activity 14 *(LN1)*, all details of the development in the coastal public property must be provided.	This Activity is no longer applied for and the List of Activities applied for has been updated accordingly in ***Table 5-1*** as well as ***Appendix E***. Furthermore the application for EA has been revised accordingly and will be submitted to the KZN EDTEA with the amended final EIAR. Activity 14 is not deemed applicable as there is no development proposed in the coastal public property. That is, given the sensitivity thereof this area is deemed a 'no go' area from a development point of view.
2.6	Activity 28 *(LN1)*, please provide more detail on how this activity is triggered.	This Activity is not applicable and has been removed.

Letter Ref.	Description	EAP Response
2.7	Activity 39 *(LN1)*, it is unclear why expansion activities have been applied for considering that the site is currently undeveloped with no infrastructure on the site, please provide clarity on the application of this activity and further details.	This Activity is applied for the expansion and/or culvert upgrades of existing sugarcane roads.
2.8	Activity 56 *(LN1)*, it is not clear why this activity is being applied for, please provide all relevant details related to this activity.	Following consultation with the KZN EDTEA (c/f ***Appendix A***), this Activity is no longer applied for and the List of Activities applied for has been updated accordingly in ***Table 5-1*** as well as ***Appendix E***. Furthermore the application for EA has been revised accordingly and will be submitted to the KZN EDTEA with the amended final EIAR. It is noted that the Tinley Manor Development will be done in two phases (i.e. Phase 1 being Tinley Manor Southbanks, and, Phase 2 being Tinley Manor Northbanks). However, these applications will be handled separately as they are viewed as two separate developments. Furthermore, the proposed Tinley Manor Beach Enhancement Project is also viewed as an independent development. Note that Tinley Manor Southbanks itself will be developed in sub-phases, however, one consolidated application is applied for (application at hand), and therefore, this Activity is not deemed applicable.
2.9	Activity 5 of GNR 545 *(LN2)*, please provide more information on how this activity is triggered.	This Activity is potentially applicable for the Water Use Licence. The Department of Water and Sanitation have indicated that a Section 21 (g) “disposing of waste in a manner which may detrimentally impact on a water resource” – application is required for the potential overflow of the sewer pump stations on the site.
2.10	Activities 6, 12, 13 and 26 *(LN3)*, it is unclear how these activities are triggered / applicable. Provide all relevant information related to these activities must be provided, all sensitive geographical areas must be identified and details on these areas must be provided.	These Activities are not applicable and have been removed, however Activity 4 of Listing Notice 3 has been applied for and reasons for the inclusion of this Activity provided.
2.11	Page 39-45 speak of the wetlands that are on the site, however there is no identification of the wetlands that will be crossed and to what extent these wetlands will be impacted. A layout plan must show all the crossings of the wetlands, as well as the dimensions and the co-ordinates related to these crossings.	A layout plan illustrating the location of each wetland crossing as well as the co-ordinates of each crossing and the dimensions is provided in ***Figure 7-13***, ***Figure 7-14*** and ***Figure 7-15*** and ***Appendix F***.
2.12	Page 51 has reference, 4.13.3, roads, please provide a clear map showing the route for accessing the site during the construction period.	Access to the site during the construction phase will be via the P228. A map illustrating the construction phase access is provided as ***Figure*** 3-15.
2.13	In light of the above mentioned, has the Sheffield Manor Estate been identified as an I&AP, and other estates / home owners along the route of the P228, who will be affected by the proposed development and construction process?	Additional consultation with estates and home owners along the P228 has occurred, and all parties have been provided an opportunity to comment on the amended EIAR. Feedback on this additional consultation will be included in the final amended document submitted.
2.14	Further, would the road be upgraded prior to	The P228 is under the authority of the KwaZulu-

Letter Ref.	Description	EAP Response
	the commencement of construction of Tinley Manor Southbanks?	Natal Department of Transport (KZN DoT). The Applicant and Traffic Engineers have engaged with the KZN DoT and comment has been received and included in ***Appendix H***. The KZN DoT have acknowledged the need to upgrade the P228 and have further indicated that the KwaDukuza Municipality will commence with assessing all neighbouring developments which also require the upgrade of the P228. Relevant contributions will be collected from all Developer's and the upgrade of the P228 will then proceed. It is noted that the upgrade of the P228 is outside the scope of this assessment and has not been applied for as part of this assessment as the KZN DoT will be undertaking the upgrade. It is further noted that the Traffic Impact Assessment (TIA) recommends the need for the upgrade of the P228 to service the Tinley Manor Southbanks as well as associated neighbouring developments. The upgrade of the P228 is not recommended solely for the Tinley Manor Southbanks. Therefore, the Applicant for this application cannot commit to the timing of the upgrade of the P228. However, the Applicant is committed to paying the required contributions timeously. Furthermore, the impacts associated with the use of the P228 in it's present stage have already been assessed in an **Analysis of Construction Traffic Report** prepared by Aurecon as part of the TIA and in this amended EIAR. A Traffic Management Plan is also included.
2.15	Page 59, the EAP is reminded that the development is adjacent to the N2 not the N3, effect the changes throughout the document.	The EAP and specialist team regret this oversight. All references to the "N3" have been corrected to the "N2" in this document and associated specialist studies.
2.16	Page 70, the land use zones speak of a private resort, however no details are provided in terms of size of the development and the proximity of the resort to the coast. Furthermore, there are no details provided regarding beach access from the resort. All details related to the development within sensitive areas, i.e. Wetlands, the estuary and the coastal zone must be detailed. Address this.	The size of the resort is 12 ha with a Floor to Area Ratio (FAR) of 0.250. The resort is located approximately 200 m away from the coast (***Figure 3-9***). Access to the beach will be via pedestrian access only, via elevated boardwalks. Two (2) emergency vehicular accesses are proposed, however, these access points are controlled (i.e. security booms will be implemented to prevent public access). Both accesses will utilise existing sugarcane road alignments / footprints and no new roads are proposed to be established. The location of the pedestrian boardwalk access and emergency vehicular access is presented in ***Figure 3-7***, ***Figure 3-16***, ***Figure 3-17*** and ***Figure 3-18.*** The relevant specialists have assessed the impacts of the accesses in sensitive areas and these findings are presented in this amended EIAR.
2.17	The details of the 11 land use zones have been omitted, i.e. the site area, please provide all relevant details related to the description of all sites.	Details of all 12 land use zones are provided in ***Table 3-2*** and ***Section 3.1.7***. Note the roads are now included as a specific land use zone.

Letter Ref.	Description	EAP Response

2.18	Page 77 has reference, project alternatives, these alternatives are not in line with the EIA Regulations (31)(2)(g)-(i). Alternatives must be described according to the requirements of the EIA Regulations 2010. Please note that the alternative, Construction Management Alternatives, presented in the EIAR is not considered a feasible and reasonable alternative and therefore cannot be considered an alternative. Please refer to the definition of alternatives in the EIA Regulations, 2010 and make the relevant changes.	Alternatives considered are presented in ***Section 4.*** These alternatives include:
		• Layout Alternative One – Coastal and Development Access Alternatives;
		• Layout Alternative Two – Stormwater Management Facilities Alternatives;
		• Layout Alternative Three – Irrigation Dam Alternatives;
		• Layout Alternative Four – 'Area 9' Alternatives;
		• Alternative Activity – Alternative Source of Irrigation Water as follows:
		  ○ Potable Water;
		  ○ Use of Sheffield WWTW Borehole;
		  ○ Abstraction from the Umhlali River and Estuary; or
		  ○ Use of treated wastewater from the Sheffield WWTW; and
		• Consideration of the No-Go Alternative.
		Construction Management Alternatives are now not presented as an Alternative in ***Section 4***, but rather presented as potential mitigation options in ***Section 8.3.20***.

2.19	Page 79, the last paragraph speaks of elevated wooden boardwalks, however, no details related to the boardwalks are provided in the EIAR. All details related to the boardwalks within all sensitive areas must be detailed as well as construction methods, impacts and mitigation measures must be identified. Address this.	A locality map illustrating the location of the boardwalks is presented in ***Figure 3-7***, ***Figure 3-16***, ***Figure 3-17*** and ***Figure 3-18***. The boardwalks (deemed a less intrusive / impactful option) are proposed in sensitive areas (i.e. along Umhlali Estuary and within Coastal Dune Forest) to promote conservation and sustainable pedestrian access to these pristine environments and the coast. The impacts associated with the installation and maintenance of these boardwalks, as well as proposed mitigation measures are presented in ***Sections 7.4.2.2*** and ***7.7.1.1***. These mitigation measures are further included in the EMPr (***Appendix B***). A proposed construction method is also presented.
2.20	Page 162, The Environmental Impact Assessment, potential impacts and significance, the impacts identified are not considerate of the type of the entire development proposal. The impacts identified are very limited. The mitigation measures presented are very basic and do not cover foreseeable possible impacts related to the construction and operation of a development of this scale. It is also questioned with great concern, as to how mitigation measures are rated, when mitigation measures presented are statements and provide no mitigation. While it is understood that the conditions in the EMPr and the impacts that have been identified in this section do overlap, sound mitigation measures must be presented in this section that consider the impact and the receiving environment. Understanding of the impacts related to the development and the receiving environment is imperative to adequately assess the impacts and rate them accordingly.	This identification, assessment and rating of impacts as well as the proposed mitigation measures have been revisited. The revision is presented in ***Section 8.3.***

Letter Ref.	Description	EAP Response
	Please address this section in depth.	
2.20.1	Page 165, bullet 2, this is not a mitigation measure and cannot be assigned a score as it is not quantifiable. Address this.	This bullet has been removed.
2.20.2	Page 168, under the aspect of surplus fill material stockpiles, bullet 3 under mitigation, this mitigation measure is not in line with the aspect and impact, remove and reconsider.	This bullet has been removed.
2.20.3	Bullet 4, this is unclear, address this.	This bullet has been re-worded.
2.20.4	Bullet 7, state what measures these are.	The required measures have been elaborated on.
2.20.5	Page 171, under aspect development of hardened surfaces, bullet 1 under mitigation measures, give examples of what land disturbances are being referred to and how they should be managed.	The bullet has been amended to explain that land disturbances refer to the clearance of land for earth-works and installation of services. Appropriate stormwater management during the construction phase has been provided, including how the phasing of land disturbances should occur, along with immediate rehabilitation and re-vegetation, where appropriate.
2.20.6	Page 172, under impact: Alteration of surface water resources due to land use changes, this impact requires further discussion and identification of impacts as well as mitigation measures to be provided.	This impact has been removed from the Hydrology Section (***Section 8.3.4***) as the alteration of surface water resources due to land use changes (i.e. loss of wetland area to accommodate the development footprint) is assessed in detail in the Wetland Section (***Section 8.3.6***) that follows.
2.20.7	Page 172, under aspect: Abstraction of water from the Umhlali River; this mitigation measure is insufficient and in its current state cannot be rated as a medium impact; there must be accurate identification of impacts associated with this aspect and impact.	The impact of abstracting water from the Umhlali River has been revisited. Due to the high significance rating and due to the specialist recommendation, the proposed option to abstract water from the Umhlali River has been aborted and is not proposed further. Therefore, the rating of this impact under this Section has been removed. However the rating of impacts associated with abstraction of water from the Umhlali River itself is still detailed in the Estuarine Specialist Report (***Appendix C***).
2.20.8	Page 172, under cumulative impact, bullet 2, how will there be improved wetland functionality? Address this.	The installation of swales, stormwater management facilities and wetland rehabilitation interventions, as proposed in the SMP, will result in appropriate flows on water into the wetland system, thereby improving the wetland functionality. However, it is accepted that improved wetland functionality is not a mitigation measure in this instance and has been removed.
2.20.9	Page 173, bullet 14 of mitigation measures, this mitigation measure must include the following: demarcation of sensitive areas and restricting movement in these areas, as well as treating them as no-go zones, any persons found in these areas must be fined according to the fine structure in the EMPr.	This is now included.
2.20.10	Page 174, bullet 9, this mitigation measure must read: the infilling of wetlands (unless where required for the necessary infrastructure) and estuarine habitat, and any other methods to reduce such environments is not supported. Provide further mitigation	The revised wording is captured. Additional mitigation measures for the construction of boardwalks within sensitive areas is also included. These include: • Materials must consist of either treated wood, poly-prop or 'eco-wood' options to ensure the

Letter Ref.	Description	EAP Response

	measures for construction within these sensitive areas.	maintenance of the landscape character as far as possible and to ensure durability;
		• The optimal width of the boardwalk must be 1.5 m minimum;
		• Design of access (ramp and/or stairs) onto the beach, as well as the decks, must take cognisance of the dynamic nature of the beach sand and be able to accommodate variation in heights;
		• Any protected trees, as well as the unnecessary clearing of any coastal vegetation, must be avoided;
		• Rubbish bins must be provided along the route;
		• Informative and education signage can be installed to educate users; and
		• The construction methodology must be appropriate to the site and local conditions of the proposed boardwalks. Specific method statements must be submitted by the contractor(s) for approval by the ECO, prior to construction. Examples of inclusions in the construction methodology include:
		  ○ Clearance of vegetation should be kept to a minimum and preferably cleared by hand, if possible;
		  ○ Follow previously disturbed and transformed existing sugarcane-harvesting contour paths; and
		  ○ Stainless steel screws should be used.

2.20.11	Page 174 / 175, under operational phase, potential impacts, under mitigation measures, bullet 1 and 2, these are not adequate mitigation measures, address this. It is not clear why impacts as a result of increased nutrient loads, have not been identified as a direct and cumulative impact, and why no mitigation measures are presented in the EIR. This section on the impact identification is considered flawed and the impact rating of low is incorrect. This section must be reconsidered, all possible impacts associated with the WWTW the direct and cumulative impacts must be identified and mitigation measures provided in this section and the EIR.	The authorisation and construction of the Sheffield WWTW was approved through a formal EIA process, wherein the impacts associated with discharging treated waste water to the Umhlali Estuary were assessed. A Water Use Licence Application (WULA) initiated by Sembcorp Siza Water is also in progress. Based on stringent water restrictions, Sembcorp Siza Water is seeking to reclaim as much water as possible from the incoming effluent for reuse. However, controlled discharge into the estuarine environment is expected and will obviously be considered in the WULA. The impacts of treated waste water on the estuarine environment have been assessed in the study. Specific mitigation measures have been provided in consultation with a Wastewater Treatment Specialist for implementation at the Sheffield WWTW. However, management of the WWTW and implementation of these measures remains the responsibility of Sembcorp Siza Water and is in no way transferred to THD. All the operational conditions of the WWTW must be added to the EMPr for the Tinley Manor Southbanks once these are made available (i.e. via the pending WULA for the Sheffield WWTW).
2.20.12	As mentioned above, include impacts related to the increased nutrient loads as a direct result of the development on the Umhlali Estuary must be included in the impact assessment and	The authorisation and construction of the Sheffield WWTW was approved through a formal EIA process, wherein the impacts associated with discharging treated waste water to the Umhlali

Letter Ref.	Description	EAP Response
	rated.	Estuary were assessed. As indicated previously, a WULA initiated by Sembcorp Siza Water is also in progress. The controls linked to that process are discussed in the rebuttal to 2.20.11 above.
2.20.13	Page 175, under the above mentioned section, the second aspect, which states, inadequate stormwater management and water contamination, as well as mitigation measures provided. Bullet 1, this mitigation measure must be reconsidered. Details on this mitigation measure must be prevented.	Detailed mitigation measures for stormwater management relating to the estuary are now presented.
2.20.14	Page 175, under cumulative, disturbance and utilisation of the estuary as a result of an increase in the number of people. A management plan must be considered as a mitigation measure to manage impacts caused by the utilisation of the estuary. The applicant, land owner, HOA whichever the case is must be responsible for implementation and monitoring of the management plan. This plan will be separate from the recommended Estuary Management Plan and will deal with issues as a direct result of the increased use of the estuary, which is not occurring currently. This should include management of the structures within 50-100 metres of the estuary, pollution, management of the proposed boardwalk structures, etc.	The authorisation and construction of the Sheffield WWTW was approved through a formal EIA process, wherein the impacts associated with discharging treated waste water to the Umhlali Estuary were assessed. As indicated previously, a WULA initiated by Sembcorp Siza Water is also in progress. The controls linked to that process are discussed in the rebuttal to 2.20.11 above. Mitigation measures for the protection of the estuary during the operational phase are included in the EMPr (***Appendix B***). Furthermore, as agreed with the KZN EDTEA (refer to minutes in ***Appendix A***), the EMPr requires that a Conservation Management Plan for the management of the open space area (including the estuary) is compiled prior to the operational phase commencing. This is also a recommended condition of the EA.
2.20.15	Page 176, 9.3.6 Wetlands; the aspects and impacts that have been identified in this section are not representative of the potential impacts that could occur during construction. These impacts identified must be reconsidered, what will be the impacts associated with the construction within the wetlands? Specify these impacts and provide mitigation measures that are reasonable and implementable. Detail the infrastructure that will be crossing the wetlands and specify ROW servitudes (trench depths and widths) for construction within the wetlands. Detail the possible impacts that are related to the flora and fauna that possibly occur in these areas and provide mitigation measures.	This section has been revisited. Additional impacts have been identified and assessed and appropriate mitigation measures presented in ***Table 8-6*** and ***Table 8-8***.
2.20.16	The cumulative impact identified in the above mentioned section, especially bullet 2 is inadequate. A wetland management plan should be implemented during the operational phase which will ensure continued protection and proper functioning of the wetlands, which the applicant / land owner will be responsible for implementing and monitoring.	Refer to the Wetland and Open Space Rehabilitation Plan (***Appendix B 4***), Section 12 which includes a Wetland Management Plan and Monitoring Programme.
2.20.17	Page 179, 9.3.7 Biodiversity, this section has a lack of impacts related to the development during construction phase. Address this.	Additional impacts and mitigation measures are provided in ***Table 8-9.***
2.20.18	Page 179, 9.3.8 Coastal, aspect 2, and mitigation measures that follow this aspect.	This has been added to the mitigation measure. A no-go map is included in the EMPr and

Letter Ref.	Description	EAP Response
	Bullet 1, there must be no construction camps within dune forests and coastal zones. All sensitive areas must be buffered and treated as no-go zones, the construction camps must be located a distance away from these areas.	***Section 10***.
2.20.19	Page 180, under 9.3.8 coastal, under impact, bullet 4, has no mitigation measures, address this.	Mitigation measures now provided.
2.20.20	Page 180, under mitigation measures, bullet 5 must specify that dumping is prohibited.	This change has been made.
2.20.21	Page 180, under the above mentioned section, bullet 10, there must be no discharge of any pollutants into the aquatic or costal environment, detail how this must be ensured.	The following mitigation measures have been added: • Stormwater design needs to ensure that stormwater run-off from the new hardened surfaces is cleaned and that flows are attenuated prior to reaching the coastal zone. Means of 'scrubbing' and removing sediment, litter and debris from the run-off must be implemented, such as silt and “trash / litter” traps. 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 (i.e. 'polishing' of contaminants) and flood control (i.e. slowing flow velocities and promoting percolation) prior to entering the estuary. • The location of one of the proposed pump stations adjacent the no-development setback line is proposed to be mitigated via the construction of an overflow pond. A stand-by generator must be installed at the pump station and must be maintained in correct working order. It is acknowledged that the infrastructure proposed complies fully with these requirements.
2.20.22	Page 180, under the above mentioned section, bullet 15 of mitigation measures speaks of the market gardens, this is not detailed in the project description, if this is not part of the development, this must be removed.	Market gardens were proposed in earlier iteration of the development concept which is no longer proposed. All references to the market gardens have now been removed.
2.20.23	Under the above mentioned section, page 182, operational phase, aspect 2, and the related impact. The mitigation measure presented is not aligned with the impact identified. Address this.	The mitigation measures have been amended as follows: • Public access to the beach via boardwalks, pedestrian pathways and emergency vehicular access must be provided for (this has been done). • A private beach is prohibited.
2.20.24	Page 185, 9.3.12 Visual. Bullet 3, this mitigation measure is questioned, dense vegetation and lower lying areas (wetlands/ drainage lines) are considered to be a sensitive area and therefore construction camps within this vicinity will have adverse impacts, reconsider this mitigation measure.	The mitigation measure is re-worded to read as follows: Locate the construction camp and storage areas in zones of low visibility i.e. behind dense bush or in lower lying areas (note: constraint related to proximity to watercourses). However, construction camps cannot be located within 50 m of watercourses, or within areas of sensitive vegetation. Furthermore, hilltop slopes that face the N2 must not be used for construction camps. The ECO must approve construction camps prior to establishment.

Letter Ref.	Description	EAP Response
2.20.25	Page 185, bullet 5 must read: areas of dense vegetation on the boundaries of the development site must be left intact to ensure natural screening of the site.	This change has been made as recommended.
2.20.6	Page 186, under the above mentioned section, the following mitigation measure must be added: the site must be screened with the use of shade cloth to reduce the visual impact of a construction site.	This change has been made as recommended.
2.20.27	Page 186, operational phase aspects and impacts. The mitigation measure provided is inadequate. This mitigation measure must read: the character of the site will be permanently altered, however, the site will be enhanced by the rehabilitation of the wetlands, dune forest etc. ensuring a sustainable development, while conserving sensitive features like the estuary, coastal forest and other naturally occurring features.	This change has been made as recommended.
2.20.28	Page 186 cumulative impacts – under mitigation measures – architecture point 1, this mitigation measure is contrary to the information presented in the project description on page 69, which states that the height of buildings will be 6 storeys high. Address this.	This has been revisited in both the amended EIAR and the revised Visual Assessment. The mitigation measure allows for a 6 storey building as proposed in the planning report.
2.20.29	Page 187, 9.3.13, Traffic, construction phase, mitigation measures. Bullet 1, this is not a mitigation measure as there are only 2 possible routes to the site and both these routes utilise the main roads, i.e. the N2 and the R 102. Address this.	This mitigation has been removed as there is only one entrance to the site via the P228 for the first phase of the construction.
2.20.30	Page 187, bullet 3 and 4, these are not mitigation measures and are not of an environmental nature, remove them.	These have been removed.
2.20.31	Page 190, under 9.3.14, Socio - economic and Health cumulative impact, eTM is made reference to. It is assumed that this is making reference to eThekwini Municipality. If this is the case, the EAP is reminded that the Local Municipality is the KwaDukuza Municipality and Ilembe Municipality is the District Municipality in which this project falls in. As such it is unclear what the first aspect is making reference to. Address this.	The reference to the Municipality has been corrected. The aspect/impact has been revisited.
2.20.32	Page 191, Table 9-18: Tinley Manor South banks stormwater attenuation facilities impacts – Revised Option (outside wetlands). The impacts and mitigation measures identified are not representative of the possible impacts that may occur during construction. What are these impacts and what are the mitigation measures? Some of these impacts could be: (i) excavation within wetland buffers, which will impact temporarily on the functionality of wetlands, (ii) heavy machinery within the wetland buffers (what are the impacts of this), (iii) possible pollution of the wetlands, (vi) possible encroachment by heavy machinery into wetland areas, (v) exceeding the width of the ROW, (vi) possible contamination flowing into	Additional impacts and mitigation measures have been presented in Table ***8-19*** and ***Table 8-20***.

Letter Ref.	Description	EAP Response
	wetlands, (vii) erosion, etc. Identify mitigation measures to the impacts identified above.	
2.21	Page 197, under Wetlands, it is noted with great concern that there has been no mention throughout the EIAR the loss of wetlands and to what extent and motivation for the encroachment into these wetland areas. It is also noted that there is mention of an off-set for the loss of wetlands which is mentioned in the EIAR (page 211) and the comments and responses report. However, there is no such document provided in the EIAR neither is there any information presented in the EIAR regarding off-sets as a result of the loss of wetlands. If there is a loss of wetlands, what ratio will be lost? This Department requests documentation that is referred to in this comment found on page 41 of the comments and response report.	The Wetland and Open Space Rehabilitation Plan referenced in the Comments and Responses Report was submitted in the final EIAR as ***Appendix B4***. This Plan included the wetland areas to be lost, off-set calculations and rations for off-sets. This quantification is now provided in the amended EIAR in ***Section 7.5.3.1.***
2.22	The impacts related to the WWTW has not been identified or mitigated in the EIR. The Estuarine Assessment notes that there will be an increase in nutrient loads once the development is connected to the WWTVV. This is a direct and cumulative impact on the Umhlali Estuary, its functioning and health of the system. All impacts related to the WWTW must be analysed by a specialist and mitigation measures presented. The EMPr must be updated to include all conditions related the WWTWW.	The authorisation and construction of the Sheffield WWTW was approved through a formal EIA process, wherein the impacts associated with discharging treated waste water to the Umhlali Estuary were assessed. A WULA initiated by Sembcorp Siza Water is also in progress. The controls linked to that process are discussed in the rebuttal to 2.20.11 above.
2.23	The change in layout has not been discussed in the EIAR, there are areas that were previously not earmarked for development that will now be developed, as discussed in the Tinley Manor South: Addendum Vegetation Report Comparing 2015 &. 2016 Layouts and Associated Impacts, dated, February 2016, prepared by Kinvig and Associates. Discuss all changes that have occurred and the reasons for those changes.	The final EIAR included a Section entitled '*Changes to the Concept Plan'* in ***Section 10.2***. Changes to the Concept Plan were detailed in this section, including reasons for the changes and the impacts of the change on each of the specialist areas (as extracted from the specialist reports). This section is retained in the amended EIAR and now details the changes from the final EIAR to the amended draft EIAR. However, due to the lengthy nature of this report, this Section has been moved forward and is now presented in ***Section 3.4*** titled '*Amendments to the Concept Plan*.' Consequently, each specialist's assessment of the implications of the amendments to the Concept Plan to their respective discipline, is presented in ***Section 7***.
3.1	The following comments are related to the EMPr. The EMPr has been reviewed and has been rejected for the following reasons: Words like avoid, should, appropriate, adequate/ly, regularly, convenient, necessary, needs to, ensure, suitable/y, may, will be, etc. are words that are open to interpretation and cannot be audited. For the purpose of auditing, the EMPr must issue instructions that must be carried out by respective parties. Therefore, when issuing an instruction the word must is to be used rather than should or may, as this can be	The entire EMPr has been revised and the requested changes made.

Letter Ref.	Description	EAP Response
	interpreted in various different ways. The word must clearly states that the action has to be taken, failing which, it would be a contravention of the EMPr and conditions of the environmental authorisation. Please address this issue throughout the EMPr.	
3.2	Phrases like as soon as possible, take special precautions, adequate care is taken, take preventative measures, in a safe and responsible manner, are phrases that cannot be used in an EMPr. They are not quantifiable and are ambiguous and therefore must be removed from the EMPr.	The entire EMPr has been revised and the requested changes made.
3.3	When stating an activity must take place regularly, give a timeframe for this to occur within.	The entire EMPr has been revised and the requested changes made.
3.4	Page 44, under 7.7.1 Site Establishment, point 7 and 8 cannot be audited, reword.	These points have been reworded.
3.5	Point 10 of the above mentioned section must read: The construction camp is to be located a minimum horizontal distance of 100 metres from any wetland, 500 metres away from the Umhlali Estuary, behind the development setback line and above the 1:100 year flood line. The site camp must be located on a disturbed site that does not require the removal of vegetation, i.e. Indigenous trees.	The requested change has been made.
3.6	Point 11 of the above mentioned section must read: Drainage on the camp site must be designed to prevent the standing / ponding of water or sheet erosion from taking place.	The requested change has been made.
3.7	Page 45, under 7.7.3 Access, point 2 reword.	The point has been reworded.
3.8	Point 3 of the above mentioned section, all sensitive areas must be no-go areas and treated as such, unless authorised for rehabilitation purposes in line with the rehabilitation plan. These areas must be cordoned off and correct signage prohibiting entry must be displayed. Address this condition and all conditions related to no-go areas.	The requested changes have been made.
3.9	Point 5 of the above mentioned section must read: drainage and erosion protection in the form of cut off berms or trenched must be provided around the site and where there is a potential for erosion.	The requested change has been made.
3.10	Page 46, under 7.7.4 Fires, point 1, will be must be changed, this condition must read: no open fires or uncontrolled fires are permitted on site. Make these changes throughout the document.	The requested changes have been made.
3.11	Page 46, under 7.75 vehicle maintenance yard, point 1, heavy machinery and construction vehicles are to be parked and not stored in a vehicle maintenance yard which must be illustrated on the construction camp layout map.	The word stored has been replaced by parked.
3.12	Point 3 of the above mentioned section, remove the statement 'such a facility must consider water recycling or water reuse options' this condition cannot be audited.	The requested change has been made.

Letter Ref.	Description	EAP Response
3.13	Page 50, under 7.9 General and Hazardous Substances and Materials, point 6, please state what these preventative measures are.	This is reworded to state that drip-trays must be emptied to prevent overflow and spillage.
3.14	Page 51 of the above mentioned section, point 24, state where this must be disposed of.	All paint products must be disposed at a hazardous landfill facility.
3.15	Page 51, point 25 of the above mentioned section, reword this condition, it cannot be audited.	The cumulative combined capacity of hazardous substances stored on site must not exceed 80 m3 at any given time unless applied for and authorised by the KZN EDTEA.
3.16	Page 52, under 7.10 Spills, incidents and Pollution Control, point 5, the concrete mixing areas must be designated to prevent random concrete mixing areas. Address this condition.	The requested change has been made.
3.17	Page 53, under 7.11 Clearing and Protection of Fauna and Flora, point 3, provide the methodology for removal of the species, or state that a qualified botanist / vegetation specialist must assist with this process.	The requested change has been made to state that a qualified ecologist must be present and oversee the relocation.
3.18	Page 53, point 10 of the above mentioned section, reword.	The condition has been reworded as follows: *The introduction of alien plant species to the site is prohibited. Alien invasive species must be removed as per the Alien Invasive Eradication Programme contained in the Wetland and Open Space Rehabilitation Plan.*
3.19	Page 53, point 12, reword this condition and specify how disposal must be done.	The requested change has been made.
3.20	Page 53, point 15 of the above mentioned section, this condition must read: the removal of indigenous/ endemic shrubs and small trees must be identified by a qualified botanist / vegetation specialist prior to the commencement of construction. If there are species which require removal or relocation, these must be marked and relocated by a biologist or vegetation specialist. The rescue and relocation plan must be detailed and included in the EMPr.	The condition now reads: *The removal of indigenous / endemic shrubs and small trees must be identified by a qualified ecologist specialist prior to the commencement of construction. If there are species which require removal or relocation, these must be marked and relocated. The relocation must be overseen by the ecologist.*
3.21	Page 56, under 7.13 Soil Management, 7.13.1 Topsoil, bullet 4, reword this condition, this appears like it permits an entire area to be stripped.	The point now reads: *Only areas that are to be impacted upon by construction and any significant vehicular movement are to be stripped of topsoil.*
3.22 – 3.26	Page 57, the above mentioned section, bullet 8 reword this condition, it cannot be audited. Bullet 9, this condition must read: the topsoil must only be handled twice, once when stripped and stockpiled and the second time for rehabilitation purposes. Bullet 11, please specify what training this condition is making reference to. Point 6, reword this condition. Page 57, 7.13.2 Subsoil, point 4 reword.	Bullet 8 - The condition has been removed as it is not practical and cannot be audited. Bullet 9 has been reworded as requested. Bullet 11 now reads - *Training on the required separation stripping and handling of topsoil must be undertaken with relevant site-staff.* Subsoil point 4 now reads *-Training on the required separation stripping and handling of subsoil must be undertaken with relevant site-staff.*
3.27 – 3.28	Page 59 shows Figure 7-2 location of surplus fill material site. It is unclear where the location of these sites is, as the legend is not specific. Further, ensure that the legend is legible. Address this matter. Page 60, under 7.13.4.1 Site Establishment, Management and Erosion Control, point 5 bullet 2, soil resources must not be located in sensitive areas, including buffer zones, if the	Figure 7-2 has been removed as this site is now earmarked as a Community Facility. The EIR and EMPr now state that Surplus Fill Material Sites must be approved by the ECO and must be located within the approved development footprint (i.e. on land that is authorised for transformation) and 50 m away from watercourses and 500 m away from the Umhlali Estuary. Section 7.13.4.1, Point 5, Bullet 2 – Noted. The

Letter Ref.	Description	EAP Response
	area is not developed there are various locations that these stockpiles can be placed.	EMPr prohibits the stockpiling of soil within open spaces, however, provision has been made for the re-use of soil as part of the Soil Management Framework Strategy. This Condition has been re-worded to make this clearer and to state that the KZN EDTEA's approval is required prior to any such activity.
3.29 – 3.32	Page 61, point 8, bullet 3, reword this and state what 'other manner' can be used. Page 80, under 7.15.2 Dust control, point 4 and 7, this condition cannot be audited, reword or remove. Point 9 of the above mentioned section, reword this condition. Page 81, under 7.16.1 General waste, point 11, this condition must state: the contractor must ensure that all general waste is disposed of at a licensed waste disposal facility. The rest of that condition in its current state, cannot be audited.	Page 61, point 8, bullet 3 – This bullet now reads: *Slopes must thereafter be vegetated as the preferred means of erosion control. Note that stockpiles are only permitted to be left un-vegetated if they are to be moved within 6 months. If left un-vegetated such stockpiles must be subject to erosion controls as detailed in the Soil Erosion and Sedimentation Control Plan (Section 7.14) so as to enforce no wind erosion impacts.* Section 7.26.2, Point 4 and 7 – This condition has been removed. Point 9 now reads: *Construction activities are to be contained to reasonable hours during the day, and not during periods of sunrise and sunset.* Section 7.16.1, Point 11 – The rest of the condition has been removed.
3.33 – 3.36	Page 83, 7.17.1 Water pollution Management (including ground water and soil contamination), point 3, this condition cannot be audited, reword. Point 4 of the above mentioned section, state how disposal must occur. Point 7, state how soon after any disturbance these areas are to be rehabilitated. Point 9 must read: abstraction of water from the permitted watercourses can only commence once the water use license has been received from the Department of Water and Sanitation.	Point 3 now reads: *Chemicals or hazardous substances must not contaminate the soil or ground water on site.* Point 4 – re-worded to state that disposal must be done at a ROSE facility. Point 7 – a timeframe of 7 days has been stipulated. Point 9 – the requested change has been made.
3.37 – 3.38	Page 83, Under 7.17.2 River and Estuary management, point 1, this must read: no construction is permitted below the 1: 1 00 year floodline or 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 backflooding of the estuary. This may result in damage / loss of property and negatively impact on estuarine functioning (detailed below). The rest of this condition can remain unchanged. Page 83, 7.17.2 River and Estuary Management, point 2 must read: the buffer / conservation area must include the entire Umhlali Estuary (i.e. below the 5 m amsl contour), as well as the remaining area below the hazard line.	The requested changes have been made.
3.39 – 3.44	Page 84, point 6 of the above mentioned section, please state how often these visits must be. Page 84, point 9 must read: there must be no untreated effluent or wastewater discharged into the Umhlali Estuary under any	Point 6 – Now stipulated to be weekly inspections. Point 9 – This will be reworded as requested. Point 10 – This will be a requirement of the Water Use Licence and now reads as follows: *Monitoring of in situ turbidity and total suspended*

Letter Ref.	Description	EAP Response
	circumstances. Page 84, point 10, state how often this must be done and why. Page 84, point 12 is incomplete, address this. Page 84 point 16, clearly state under what circumstances the grass buffer strips must be implemented. Page 84, point 17, remove this condition, it cannot be audited.	*solids pre-construction and during construction is required by the DWS and must be done on a quarterly basis.* Point 10 – This point has been removed as it cannot be monitored or audited. It is a design requirement which has been factored into the formulation of the Stormwater Management Plan. Point 12 – This has been removed for the same reasons put forward for the removal of Point 10. Point 16 – Grass buffer strips are required as part of the Open Space area in the no-go areas. Therefore, this condition has been removed as it is covered in the rehabilitation sections. Point 17 has been removed as requested.
3.45 – 3.47	Page 84, Under 7.17.3 Coastal Management, point 1, state what the setback line and limited development line distances are. Page 85, point 4 of the above mentioned section, this condition must read: There must be no access to the coastal dune forest during construction. This area must be cordoned off and treated as a no-go zone. Page 85 point 5, this condition is questioned, as according to the Layout plan there will be no development within the vicinity of the coastal dune forest, therefore it is unclear why there will be a removal of vegetation. Address this.	Point 1 - Clarification is provided in the amended EIAR and clearly illustrated in ***Section 6.7***. It should be noted that specific distances between the proposed coastal setback line and limited development lines are modelled and are therefore not consistent. These are included in the amended layout and have fully informed the location of the proposed development. As a uniform distance for these lines cannot be provided in the EMPr, the setback line and limited development line is included in the 'no-go areas' for which reference to the relevant map has now been made in this point. Point 4 now reads: *There must be no access to the coastal dune forest during construction. This area must be cordoned off and treated as a no-go zone, unless approved for the installation of boardwalks, pedestrian pathways and/or emergency vehicular access.* Point 5 – the condition is removed.
3.48 – 3.51	Page 85, point 7, these conditions must be reconsidered as per the information requested in point 2.12 of this letter. Page 85, point 10 is questioned, are there antelope within this vicinity? Page 85, point 11 must read: The discharge of stormwater must be controlled to avoid any erosion to the dunes. Page 85, under 7.17.4 Wetland Management, bullet 1, these access roads referred to in this condition must be identified on a layout map and all impacts associated with the crossings presented in the EIAR as well mitigation measures. Thereafter conditions related to those impacts must be included in the EMPr. Address this matter.	Point 7 has been revisited. Point 10 – this condition is removed. Point 11 – reworded as requested. Section 7.17.4, Bullet 1 – This section has been revisited in its entirety and a bullet brought forward to replace bullet 1 which stipulates the wetland areas to be impacted on and the wetland areas to be classified as no-go areas. Reference is made to the wetland crossing map and tables (with co-ordinates) which are now appended to the EMPr. All impacts are assessed in the EIAR.
3.52 – 3.54	Bullets 3 - 5 these are design matters and do not have anything to do with the impacts related to construction within the wetland areas, the contractor does not have a responsibility to ensure that the designs are as specified in these conditions, this is the responsibility of the engineering team doing these designs. The contractor is responsible for matters related to construction only and not design. Address this. Page 86, Bullets 6 and 7, these conditions	Bullets 3-5, the design requirements have been removed as the design has taken cognisance of these requirements. Bullets 6 and 7 – These conditions have been reconsidered and removed. Point 3 – The condition has been removed.

Letter Ref.	Description	EAP Response
	must be reconsidered. Page 86, point 3, cannot be audited, reword.	
3.55 – 3.57	Page 86, point 5 cannot be audited, reword. Page 86, point 6, it is unclear what this condition aims to achieve, please reword to provide a clear indication of what is required. Page 86, point 19 must read: the full length of works must not be stripped of vegetation at once. The contractor must submit a clearing and earth-works plan to the SHE officer and the ECO for approval prior to construction occurring. This plan must indicate how clearing and earth-works are going to progress across the site. This can be done in a phased approach. Ground cover removal must follow this plan and there must be no deviation from the plan unless approved by the ECO.	Point 5 – The condition is not implementable and has been removed. Point 6 now reads: *A row of silt fences, sandbags, shade cloth or snow fencing must be established along the wetland buffer edge prior to construction commencing to prevent sedimentation and/or pollution entering the wetland. These silt fences and sandbags must be checked weekly and maintained and must only be removed once vegetation has successfully colonised following the rehabilitation period.* Point 19 has been reworded as requested.
3.58 – 3.60	Page 86, point 22, remove this condition. It is the responsibility of the EAP to provide conditions to ensure the protection of wetlands and sensitive features on site. It is the responsibility of the contractor to ensure compliance with these conditions in the EMPr and therefore, not the responsibility of the Contractor to come up with these protection mechanisms. Therefore, the EAP must provide implementable conditions in the EMPr to ensure that wetlands and sensitive areas are protected. Address this point. Page 89, Under 7.18 Stormwater Management, point 4, 'where possible', cannot be audited, reword. Page 89, point 5, this condition is unclear, reword.	Point 22 has been removed. Section 7.18, Point 4 – 'where possible' has been removed. Point 5 now reads: *The final SMP must be approved by KwaDukuza Municipality prior to implementation.*
3.61 – 3.64	Page 89, point 8 and 9 cannot be audited, reword. Page 93, Under 7.20 Noise, point 9, this cannot be audited, reword. Page 94, points 12 and 13 of the above mentioned section, these conditions cannot be audited, reword. Page 94, Under 7.21 Heritage, point 3, this condition cannot be audited, reword.	Point 8 and 9 – both points have been reworded. Section 7.20, Point 9 – This condition has been removed. Points 12 now reads: *Loitering by labour is prohibited. The Contractor must provide an adequate eating and rest area for labourers within the construction camp away from neighbouring communities to prevent noise nuisance.* Point 13 now reads: *Construction activities are to be contained to daylight hours Monday to Saturday unless consent has been obtained from the ECO and neighbouring landowners have been provided with prior warning.* Section 7.21, Point 3 now reads: *The contractor must prevent any person from removing or damaging any such article and must immediately, upon discovery thereof, inform the Construction Engineer.*
3.65 – 3.67	Page 100, Under 7.31 River and Estuary Management, point 6, this condition is questioned considering it is within the Operational phase and it is questioned if there would be an EO still in the employ of the applicant. Point 7, this is a construction condition, please move it to construction. Point 14, according to the information provided	Point 6 – This requirement is now the responsibility of the Management Association which will be established to manage open space areas. Point 7 – This is retained as the EAP believes that the formalisation of sports grounds within the open space can occur during the operational phase and whilst permitted in the open space area, cannot be located within the estuarine

Letter Ref.	Description	EAP Response
	in the EIR, this concept is no longer an option, therefore remove this condition.	boundary. Point 14 – This point has been removed.
3.68 – 3.71	Point 21, remove this condition, this is outside the scope of study, there has been no details related to jetties in the EIR. Point 24, remove this condition, this is not part of the operational conditions. Page 101-102, under 7.32 Coastal Management, point 3 this condition must be removed. Point 4, this condition is not applicable as there is no development proposed within the dune system, remove.	Point 21 – The condition has been removed. Point 24 – The condition is retained as water will be required during the operational phase for irrigation of the open space areas. Water from the Umhlali River is prohibited for this. However, the condition now reads: *The abstraction of water from the Umhlali River / Estuary for irrigation of the open space is prohibited.* Section 7.32, Point 3 – The condition is retained by reworded to focus on the maintenance requirements during the operational phase. Point 4 – The condition is removed as requested.
4	The comments from the Department of Agriculture, Forestry and Fisheries (DAFF), dated, 19 May 2015, requested a 50 metre buffer for protection of the Coastal Dune Forests, to which the EAP deems unnecessary. The EAP is reminded that DAFF is the competent authority for forests and therefore their requirement of a buffer of 50 metres around the coastal dune forest must be implemented. The requirements of specialists are merely recommendations and the opinion and requirements of the National Department takes precedence over a recommendation. As a result, it is an instruction from this Department that the layout is revised to include the 50 metre buffer requirement from DAFF, unless discussions are held with DAFF and DAFF agrees to a deviation in the buffer requirement. A letter from DAFF must be included in the EIAR should this be the case. Address this.	A letter from DAFF stating that a 40 m buffer is acceptable has been obtained and included in ***Appendix H***.
5	The Traffic Impact Assessment (TIA), titled Tinley Manor Southbanks – Traffic Impact Assessment, dated 21 January 2016, prepared by Aurecon, has reference. Clarity is required on the following matters:	Noted.
5.1.1	On page 45 of the TIA, the report makes reference to Seaton Delaval being previously known as Sheffield Manor. This information appears to be incorrect, as a development by the same name already exists and is a fully operational residential estate.	The reference to “Sheffield Manor” was a typing error. The report has been amended accordingly.
5.1.2	Has the above mentioned estate, Sheffield Manor, been considered in this TIA and the traffic volumes originating from this estate?	Since the Sheffield Manor development is complete and operational, the traffic generated by the Sheffield Manor (as it exists) forms part of the background traffic volumes and therefore these traffic volumes were captured in the traffic counts that were carried out. As such, it can be confirmed that the traffic volumes from the Sheffield Manor were included in the traffic analyses undertaken in the TIA.
5.1.3	Section 9.1 speaks of the change in traffic patterns with the introduction of the Sheffield interchange. However, this section fails to include patterns of lifestyle, where amenities	The TIA was based on the manual developed by the National Department of Transport titled Manual for Traffic Impact Studies (RR93/635) which states that the road network must be

Letter Ref.	Description	EAP Response
	are located, the distance to these facilities from the proposed development and the traffic generated as a result. Please address this.	analysed for the typical AM and PM peak hours only for this particular type of development scheme. In accordance with this manual, the focus of this TIA was the typical peak hours and not the off-peak periods of the day or week when the so called "lifestyle trips" are made to places.
5.1.4	Recommendations made in the TIA is limited to the proposed Sheffield interchange which is unacceptable, as there are various other factors that will contribute to the generation of traffic that has not been identified and that the construction of the Sheffield interchange will not resolve.	The trip generation rates used in this TIA for the proposed development scheme has been directly extracted from the Manual for Traffic Impact Studies (RR93/635) mentioned above. This TIA has been approved by the KZN Department of Transport (refer to ***Appendix H***) who have raised no objection to the trip generation rates and the methodology used in the TIA since these calculations were undertaken strictly in accordance with the above mentioned manual. In addition, Aurecon has subsequently analysed the traffic volumes that will be generated by the construction phase of this project. This analysis revealed that the constructional traffic will not a have any detrimental or negative impact on the road network. The analyses of the construction traffic and findings thereof have been encapsulated in *Technical Note 1: Analysis of the Construction Traffic for the Tinley Manor Southbanks Development*.
5.1.5	Interventions must be detailed for the following areas: a) P228; b) Salt Rock Road (P330) and the P228 intersection; c) Hard surfacing and upgrading of the identified roads; d) New Sheffield Interchange.	The phasing of the Tinley Manor Southbanks Development, along with the traffic generated by the surrounding major proposed developments has been taken into account to develop a proposed phasing plan to upgrade the external road network in the 5 year development scenario, the 10 year development scenario and the 20 year development scenario. The summary of this phasing plan has been provided in *Technical Note 3: Proposed Phasing Plan for the Upgrade of the External Road Network for the Tinley Manor Southbanks Development*.
5.2	The Tinley Manor Southbanks Development Site Development Plan, dated February 2016, prepared by The Markewicz Redman Partnership, Urban Planners and designers, has reference. Page 15 of the report under 4.3.3 Services and Infrastructure, this section speaks of the reuse of greywater for irrigation purposed within the proposed development. There have been no details regarding this presented in the EIAR. If reuse of greywater is an option for implementing in the development, all details related to this must be provided in the EIR.	This section has been amended and the reference to greywater removed. All proposals relating to provision and use of water are now contained within the Engineering Services Report (***Appendix C11***) and presented in the amended EIAR ***Section 3.2.6***.
5.3	Page 22 of the report contains incorrect information; the N2 is the national highway in proximity of the site not the N3.	All incorrect references to "N3" have been removed and replaced with "N2".
5.4	This study does not have conclusions or any references, it is assumed that the report is therefore incomplete. The report must be completed and submitted to this Department.	Conclusions, recommendations and references have been added.

Letter Ref.	Description	EAP Response
6	Kindly provide a phasing plan for the entire development. Such plan must clearly depict the various phases, the timing of such phases and the bulk service requirements for each phase.	A Phasing Plan is provided in ***Sections 3.1.9*** and ***3.5*** and in the Engineering Services Report (***Appendix C11***) as well as in ***Appendix F***.

1.2.4 Environmental Management Programme

An EMPr (***Appendix B***) has been compiled for the construction and rehabilitation / operational phases for Tinley Manor Southbanks.

The EMPr has been compiled as a stand-alone document from the EIAR and will be submitted to the KZN EDTEA along with the amended final EIAR documentation. The EMPr has been compiled in accordance with the EIA Regulations (2010). The 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 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 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 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 1-3***):

Table 1-3: 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***
Wetland and Open Space Rehabilitation Plan	SiVEST	***Appendix B 4***
Traffic Management Plan	Aurecon	***Appendix B 5***

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 the Tinley Manor Southbanks (***Table 1-4***):

Table 1-4: List of specialist studies

Specialist Study	Organisation	Appendix
Agricultural Potential Assessment	Mottram and Associates	***Appendix C 1***
Geotechnical Investigation	Drennan, Maud & Partners	***Appendix C 2***
Heritage Assessment	eThembeni Cultural Heritage	***Appendix C 3***
Vegetation Assessment	SiVEST / Kinvig and Associates Environmental Consultants	***Appendix C 4***
Wetland Assessment	SiVEST	***Appendix C 5***
Estuarine Assessment	Royal HaskoningDHV[1]	***Appendix C 6***
Coastal Assessment	Royal HaskoningDHV[2] / Coastwise Consulting	***Appendix C 7***
Socio-economic Study	Urban Econ	***Appendix C 8***
Traffic Impact Assessment	Aurecon	***Appendix C 9***
Visual Assessment	SiVEST	***Appendix C 13***

In addition to the above specialist studies, the following reports have been prepared in support of the EIA study (***Table 1-5***):

Table 1-5: List of supporting reports

Specialist Study	Organisation	Appendix
Urban Planning Report	The Markewitz Redman Partnership	***Appendix C 10***
Engineering Services Report	SMEC South Africa	***Appendix C 11***
Electrical Services Report	Bosch / Admastor Consulting CC	***Appendix C 12***

1.3 Details of the Project Proponents

THD is the Applicant and primary developer for Tinley Manor Southbanks. The details of the responsible person from THD are presented in ***Table 1-6***.

Table 1-6: 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.

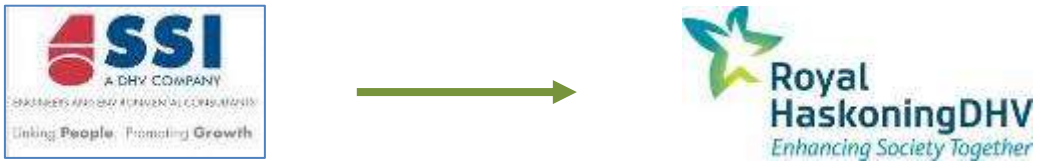
The professional team of Royal HaskoningDHV has considerable experience in the environmental management field. Royal HaskoningDHV been involved in and/or managed several of the largest EIAs undertaken in South Africa to date. A specialist area of focus is on the assessment of multi-faceted projects,

[1] *As the specialist, Catherine Meyer is from the same organisation as the EAP, the specialist report had been independently peer-reviewed by Source to Sea. The amended specialist report has been reviewed by Tandi Breetzke of Coastwise Consulting who is no longer under the employ of Royal HaskoningDHV.*

[2] *As the specialist was from the same organisation as the EAP, the specialist report had been independently peer-reviewed by Source to Sea. The specialist is no longer part of Royal HaskoningDHV and now operating as Coastwise Consulting. Therefore, the amended specialist report has not been peer-reviewed.*

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, 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 further be noted, that from May 2016, the EAP's office location and contact details have changed. The change in contact details was communicated to all registered I&APs in June 2016 together with the notification of the rejection of the final EIAR. Updated contact details are provided in ***Table 1-7***.

Table 1-7: Details of the EAP

Consultant	Royal HaskoningDHV	Royal HaskoningDHV	Royal HaskoningDHV
Contact Persons	Humayrah Bassa	Bronwen Griffiths	Malcolm Roods
Postal Address	PO Box 1243 Umhlanga Rocks 4320	c/o PO Box 1243 Umhlanga Rocks 4320	c/o PO Box 1243 Umhlanga Rocks 4320
Telephone	087 350 6760	021 936 7714	011 798 6442
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 7 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 Royal HaskoningDHV 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 Royal HaskoningDHV 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 PROJECT PLANNING CONTEXT

2.1 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 2-1***).

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 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.

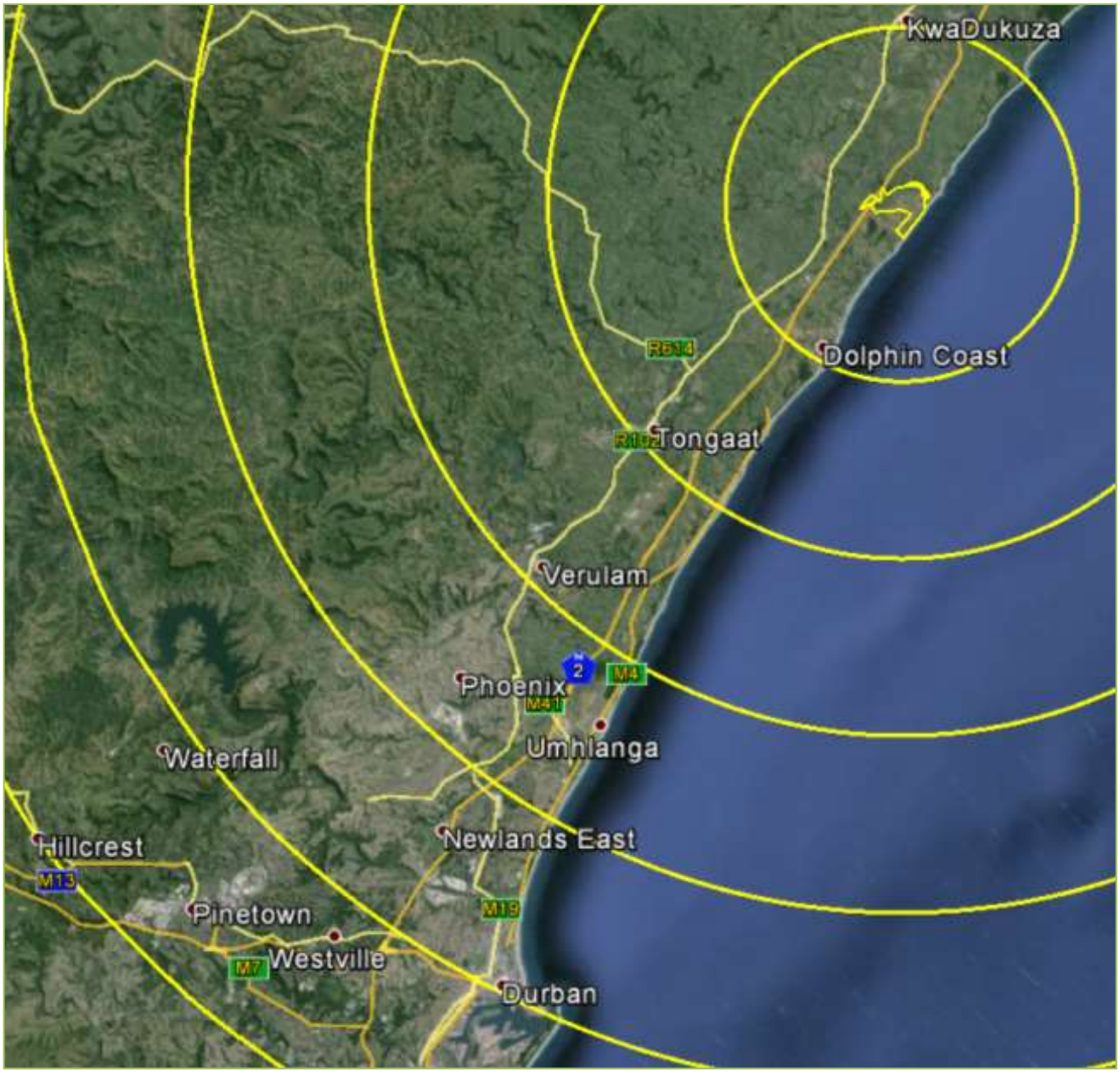


Figure 2-1: Tinley Manor Southbanks regional context

2.2 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 2-2***).

Figure 2-2: Site boundary

All properties which make up the Tinley Manor Southbanks estate are owned by Tongaat Hulett (***Table 2-1***).

Table 2-1: List of properties and landowners

Property Description	Ownership	SG 21 Digit Code
Rem of the Farm Greywater No. 18435	Tongaat Hulett	N0FU03330184350000000
Rem of Sub 44 of Lot 69 No. 917	Tongaat Hulett	N0FU03330009170000044
Sub 11 of Lot 69 No. 917	Tongaat Hulett	N0FU03330009170000011
Rem of Portion 83 of the Farm Lot 69 No. 913	Tongaat Hulett	N0FU03330009130000083

2.3 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. The need to consider diversification of agricultural land is further motivated by the lack of water for sugarcane production in the north coast as found in the Agricultural Potential Assessment and detailed in ***Section 7.1***. 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 by releasing 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 R9.8 billion in capital costs. Furthermore, the proposed development is expected to contribute significantly to the rates base of the KwaDukuza Municipality. The proposed development's accumulated contribution to municipal rates are estimated to be around R75 million by 2020 and this is expected to increase to R2.9 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 R12 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 billion to Gross Geographic Product;
- The households benefitting from economic activity created by the capital expenditure will see their income increase by R2.1 billion;
- The capital expenditure phase will create a total of 46 784 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.

2.3.1 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.

2.3.1.1 Development Vision

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

- 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, 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.

2.3.1.2 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;
- 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.

2.3.1.3 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 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 management line (as the coastal management line is not finalised, the coastal setback line is used in the mapping as a proxy for the coastal management 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 away from the sensitive areas.
- ***Responsiveness to coastal erosion managed through the coastal management / 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 coastal management / setback line.
- ***Protection of high potential agricultural land:*** The development of Tinley Manor should not compromise opportunities to protect high potential agricultural land for commercial production of high value perishable produce destined for export through the airport (i.e. between Umhlanga and Ballito).
- ***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.
- ***Facilitating public access to the coast:*** The development proposal considers accessibility of the coast and promotes reasonable public access via suitably sensitive means as well as providing for emergency vehicular access. it is noted that due to the sensitively of the coastal zone and the nature of the marine environment, beach use cannot be focused on mass tourism but rather limited access.

2.3.2 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 (2017) 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 (Act No.24 of 2008)(as amended);
  - The National Coastal Management programme (2015);
- 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 Environmental Management Framework (2013);

- Municipal Policy:
  - The KwaDukuza Integrated Development Plan (2012-2017);
  - The KwaDukuza Spatial Development Framework (2016);
- Local Policy:
  - The KwaDukuza Coastal Zone Recreational Use Plan (2003);
  - Towards a Coastal Management Plan for KwaDukuza (2008);
  - Policy Approach to Coastal Development (2008); and
  - The KwaDukuza Coastal Management Programme (2011): Development Management Tool (2016).

2.3.2.1 Integrated Coastal Management Act

The NEM:ICMA (Act No. 24 of 2008)(as amended) is the prevailing body of legislation which must be considered when reviewing any development application within 100 m from the high-water mark in urban areas or 1 km in rural areas.

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.

2.3.2.2 KZN Provincial Growth and Development Strategy and Plan

The KwaZulu-Natal Provincial Growth and Development Strategy (PGDS) (2030) identify 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; and

- 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.

2.3.2.3 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.

2.3.2.4 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 "Urban Town" (***Figure 2-3***).

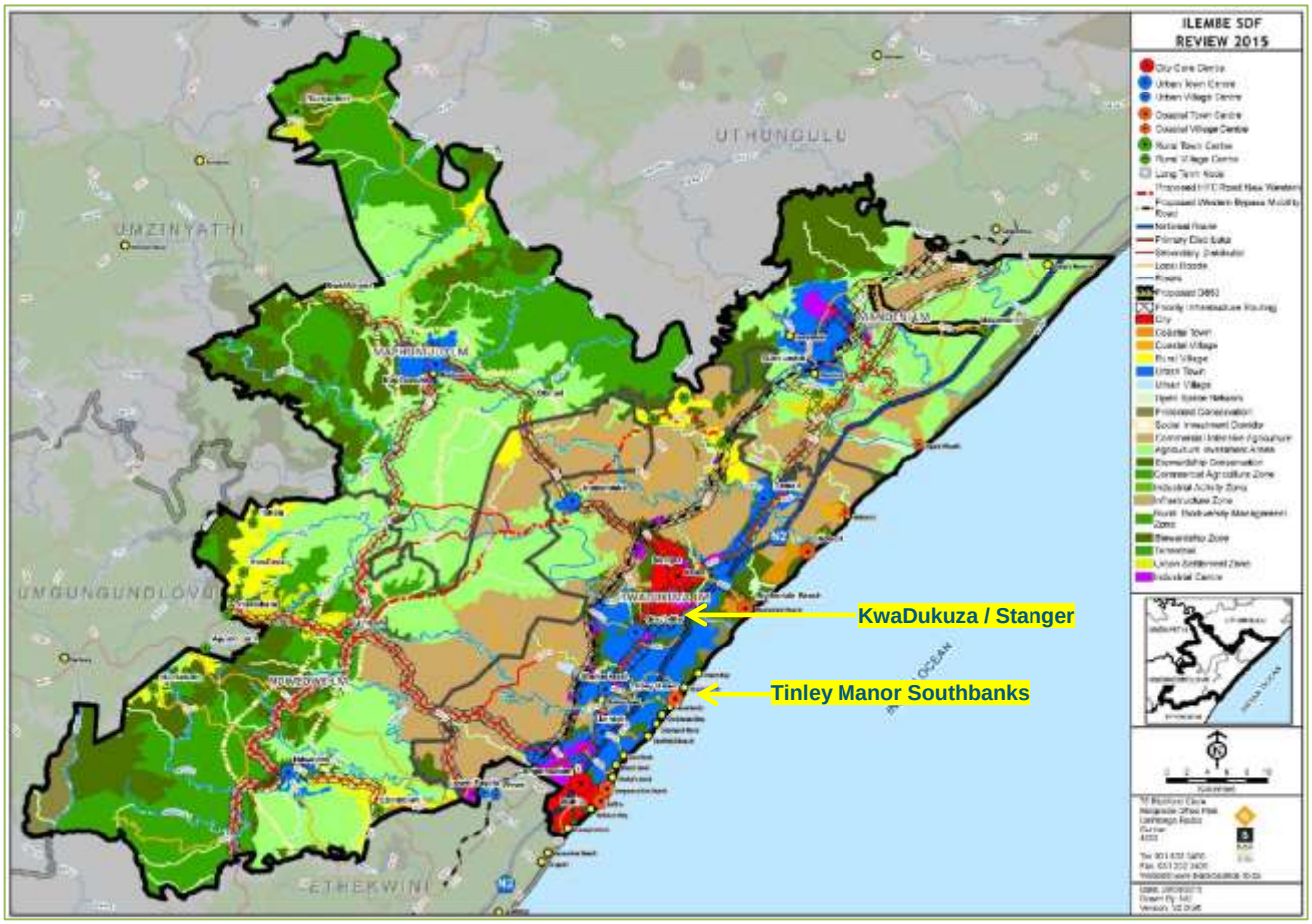


Figure 2-3: iLembe Spatial Development Framework Plan (2016)

2.3.2.5 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 2-4***).

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.

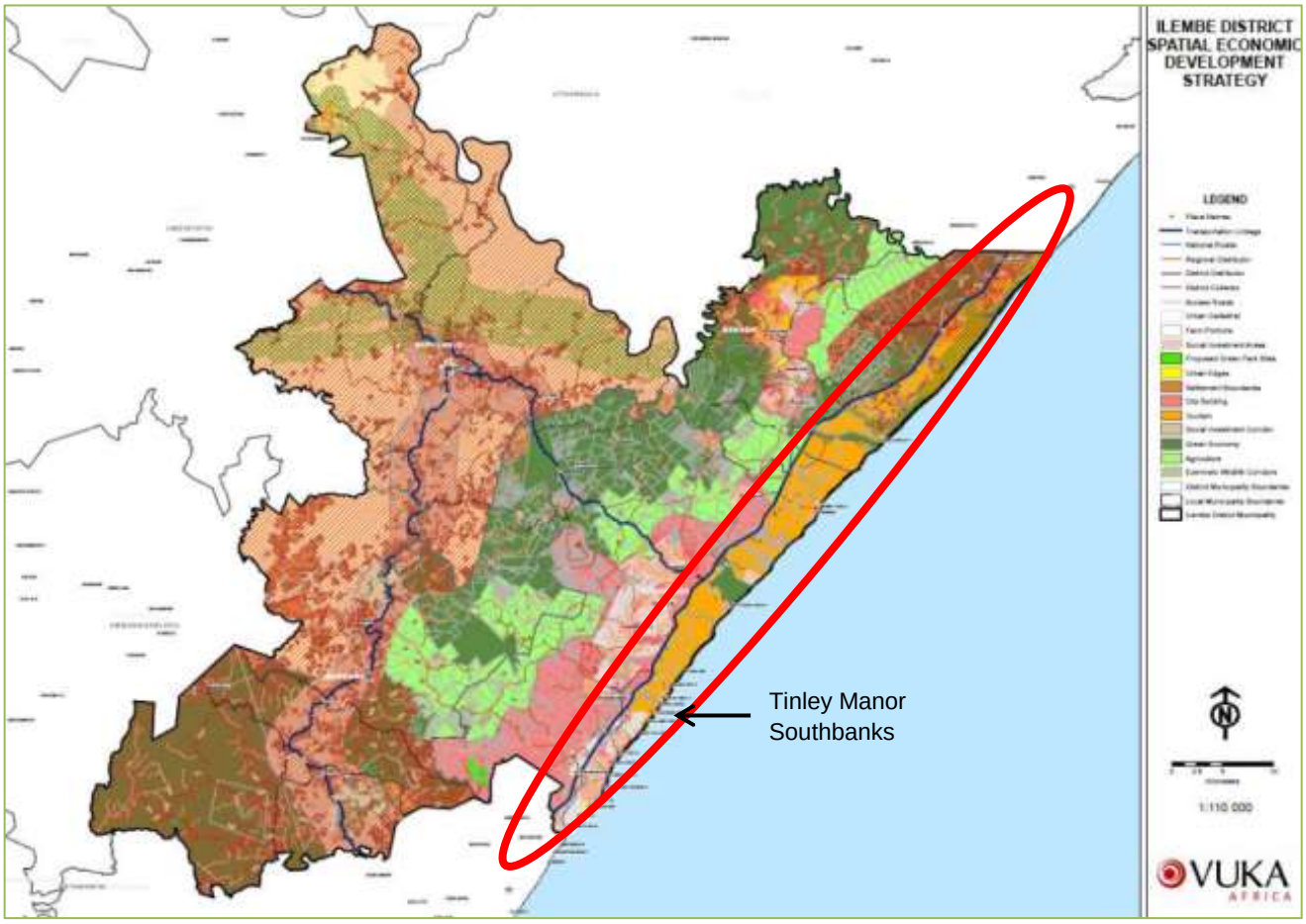


Figure 2-4: Primary tourism corridor according to the DSEDS (2012)

2.3.2.6 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.

2.3.2.7 KwaDukuza Spatial Development Framework

The KwaDukuza SDF *(2016)* presented in ***Figure 2-5*** 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.

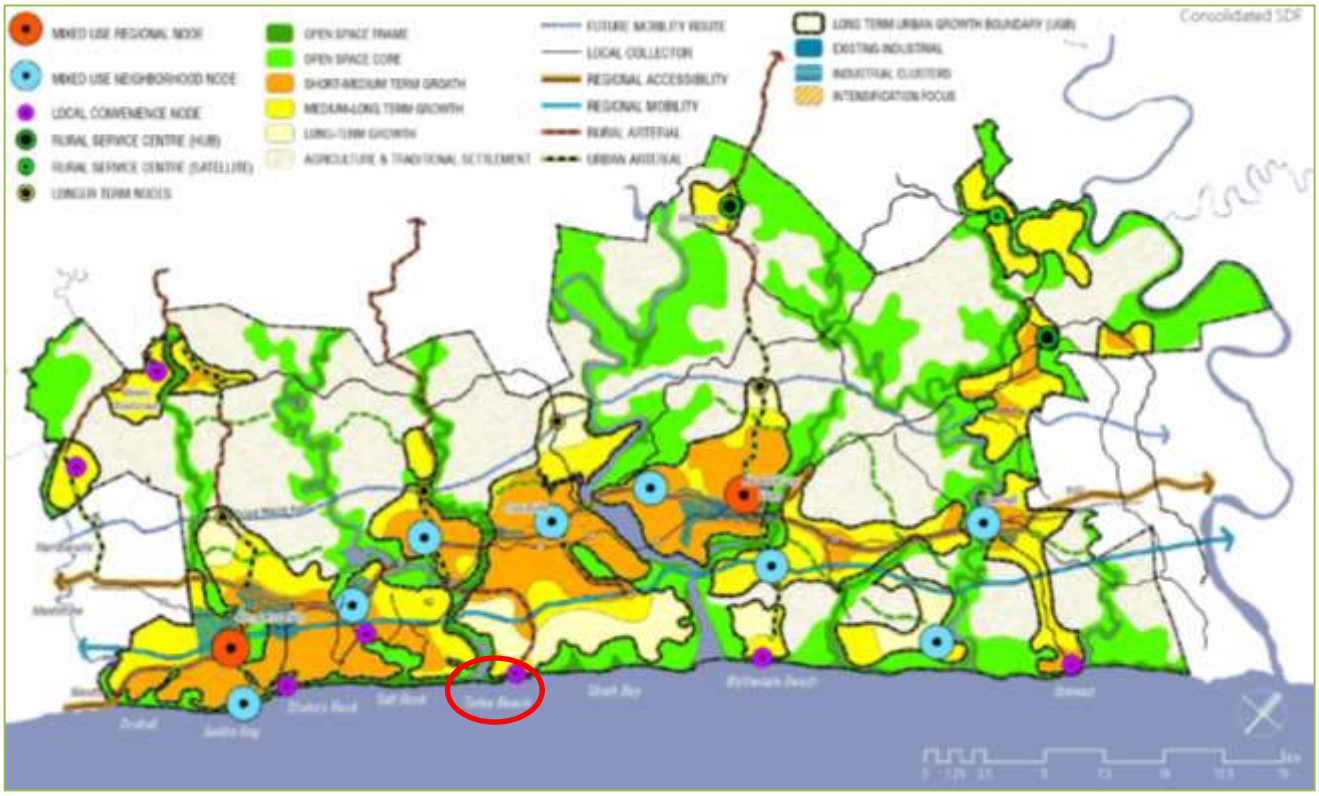


Figure 2-5: KwaDukuza Spatial Development Framework

2.3.2.8 KwaDukuza Coastal Management Programme

The 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).

2.3.3 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. Additional commonalities with 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 IDP and the KwaDukuza Coastal Overlay Zones 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 IDP)

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 International Airport (KSIA) 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 by the KwaDukuza Municipality in order to ensure this sensitive environment is not disturbed significantly.
- A fragile but high value coastal frontage zone exists 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 interim 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.

3 PROJECT DESCRIPTION

3.1 Development of the Tinley Manor Southbanks Concept Block Layout

3.1.1 Landscape Character Assessment

The undulating topography of the site as described in ***Section 6.2*** produces two distinct experiences, namely (i) vast open areas and (ii) intimate spaces. ***Figure 3-1*** highlights these key landscape characteristics and the defining features.

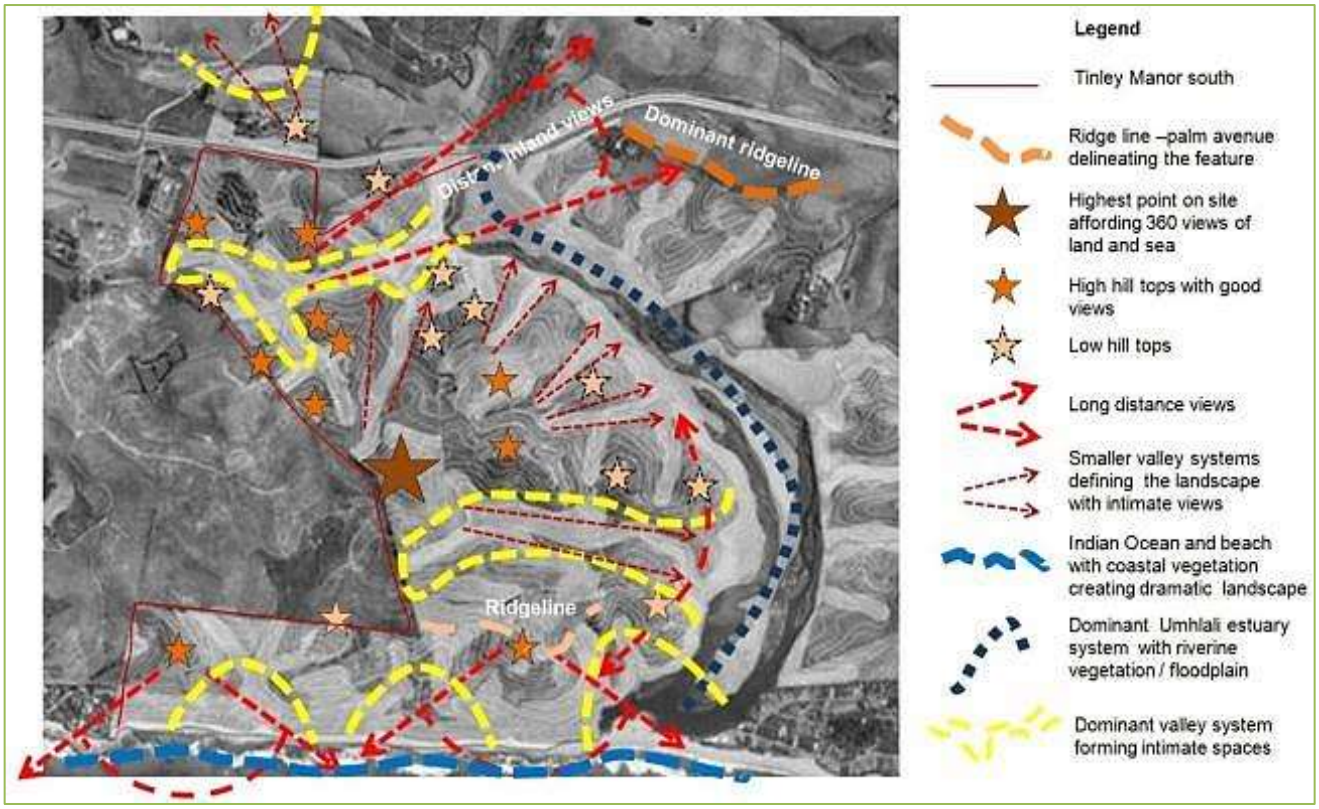


Figure 3-1: Tinley Manor Southbanks landscape assessment

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 3-1*** 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 3-1***.
    - 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.

3.1.2 Implications of the Baseline Environment

Some key implications of the baseline environment as presented in ***Section 6*** 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 restricted access will need to be addressed on a sub-regional, district, and local level and will need to include long-term provision for additional access to the land east of the N2.
- There could be significant advantages to the 'experience' of the overall development. This will be reliant on the access, concept 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.

3.1.3 Development Characteristics

The vision for Tinley Manor Southbanks forms part of an overall development vision for all the Tongaat Hulett landholdings that span the Umhlali River.

The overall Spatial Development Concept Plan for Tinley Manor Southbanks and Northbanks is presented in ***Figure 3-2***.

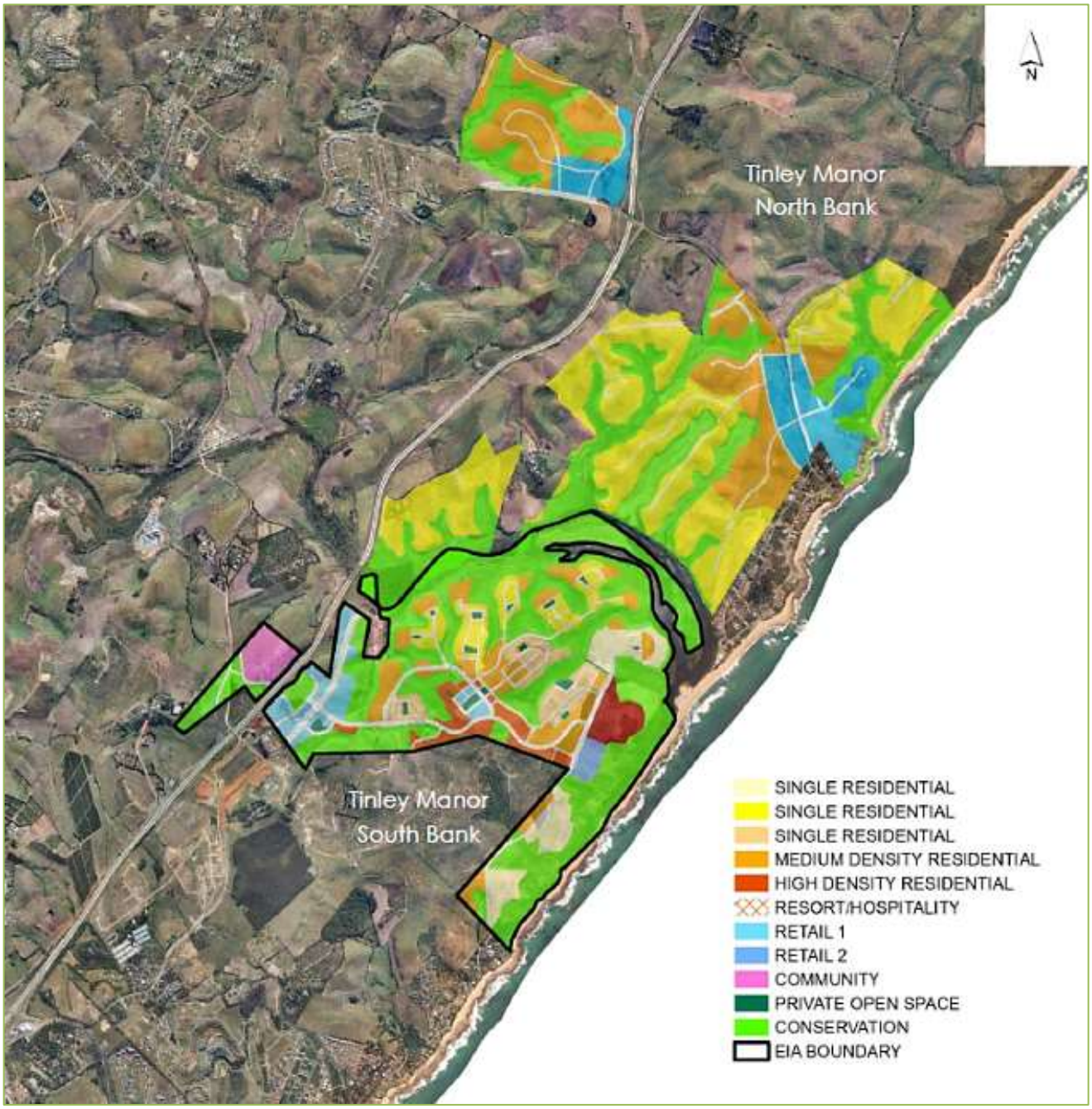


Figure 3-2: Tinley Manor Spatial Development concept plan

3.1.4 Site Structure and Concept 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 concept 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 concept blocks, each of which is situated astride and structured by a major or minor ridgeline.

The concept "blocks" each contain one (1) or more neighbourhoods which are characterised by the various locational and amenity attributes of the site (i.e. regional accessibility, location within the site and/or environmental amenity) and each derive their primary land use, form, and value, from these attributes (***Figure 3-5***).

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

Spatial Structuring features include:

- ***Nodes*** – A regional mixed-use node at the entrance to the development and adjacent to the N2. A Village Centre provides a mixed-use focus and local service centre for the site and a Beach Node to provide beach access and amenities for residents and the public;
- ***Circulation*** – An integrated hierarchy of pedestrian, cycle and vehicular networks structured around a Primary Spine Road, two secondary Spine Roads and a series of lower order access streets, loops and cul-de-sac;
- ***Open Space*** – An integrated network of soft and hard public spaces and coastal, estuarine and wetland conservation areas that integrates the residential, leisure and mixed use neighbourhoods and the various nodes;
- ***Density*** – A mix of residential density and development intensity across the site in accordance with site features and layout characteristics;
- ***Built Form*** – Mix of detached and attached low to medium rise single use and mixed use building typologies; and
- ***Land Use*** – A mix of residential, leisure, commercial, community, conservation and recreation uses and activities distributed according to site characteristics and layout features and embedded in the open space system.

The Village Centre is located at the highest and most central part of the site and forms the community heart of the overall development. It is to be designed as a public place that will serve all of the neighbourhoods on the site. It should have a built form accentuating the hill top location and its central and public role with urban attributes of higher density, mixed land use and compact built form with modest building heights. Moreover, it should provide a pleasant pedestrian friendly environment with a central public space and landscaped streets.

Elements should include:

- Traditional town centre grid layout focused on a Village Square / Common with walkable blocks of approximately 60 x 60 m connected into the surrounding street system.
- Landmark buildings with landscaped public spaces at gateways to the Centre off the Primary and Secondary Spine Roads.
- Landscaping to integrate it with the site's unique landscape qualities, such as inland and coastal views, coastal and subtropical vegetation.
- Mixed-use buildings fronting onto the internal street system and Village Square and ground floor frontages to create friendly active edges through shops, restaurants and markets.
- Building edges with canopies and colonnades to provide pedestrians with a protected and comfortable environment.

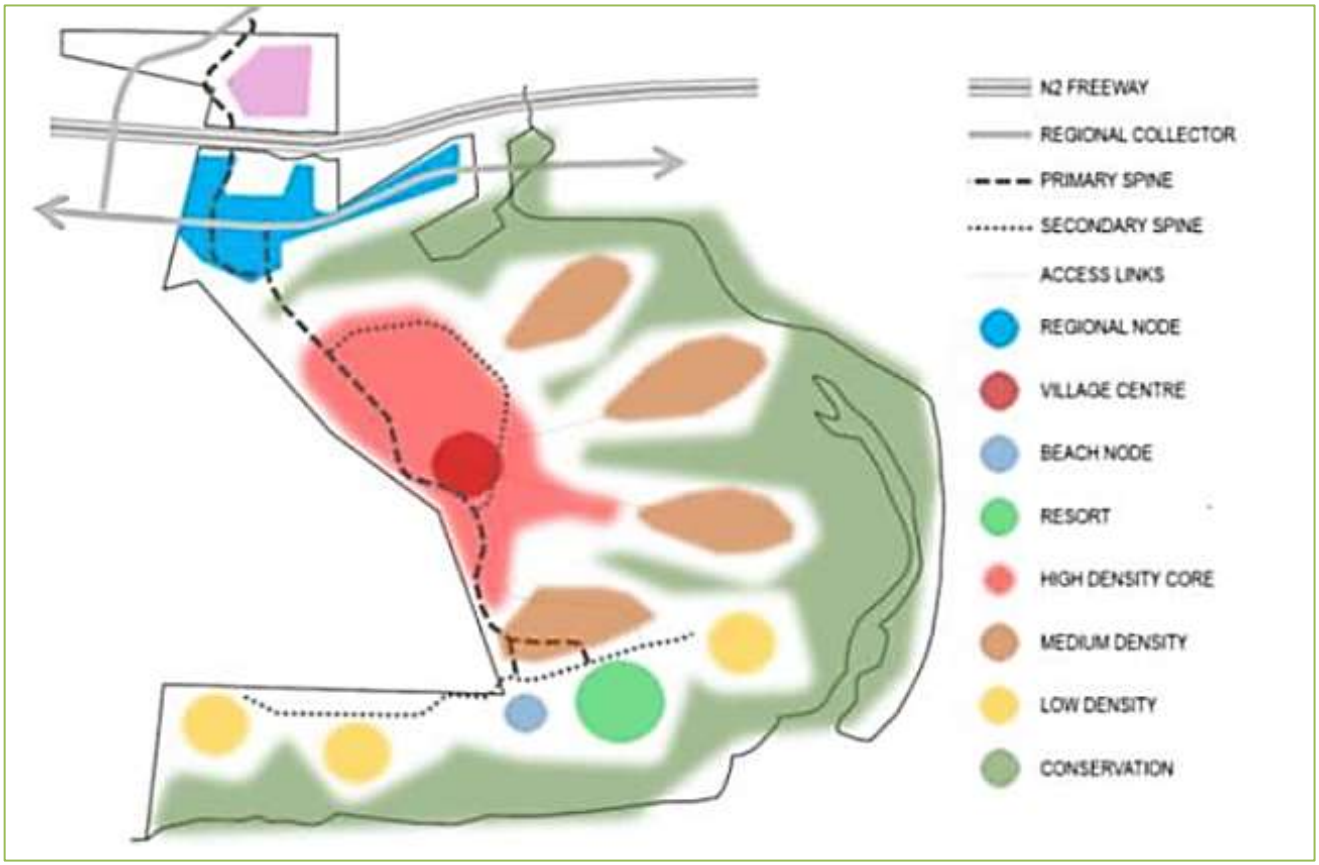


Figure 3-3: The Tinley Manor Southbanks concept plan

Figure 3-4: Example of a built-form concept

Figure 3-5: The Tinley Manor Southbanks concept block layout

3.1.5 Environmental Framework

The environmental framework formed the key basis of the site as presented in ***Figure 3-6***.

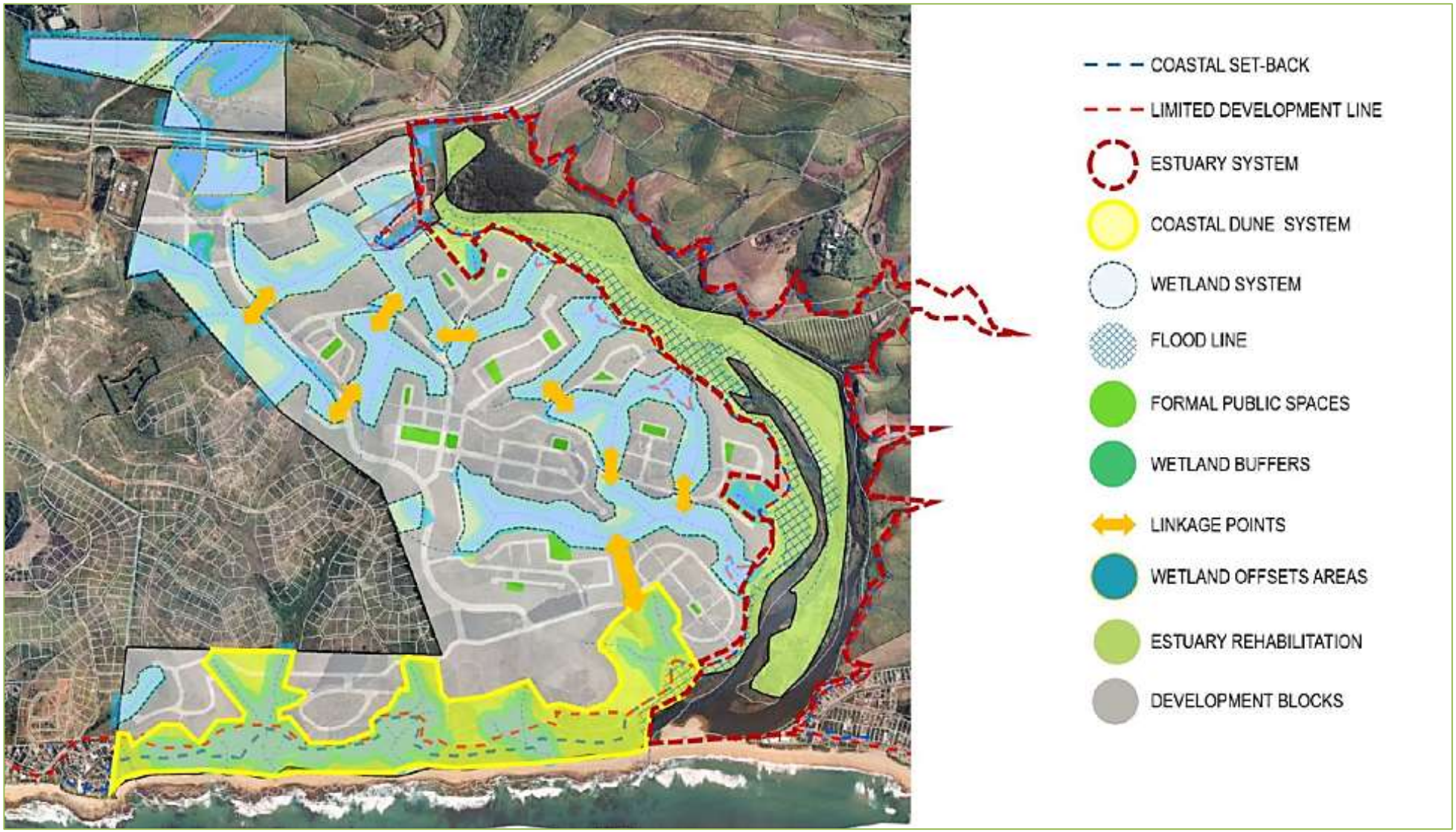


Figure 3-6: Environmental framework of the site

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 a 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 Estuarine 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 protection from dynamic coastal processes, 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. 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.
- ***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).

3.1.6 Access and Circulation Network

The access and circulation network is presented in ***Figure 3-7***.

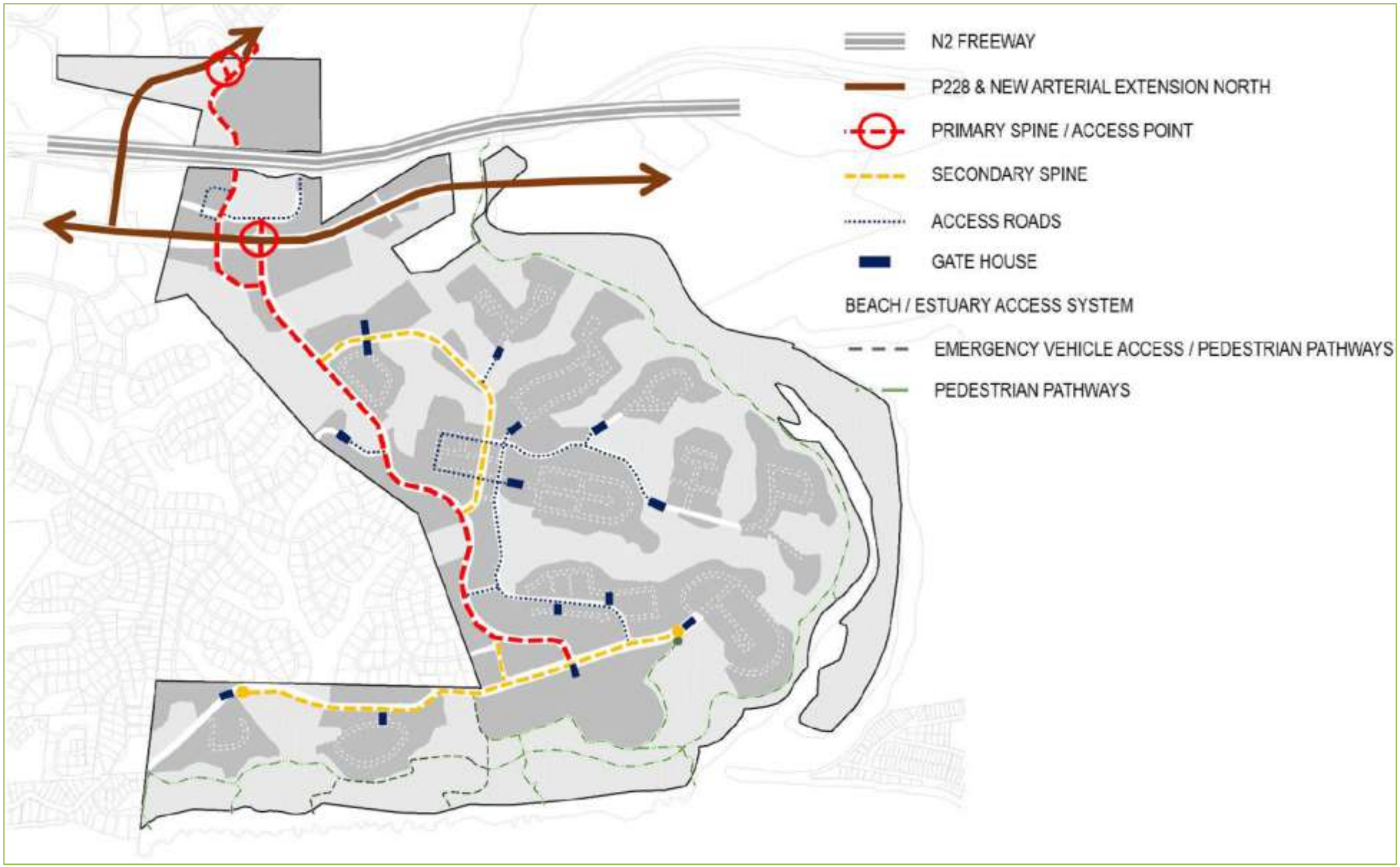


Figure 3-7: Access and circulation framework of the site

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 N2;
- 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 concept 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 concept blocks on the site whilst minimising breaching of the wetland system.

The elements are as follows:

- ***Main Access Points from Regional System*** – There will be two (2) primary access points to the proposed development.
  - The first is located off the proposed new coastal collector road east of the N2 and that would ultimately link the south bank with the north bank. The coastal collector road will in turn be linked to the proposed new interchange on the N2 where the P228 crosses it. This access point will provide access to the land both east and west of the proposed collector road.
  - The second access point would be directly off P228, but on the western side of the N2 and would provide access to the eastern portions of the site located between the N2 and the proposed new coastal collector road.
  - A road, that will come off the Primary Spine Road, and that will pass under the proposed new coastal road, will provide additional access to the portion of land between this road and the N2. 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 N2.
- ***Provision for Coastal Arterial*** – Provision has been made for the long-term development of a coastal collector, east of and parallel to, the N2 and which will connect the northern and southern banks of the Umhlali River (i.e. off the P228 and connecting to the P467 on the northern bank);
- ***Primary Spine*** – The primary spine road of the development will link its various components, as well as, link it into the regional movement system and will function as a public route. 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 residential and leisure zones;
- ***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 cul-de-sacs 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, loops and cul-de-sacs.
- ***Village 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”.

- ***Beach / Estuary Access System*** – The pedestrian and cycling (i.e. Non-Motorised Transport – NMT) portion of the beach and estuary access and circulation system consists of two (2) components – (i) a "natural" and (ii) a "built up" component. The system will contain a combination of 'at grade' pathways and elevated boardwalks.
  (i) The "natural" includes the system that meanders through the open space system linking coastal and estuarine environmental amenity zones to development zones providing routes for walking, cycling, jogging, golf-carts, 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 and/or boardwalks in these areas are 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. The system will be able to be accessed from either the public node situated along the coastal portion of Secondary Spine, the resort development site and / or the residential neighbourhoods adjacent to the coast or river.
  (ii) The "built up" component is integrated with the street and road systems and will include where required additional dedicated pedestrian / cycle pathways, so as to ensure that walking and or cycling is convenient, safe, and a pleasant experience. Infrastructure design on the routes will reflect the role of the route, and will be designed to optimise access to the Village Centre and other nodes in the development.

Two potential controlled vehicular emergency and service access routes to service the beach through the coastal dune zone have been identified as part of the system. Both options identified are along existing sugarcane roads and will not require any new road infrastructure. The emergency vehicular access will be controlled by booms preventing public access. All public access to the beach will be via pedestrian pathways and boardwalks.

It should be noted that one of the emergency vehicular access routes identified may potentially service the proposed beach enhancement node currently being investigated and which will form part of a separate Application for Environmental Authorisation.

The proposed street widths are presented in ***Table 3-1***.

Table 3-1: 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	14 m

3.1.7 Land Use Framework

The land use framework for Tinley Manor Southbanks is presented in ***Figure 3-8*** and ***Table 3-2***.

Table 3-2: Land use zoning bulk schedule

	LAND USE	DETAILS	DENSITY (du/ha)	NON-DEVELOPABLE AREA (ha)	DEVELOPABLE AREA SALEABLE EXTENT (ha)	ROADS (ha)	OPEN SPACES (ha)	TOTAL SITE AREA (ha)	% OF TOTAL AREA	FAR	MIXED USE: RESIDENTIAL SPLIT	TOTAL FLOOR AREA (m²)	TOTAL COMMERCIAL FLOOR AREA (m²)	TOTAL RESIDENTIAL FLOOR AREA (m²)	TOTAL OTHER FLOOR AREA (m²)	AVERAGE UNIT SIZE (m²)	TOTAL NO RESIDENTIAL UNITS
Residential (MU)	Single Residential	Single Residential 1500m²	6	-	24.56	-	-	**24.56**	5%	0.500	-	122 795	-	122 795	-	-	**147**
	Single Residential	Single Residential 1000m²	10	-	23.72	-	-	**23.72**	5%	0.500	-	118 580	-	118 580	-	-	**237**
	Single Residential	Single Residential 600 / 800m²	12-16	-	18.55	-	-	**18.55**	4%	0.500	-	92 755	-	92 755	-	-	**260**
	Medium Density Residential	Planned Unit Development (25units/ha)	25	-	44.78	-	-	**44.78**	9%	0.150	-	67 173	-	67 173	-	60	**1 120**
	High Density Residential	Planned Unit Development (75 units/ha) with 10% commercial (Village Centre)	75	-	3.56	-	-	**3.56**	1%	0.375	10:90	13 347	1 335	12 013	-	45	**267**
		Planned Unit Development (75 units/ha)	75	-	14.66			**14.66**	3%	0.375		54 971	-	54 971	-	45	**1 222**
Resort	Resort / Hospitality	Hotel with Entertainment	-	-	12.00	-	-	**12.00**	2%	0.250	-	29 991	-	-	29 991	-	-
Commercial	Retail 1 (MU)	Mixed Retail, Office and Residential Node	-	-	20.46	-	-	**20.46**	4%	0.500	25:75	102 294	25 574	76 721	-	60	**1 279**
	Retail 2	Low Impact Retail and Entertainment Mixed Use for Beach Node	-	-	5.36	-	-	**5.36**	1%	0.150	-	8 035	8 035	-	-	-	-
Social	Community	Higher Order Community Facilities	-	-	12.43	-	-	**12.43**	3%	0.350	-	43 517	-	-	43 517	-	-
Open Space	Private Open Space	Parks within Residential Areas	-	-	-	-	5.50	**5.50**	1%	-	-	-	-	-	-	-	-
	Conservation	Wetlands, Estuary, Coastal Zones, Grasslands including buffers	-	246.35	-	-	-	**246.35**	51%	-	-	-	-	-	-	-	-
Utilities	Road	All roads	-	-	-	52.31	-	**52.31**	11%	-	-	-	-	-	-	-	-
	Grand Total		-	**246.35**	**180.07**	**52.31**	**5.50**	**484.23**	-	-	-	**653 458**	**34 944**	**545 006**	**73 508**		**4 531**

Notes:

1. Retail 1 Zone - Residential / Commercial or Community Mix Ratios : 75:25 of floor area
2. High Density Residential Zones - Residential / Commercial or Community Mix Ratios : 90:10 floor area (only applied in residential blocks in the Village Centre)
3. Retail 2 excludes Residential Use
4. Total Residential Units excludes Hotel Rooms

Figure 3-8: 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 opportunities for use of beach assets for both tourists and local residents and facilitate appropriate beach access at the local scale. These "assets" are both recreational, aesthetic, and critically ecological functionality.

Twelve (12) Land Use Zones have been identified and allocated in different mixes to each of the development concept blocks.

These land use zones are as follows:

- ***Retail 1 (Mixed Use) – Mixed Retail, Office and Residential*** – This land use zone is located in the node adjacent to the N2 and is intended to serve the residents of the new development, as well as, the surrounding region through both its highly accessible location at the interchange on the N2, as well as along the proposed future coastal arterial located east of the N2. It is also located within the Village Centre which will serve the residents of the development and provide them with a mixed-use community oriented focal precinct. The FAR of this precinct would be 0.5 and land uses would accommodate retail, offices, residential, and some service oriented uses commensurate with the needs of the surrounding region.
- ***Retail 2 – Low Impact Retail and Entertainment*** – This land use is located in a 'Beach Node' situated along the coastal portion of the Secondary Spine Road and provides for day to day retail needs, as well as, some public entertainment and leisure activities (i.e. restaurants, pubs, etc.). The Development will be facilitated by a FAR of 0.15.
- ***High Density Residential – Planned Unit Development (75 units / ha) with 10% Commercial in the Town Centre*** – This zone is accommodated adjacent to the Primary Spine Road and in the Village Centre. Development in these zones will be at an FAR of 0.375, generating densities of 75 units per hectare, and built form which could accommodate building heights of up to 6 storeys. The building heights and massing should accentuate the highest parts of the site and should not interfere with views of other residential types in close proximity. The zone allows for 10% of floor area to be retail and/or entertainment to accommodate mixed use and is intended that this would occur in developments in the Village Centre in order to provide an active street edge at ground floor level.
- ***Medium Density Residential – Planned Unit Development (25 units / ha)*** – This zone is accommodated in various locations around the site either close to the Village Centre and/or Beach Nodes or in prime locations overlooking the estuary or the sea. Development in these zones will be at an FAR of 0.15 generating densities of 25 units per hectare and built form could accommodate building heights of 2 to 4 storeys. The sites for this zone which are adjacent to and in front of other residential zones overlooking the river or sea will be restricted to two storeys maximum.
- ***Single Residential 600/800 m^2 (12 to 16 units / ha)*** – This zone provides for single detached housing on individual erven of 600 to 800 m^2 at a maximum height of three storeys and which are located primarily around the Village Centre.

- ***Single Residential 1,000 m^2 (10 units / ha)*** – This zone provides for single detached housing on individual erven of 1,000 m^2 at a maximum height of three storeys and which are located in the development blocks accessed via the Village Centre and overlooking the Estuary.
- ***Single Residential 1,500 m^2 (6 units / ha)*** – This zone provides for single detached housing on erven of 1,500 m^2 at a maximum height of three storeys and which are located in prime locations overlooking the ocean and or Estuary.
- ***Resort Hospitality (Hotel and Entertainment)*** – This zone is located to optimise coastal amenity and is positioned so as to ensure a prime location in the development. The precinct provides for resort / leisure developments that ensures beach access for residents. It will have a separate access point off the secondary coastal spine road and controlled access to the beach zone and overall pedestrian system. Density is determined by an FAR of 0.25 and building height will be a maximum of 4 storeys.
- ***Community*** – This zone caters for community uses that would be generated either by the proposed new development on its own and/or by general development in the surrounding areas and could include education facilities. Whilst no specific local level community facilities sites have been indicated on plan these will be accommodated according to demand within either the mixed use retail or higher density residential land use zones and could accommodate local level and associated supporting/complementary social/community facilities including education, health etc. Should any of these facilities require additional environmental authorisations, permits or licences, these will be undertaken at the appropriate time by the end-use Developer.
- ***Private Open Space*** – This zone provides for small private open spaces, or for parks within each of the potential development blocks to provide common neighbourhood spaces.
- ***Conservation*** – This zone accommodates all of the ecological assets of the site and includes linkage spaces that connect the various habitat zones, e.g. coastal zones, wetlands and estuary zones.
- ***Roads*** – This zone accommodates the Primary, Secondary and all local access and circulation roads in the development.

Details relating to the location, size and densities of each land use zone are provided in ***Figure 3-8*** and ***Table 3-2*** as well as the composite concept block plan layout presented in ***Figure 3-10.***

3.1.8 *Elaboration on Resort Hospitality*

The single resort node proposed, currently at conceptual stage only, is located adjacent to the coast approximately 200 m inland. Pedestrian access from this node to the beach is proposed via boardwalks, with such boardwalks being elevated when crossing sensitive dune areas. Possible construction methods, impact assessment and mitigation measures are provided in this assessment. It should be noted that any changes to the natural topography of the dunes are avoided and their dynamic nature are taken into consideration. The location of the resort node, access and boardwalks (conceptual only) in relation to the coast is shown in ***Figure 3-9***.

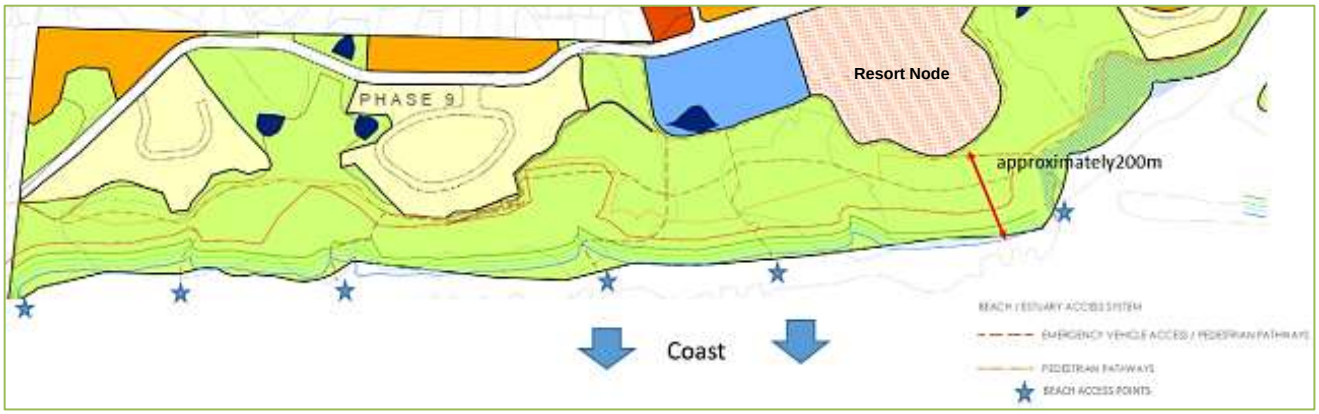


Figure 3-9: Location of Resort in relation to Coast and Beach Access

3.1.9 Sub-Phasing of Tinley Manor Southbanks

Due to the magnitude of the Tinley Manor Southbanks, it will be developed in a phased manner over a number of years. The Tinley Manor Southbanks consists of ten (10) sub-phases in total as illustrated in ***Figure 3-10.*** Construction is expected to commence with sub-phase one and conclude with sub-phase ten.

Detailed sub-phasing layouts, including the service infrastructure requirements for each sub-phase are provided in ***Appendix F***.

The service infrastructure requirements will be elaborated on in ***Section 3.2***.

Figure 3-10: Composite Concept Block Plan Layout for Tinley Manor Southbanks

3.2 Engineering Services[3]

3.2.1 Water

The Tafeni Reservoir (2,500 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.

The water demand parameters for the different land uses are detailed in the Engineering Services Report (2017) prepared by SMEC South Africa and provided in ***Appendix C 11***.

It was previously anticipated that water supply for Tinley Manor Southbanks would be from a reservoir proposed to be constructed within Seaton Delaval, the neighbouring development. Due to various challenges and delays in implementing this development, a new solution was investigated.

The Tinley Manor Southbanks is to be serviced from the Tafeni Reservoir, operated by Sembcorp Siza Water. An upgrade of the reservoir will be required to meet the ultimate water demand of the development.

Four additional 4.5 Mℓ cells will be required, constructed in a phased manner as required. This will result in a total ultimate reservoir capacity of 20.5 Mℓ, which is sufficient to service the entire Tinley Manor Southbanks, along with the existing planned ultimate service area for the Tafeni Reservoir. The 20.5 Mℓ will provide a 48-hour storage capacity for the ultimate development to take place within its service area.

It is proposed that the existing 250 mm diameter water main, running from Tafeni Reservoir along the P228, be extended to supply the first phase of the development. Sembcorp Siza Water has confirmed that the existing 250 mm diameter water main, from Tafeni Reservoir, which terminates near the gravel access, can be extended to supply the first phase of the Tinley Manor Southbanks.

This water main will have sufficient capacity to service the first development phase of the Tinley Manor Southbanks. The 250 mm diameter water main will ultimately service the Seaton Delaval Development and is therefore only an interim supply for Tinley Manor Southbanks.

A new 600 mm diameter steel bulk water main will need to be constructed from the Tafeni Reservoir to the development boundary. Sembcorp Siza Water will be commencing with a separate Application for Environmental Authorisation for the proposed upgrade of the Tafeni Reservoir as well as the construction of the proposed 600 mm diameter steel bulk water main from the Tafeni Reservoir along the P228 to the Tinley Manor Southbanks. THD will bridge fund the application, whilst Sembcorp Siza Water will sign as the Applicant who will be the ultimate custodians of the infrastructure.

The anticipated phased water demand is tabulated below. It is reiterated that Tafeni Reservoir can service Sub-phase 1 of the Tinley Manor Southbanks via the existing 250 mm diameter water main.

The Siza Water Master Planning report prepared by SMEC on behalf of Sembcorp Siza Water, as well as the anticipated yields provided by the Urban Planners, has been used to calculate the Average Daily Water Demand (ADD) of the proposed development (6.31 Mℓ/day).

[3] *The information provided in this section has been obtained from the Tinley Manor Southbanks Engineering Services Report (2017) prepared by SMEC South Africa provided in Appendix C 11.*

Table 3-3: Water Demand per Sub-Phase

Sub-Phase	Total ADD (Mℓ/day)	Cumulative ADD (Mℓ/day)
1	0.33	0.33
2	0.28	0.61
3	0.39	1.00
4	1.13	2.13
5	0.43	2.57
6	0.89	3.46
7	0.17	3.63
8	0.54	4.17
9	0.35	4.52
10	1.79	6.31
Total		**6.31**

Figure 3-11: Proposed bulk water network

3.2.2 Sewage

The existing Sheffield WWTW (***Figure 3-12***) is located within the project boundary. Although the Sheffield WWTW is located within the site, it is located on land which is owned and operated by Sembcorp Siza Water (SSW), under the auspices of the Ilembe District Municipality (IDM).

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).

Details of the Sheffield WWTW as furnished by SSW are as follows:

- Current Capacity: 6 Mℓ/day; and
- Current Usage: 0.3–0.5 Mℓ/day.

Figure 3-12: The existing Sheffield WWTW

The sewer demand parameters for the different land uses are detailed in the Engineering Services Report (2017) prepared by SMEC South Africa and provided in ***Appendix C 11***.

Sewage generated will be treated at the existing Sheffield WWTW. Sembcorp Siza Water has stated that the current flow to Sheffield WWTW ranges between 0.3 Mℓ/day and 0.5 Mℓ/day. Consequently, the current Sheffield WWTW has sufficient capacity to treat sewer from the proposed Tinley Manor Southbanks for at least the first four phases without any upgrades required. Thereafter, the Sheffield WWTW will need to be upgraded to accommodate sewer from Phases 5 to 10. The ultimate capacity of the Sheffield WWTW is 18 Mℓ/day.

The anticipated phased sewer generation expected from the development is tabulated in ***Table 3-4*** below.

The Siza Water Master Planning report prepared by SMEC on behalf of Sembcorp Siza Water as well as the anticipated yields provided by the Urban Planners has been used to calculate the Average Daily Flow (ADF) of the proposed development (5.07 Mℓ/day).

Table 3-4: Sewer Demand per Sub-Phase

Sub-Phase	Total ADF (Mℓ/day)	Cumulative ADF (Mℓ/day)
1	0.25	0.25
2	0.22	0.47
3	0.31	0.78
4	0.90	1.68
5	0.34	2.02
6	0.71	2.73
7	0.14	2.87
8	0.47	3.34
9	0.28	3.62
10	1.45	5.07
Total		**5.07**

Due to the topography of the proposed development area, three (3) sewer pump stations will be required to convey sewer to the Sheffield WWTW. The pump stations will be designed in accordance with SSW's specifications and guidelines.

Emergency storage to be provided for each of the pump stations is four hours of average daily flow with a peak flow period included in these four hours. Due to its proximity to the coastal dune forest, the easternmost pump station (Pump station 3) will also include an emergency overflow facility to prevent contamination of the coastal dune forest. Should an overflow event occur, the sewage contained within the overflow facility will be removed by SSW and returned to the sewer network to be treated.

Previously, four (4) sewer pump stations were proposed, however, following consultation with SSW, this was reduced to three (3) sewer pump stations to reduce maintenance and operational costs for SSW.

The proposed sewage network is presented in ***Figure 3-13***.

Figure 3-13: Proposed bulk sewage network

3.2.3 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.

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.

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.

The proposed road network is illustrated in ***Figure 3-14***.

Figure 3-14: 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.

The road network consists of the following:

- ***Proposed Interchange*** – A Traffic Impact Assessment (TIA) has been compiled by Aurecon, indicating that an interchange is required on the N2 to provide direct access to development via the P228. It is emphasised that this interchange is not required solely for the Tinley Manor Southbanks, but is rather a regional recommendation made in the TIA to support Tinley Manor Southbanks and other neighbouring developments. Due to the phased nature of the development, an interchange will only be required once construction of Phase 5 commences. The interchange is not part of this assessment and will be subject to a separate Application for Environmental Authorisation to be undertaken by SANRAL. SANRAL will be

responsible for the implementation of the interchange, whilst securing contributions from relevant affected developments.

For Phase 1 of Tinley Manor Southbanks, access via the P228 will be sufficient. A simple diamond interchange will be required. The proposed simple diamond interchange will need to be upgraded to the ultimate proposed interchange in order to commence with Phase 10 of the development. Similar to the ultimate development, the Diamond Interchange is the responsibility of SANRAL and is outside the scope of this application.

- ***Proposed North South Link (P228)*** – KwaDukuza District Municipality (KDM) has indicated their intention to construct a North-South Link Road, east of the N2. This link road will follow the alignment of the current P228 south of the Tinley Manor Southbanks and will dissect the development going north after the existing P228 crosses over the N2. The North-South Link Road does not form part of the Tinley Manor Southbanks and will be implemented by KDM in the future. In order to ensure uniformity with the long-term planning of the local municipality, sufficient road reserve width has been provided for along the extension of the access road into Tinley Manor Southbanks to allow for a North-South Link Road.
- ***Additional connectivity with adjacent developments*** – As per KDM's request, to provide alternative accesses to the development, the urban planning layout has been designed in such a manner so as to provide possible future road connections between Tinley Manor Southbanks and the adjacent developments. Two possible road connections have been allowed for off the Main Spine Road into the future Seaton Delaval Development. A third possible connection point to Seaton Delaval is provided along the beach road. Provision, in the form of a road servitude to the development boundary, has been made in the urban planning layout for a future connection to the extended Colwyn Drive. The extension of Colwyn Drive, if implemented, will be done by KDM at a later stage and is outside the scope of this application.

Existing access to the Tinley Manor Southbanks during the construction phase and for the implementation of Phase 1 will be via the P228. Access during construction is illustrated in ***Figure 3-15***.

Figure 3-15: Construction Phase Access

The TIA recommends that the P228 is upgraded. It is reiterated that the upgrade is a regional recommendation for the implementation of Tinley Manor Southbanks and other neighbouring developments. It is further noted that the P228 is administered by the KwaZulu-Natal Department of Transport (KZN DoT) and any upgrade of this road will need to be applied for and implemented by the KZN DoT. Therefore, the upgrade of the P228 is outside the scope of this application.

However, the Applicant (THD) and their Traffic Engineers (Aurecon) have engaged extensively with the KZN DoT who have acknowledged and committed to the need to upgrade the P228 (refer to comment in ***Appendix C 9***). The KZN DoT have indicated that the KDM will commence with determining the relevant financial contributions by all Developers' and will commence acquiring contributions for the proposed upgrades. As such, the Applicant (THD) cannot commit to a timeframe for the upgrades to the P228.

It is understood that concerns relating to the use of the P228 during the construction phase have been raised and this has been addressed through the following documentation:

- Analysis of Construction Traffic (technical note to the TIA) prepared by Aurecon and presented in ***Appendix C 9;*** and
- Traffic Management Plan for the construction phase which is appended to the EMPr as ***Appendix B 5***.

The impacts and mitigation measures are assessed further in this report.

3.2.4 *Boardwalks, Pedestrian Pathways and Emergency Beach Access*

In order to try and create an opportunity for the utilisation and enjoyment of the Open Space System, a series of boardwalks and pathways have been proposed. The boardwalks will provide a dual function in that they will create access to the beach areas as well. It must be noted that for reasons of security and human safety there will need to be beach access for emergency motor vehicles only. These areas will be boomed to prevent use by non-emergency vehicles.

Two emergency beach accesses are proposed along existing roads, and these will simply be managed accesses, with limited maintenance to be undertaken going forward, which will involve the pruning of vegetation when and if it impedes the ability of vehicles to access the beach area. The roadways will be maintained and monitored for erosion or any impacts that they may impart. Apart from these two (2) accesses (***Figure 3-16***) the remaining boardwalks will be no wider than 3 m and these boardwalks will be a combination of earthen tracks and elevated wooden boardwalks.

Figure 3-16: Emergency Vehicular Access Paths (Yellow Arrows)

The boardwalk sections will for the most part fall within the woody areas and across the sensitive environments, such as wetlands and along the estuary. Three (3) boardwalk accesses that have been proposed will need to be correctly pegged and demarcated prior to their construction by a qualified botanist (***Figure 3-17)***. Two (2) of the areas will be elevated boardwalks and fall into areas where alien vegetation has perforated the existing indigenous woody vegetation. The third boardwalk, Boardwalk 3 lies adjacent to fence lines of adjoining properties and the vegetation in this area is disturbed as a result of the fence lines and the activities taking place on the adjoining properties.

It is important to note that the construction of the boardwalks will be "un-invasive" as for the most part they traverse existing pathways, alien encroached areas or cleared areas. Access into and along the boardwalk areas for the purposes of construction must only be along existing paths.

The pathways that are proposed in the open spaces which are not in sensitive environments will make use of the existing tracks that run through the current cane lands and in areas where agricultural activities have ceased. These pathways will not require any significant amendments to be made to them as they will be founded on existing haulage roads. In addition, the majority (over 95%) of these pathways are running on the contour and thus will not pose a threat in terms of stormwater erosion or damage. Where they are running perpendicular across the contour, there may need for some limited interventions to prevent erosion of these pathways, however, this will be easily managed through employing berms and swales and vegetating the areas adjacent to these pathways with indigenous vegetation.

Figure 3-17: Proposed Boardwalk Alignment

Key design requirements for the installation of boardwalks include:

- ***Siting:***
  - Form must maintain and enhance landscape character;
  - Form must recognise natural processes and features and be in keeping with the landscape setting;
  - Siting, design and construction of the boardwalk must result in minimal change to the natural drainage patterns and quality of run-off water of the area;
  - Siting, design and construction of any structure must result in minimal disruption to soils;
  - All efforts must be made to prevent any erosion and minimise adverse impacts to shore stability and habitat; and
  - Key view-sheds should be maintained and protected from inappropriate development that may reduce or impinge on the setting.
- ***Design***
  - Design must respond to potential user characteristics such as type (hikers, runners, bikers, etc.), frequency (daily, weekly, seasonally, etc.) and intensity (volume of users during use periods);
  - Boardwalks must be the minimum width to accommodate the anticipated use (1.8 m moderate use, 4.9 m heavy use). The minimum clearance width for two wheelchairs is 1.5 m. Since most elevated boardwalks are constructed with pilings that encroach into the walking surface, 1.8 m must accommodate the pilings, railings, etc. (Width: 1.5 m minimum for 2-way traffic; 1.8 – 2.4 m average for typical nature area; 3 – 3.7 m for high use areas);
  - Boardwalk gradient cannot exceed 5% without handrails and landings at minimum 30' intervals. Maximum gradient is 8.33%;
  - Structures must be designed to minimise maintenance and be incorporated into the coastal landscape;
  - Structures must be designed to satisfy the engineering constraints of the special wind and soil conditions of the coastal environment;
  - The design of structures must maintain and enhance the coastal landscape character of the area as expressed in the dominant colours found in the surrounding environment;
  - Signs must be clear and informative but generally unobtrusive; and
  - The design of structures, outdoor furniture, signs and utilities within a locality must be visually co-ordinated.
- ***Materials***
  - Practical and cost-effective construction techniques must be applied;
  - Treated wood or recycled plastic “wood” should be used. All fasteners must be galvanised
  - All materials and finishes must be durable in the coastal environment;
  - Handrails: 0.86 – 0.97 m tall;
  - Guardrails: 1.1 m minimum height. Maximum opening between banisters is 10 cm. Wide top rails can obstruct the view of those seated nearby;
  - Cognisance must be taken of the risks involved in using treated wood (with poly-aromatic hydrocarbons (PAH) and creosote) in a sensitive mangrove environment. Where wood is used in the construction of the boardwalk (pilings, supports, etc.) wood treatment is an essential to ensure the durability of the structure; and
  - Public pedestrian walkways may be constructed from a variety of materials. Whenever possible, pervious or semi-pervious surfaces should be used. Materials such as wood decking (with spaces between the boards), gravel, and porous pavers are considered pervious.

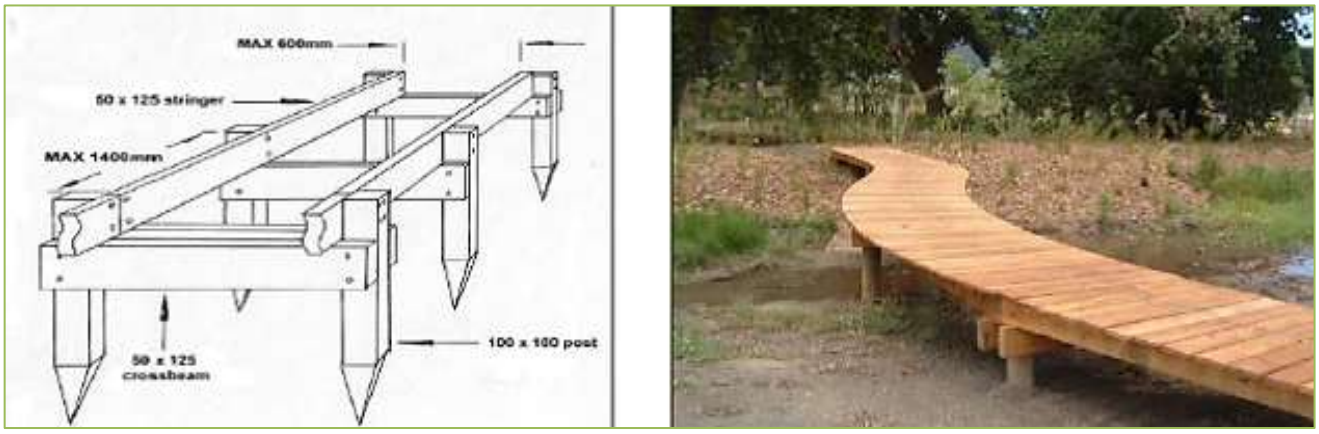


Figure 3-18: Typical Boardwalk Structure

3.2.5 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 stormwater 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.
- Stormwater Management Facilities (SMFs) will be used to reduce run-off into the natural drainage system to the pre-development 1:10 and 1:50 year peak flow rates. SMFs will be sized to ensure that pre-development 1:10 and 1:50 discharge flows are not exceeded.

3.2.6 Bulk Irrigation

Based on discussions with the landscape architects, Uys and White, the land uses that will require irrigation are open spaces, resorts, educational and selected verges and medians. The anticipated total irrigation surface area is approximately 225,000 m^2 which requires a total weekly irrigation volume of 7.75 Mℓ or 1.55 Mℓ/day over 5 days. To reduce losses due to evaporation and to maximize the benefit of use by pedestrians, an 8 hour nightly irrigation time is proposed.

Considering that the KZN region is currently experiencing a drought, four (4) potential water sources for irrigation were investigated:

- ***Potable Water*** – Using potable water for irrigation is not deemed an economically feasible solution.
- ***Existing Siza Water Borehole*** – SSW has indicated that their borehole water can be utilised for irrigation in the interim (construction phase). The quality of the borehole water however necessitates diluting or treatment to get it to an acceptable quality for irrigation. SSW will undertake the treating and dilution within their processes and provide treated water to THD for irrigation.
- ***River Abstraction from the Umhlali River*** – 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 be established and appropriate management interventions and mitigation measures applied towards reaching an improved condition. Currently, the state of the estuary is classified as Category D, that is to say, it has been largely modified from its pristine condition. Through various assessments, the estuary is deemed regionally and nationally important and therefore should be managed to obtain a Category B status (i.e. resembling a largely natural system with few modifications). The best scenario to ensure a Category B status requires the present mean annual rainfall (MAR) (minus the WWTW discharge), and including remedial actions: rehabilitation of flood plain, removal of old weir, no

artificial breaching, and no sugarcane farming in the Estuary Functional Zone, as given in the Ecological Reserve study. Additional abstraction will result in reduced MAR reaching the estuary and is in opposition to improving the health of this national asset.

- ***Utilising Treated Waste Water from Sheffield WWTW*** – SSW has the ability to provide treated effluent from Sheffield WWTW, subject to the effluent inflow into the WWTW. This however will be an interim measure as SSW's future plans include constructing a Reverse Osmosis (RO) Plant at Sheffield WWTW to treat effluent to supplement their potable water supply. The RO Plant is not anticipated to be constructed before Phase 5. Two (2) supply scenarios were considered to distribute the required weekly volumes, one which attempts to utilise gravity and the other relying on a fully pumped system.

Considering the elevation ranges and hilly nature of the region it was identified that the fully pumped system will be the most effective system to adopt. The most feasible irrigation water supply for the development is deemed to be a combination of the Sheffield WWTW effluent and the SSW borehole. This will however be an interim solution. As and when required, the ultimate irrigation water supply source will be investigated, and applied for to the KZN EDTEA and to the DWS.

It is proposed that an irrigation storage dam with a capacity of 3.1 Mℓ be constructed within the development, from where it will be distributed via the bulk irrigation network. Three (3) proposed locations for the irrigation storage dam are presented in ***Section 4***.

The estimated irrigation demand per phase is tabulated below.

Table 3-5: Estimated Irrigation Demand per Sub-Phase

Sub-Phase	Total Demand (Mℓ/day)	Cumulative Demand (Mℓ/day)
1	0.69	0.69
2	0.57	1.25
3	0.90	2.15
4	0.33	2.48
5	0.36	2.84
6	0.48	3.32
7	0.56	3.89
8	1.81	5.70
9	0.14	5.84
10	1.91	7.75
Total		**7.75**

3.2.7 Telecommunications

Duct crossings will be installed to allow for telecommunication infrastructure.

3.2.8 Waste Management

Waste management during the operational phase will be the responsibility of the local authority (i.e. the KwaDukuza Local Municipality).

Waste will be collected by the Municipality and transferred to the only available landfill – the KwaDukuza Landfill Site. It is owned and operated by the Dolphin Coast Waste Management which is responsible for collection and disposal of solid waste in the KwaDukuza, Empangeni and Richards Bay area.

Waste generated during the operational phase is expected to consist predominantly of domestic and garden refuse.

3.2.9 Electrical[4]

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.

3.2.9.1 Total Load Estimate

The estimated total electrical load requirement, based on NRS 069:2004 is presented in ***Appendix C12.***

Applying further diversification to the load at the substation, the estimated load will be in the order of 21.7 MVA.

3.2.9.2 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.

KED have recently commissioned the new 10 MVA (firm), 33/11 kV Sheffield Beach substation. 2 x 33 kV cables were laid from the Shakaskraal substation to the new Sheffield Beach substation and 2 x 10 MVA transformers installed (Note: 10 MVA firm as the second transformer provides contingency in the event of a transformer failing). An existing electrical load of 6 MVA has already been transferred to this substation from surrounding areas with the balance of the electrical load being allocated to projects within the immediate vicinity of this substation.

3.2.9.3 Future Planning

Due to electrical capacity constraints in the Salt Rock / Sheffield Beach area and the number of developments planned for this area, KED have appointed Aurecon (Electrical Consulting Engineers) to undertake a study of the area and produce an overall master plan that will increases the electrical capacity into this area in order to meet its growing demands.

The master plan report is near completion and the contents will be made known by KED in due course to assist with planning of electrical networks. Notwithstanding, Aurecon have indicated that the plan does indicate the introduction of a new 132/11 kV substation into the area, which when commissioned will address all the electrical needs of the area.

Of concern is that this master plan indicates that a 132/11 kV substation will be required in the area in 5 years. Following all the correct approvals and procedures generally the establishment of a substation of this size takes five and a half years or longer.

Notwithstanding the above, the recently commissioned Sheffield Beach substation has been designed to double its current capacity to 20 MVA (firm) as demand in the area increases. This would require an additional cable to be laid from Shakaskraal substation and the introduction of a third 10 MVA, 33/11 kV transformer at Sheffield Beach substation.

---

[4] *The information provided in this section has been obtained from the "Tinley Manor Southbanks EIA Electrical Services Report" (2017) prepared by Admastor Consulting CC, provided in Appendix C 12. This section must be read in conjunction with this report.*

3.2.9.4 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.

However, agreement can be reached with KED to upgrade the capacity of the Sheffield Beach substation from 10 to 20 MVA making 10 MVA or part thereof available to this development to meet its short to medium electrical requirements. It must be noted that the overall electrical requirement for this project is in the order of 23 MVA and will take a number of years over 10 phases to reach this demand.

During this period the proposed 132/11 kV major substation would have to have been designed and commissioned and would address any further load requirements in the area.

An agreement with the KED to increase the capacity of the Salt Rock substation would be subject to financial contribution for the following components:

- Capital contribution towards the 33 kV cable from Shakaskraal.
- Capital contribution towards the new 33/11 kV transformer.
- Developer kVA contribution.
- Any other contribution that may be required.

3.2.9.5 Further Actions

Admastor Consulting and THD are presently in discussions with the KwaDukuza Municipality regarding electrical supply to Tinley Manor Southbanks.

A Letter of 'In Principle' Agreement has been obtained and included as ***Appendix G***.

3.2.10 Internal Infrastructure

Internal water and sewer infrastructure will comply with the iLembe District Municipality and Sembcorp Siza Water (SSW) standards.

3.3 Community 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. 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.

3.4 Amendments to the Concept Plan

3.4.1 Changes from the draft EIA Report to the final EIA Report

Following the public review of the draft EIA Report (February 2015) and the submission of the final EIA Report (February 2016), the Concept Plan was amended.

Concerns relating to the potential impacts on the estuary of the agricultural village concept, as well as, the restricted public beach access that a gated estate would result in, necessitated a change in the concept for the site.

The new concept and block plan has responded to these concerns. Key amendments include:

- Amendment of previous fully gated estate concept to a new mixed use village scheme enabling public access;
- Removal of agricultural concept (market gardening, banana plantations, orchards, and irrigation ponds etc.) and introduction of an appropriate landscaping strategy;
- Amendment from the previously proposed four resort nodes to a single resort node;
- Amendment of previous resort nodes to residential development (single residential and planned unit development);
- Increase in planned development areas (159.30 ha previously identified developable area increased to 179.45 ha developable area of the total area of 485 ha which equates to an increase of 4%);
- Consolidation of wetland areas, proposed attenuation facilities, buffers, recreation areas, conservation and proposed agricultural uses into a single conservation zoning; and
- Areas previously identified for rehabilitation (falling outside the site boundary) are now excluded.

The new concept and block plan does not deviate from the original concept in developing the site optimally without compromising its environmental character and function.

The updated design continues to capitalise on the undulating landscape, wetland areas and coastal vegetation as part of an eco-centric design concept, which includes both direct and indirect interactions with the Umhlali Estuary, through the numerous drainage lines, wetland areas, estuary and the shoreline.

3.4.2 Changes from the final EIA Report to the amended EIA Report

Following the rejection of the final EIA Report (February 2016) and the presentation of this amended draft EIA Report (March 2017), a number of changes to the concept plan and engineering services layout have been necessitated. These changes have occurred through a detailed iterative design process in consultation with the entire specialist team. Changes to the urban planning concept block layout are illustrated in ***Figure 3-19*** and changes to the engineering services layout are presented in ***Figure 3-20***.

Summary of amendments are as follows:

1. Road reserves for all major roads were widened to accommodate latest road designs, particularly planning to align with future KDM extensions;
2. The road reserve in the south-east corner was amended to provide for future access, pedestrian access and/or emergency access points to adjacent existing developments;
3. The coastal access road northwards from the P228 through the site has been classified as a Class 3 road, therefore no access is permitted to adjacent sites. Accordingly, the Retail 1 site at corner of this access road and the proposed Primary Spine Road has been expanded southwards to accommodate the road access off the Spine Road;
4. Provision of additional indicative future road and/or pedestrian access and/or emergency access options to adjacent land or developments;
5. Coastal portion of the Secondary Spine Road was widened and realigned to accommodate latest road designs;
6. Minor refinements to the concept block outline based on preliminary design of roads and/or services networks;
7. Education site inland of N2 now called Community site;
8. The bulk waterline alignment changed from the Seaton Delaval Reservoir to the Tafeni Reservoir. The bulk water main will follow the alignment of the P228 and will be constructed within the road reserve. The bulk water main does not form part of this application;
9. The number of sewer pump stations required was reduced from four to three pump stations as requested by SSW. Subsequently, slight changes in the sewer network layout were made;
10. An irrigation network and dam have been added to the application;
11. Yields amended to reflect more detailed work undertaken during the course of 2016 – the number of units therefore increases from 4,336 to 4,532 units; and
12. The stormwater management facilities layout was changed. Alternative solutions had to be found in order to minimise wetland losses. A number of swales have been included in the Stormwater Management Plan.

Figure 3-19: Amendments to the Concept Block Plan (2017)

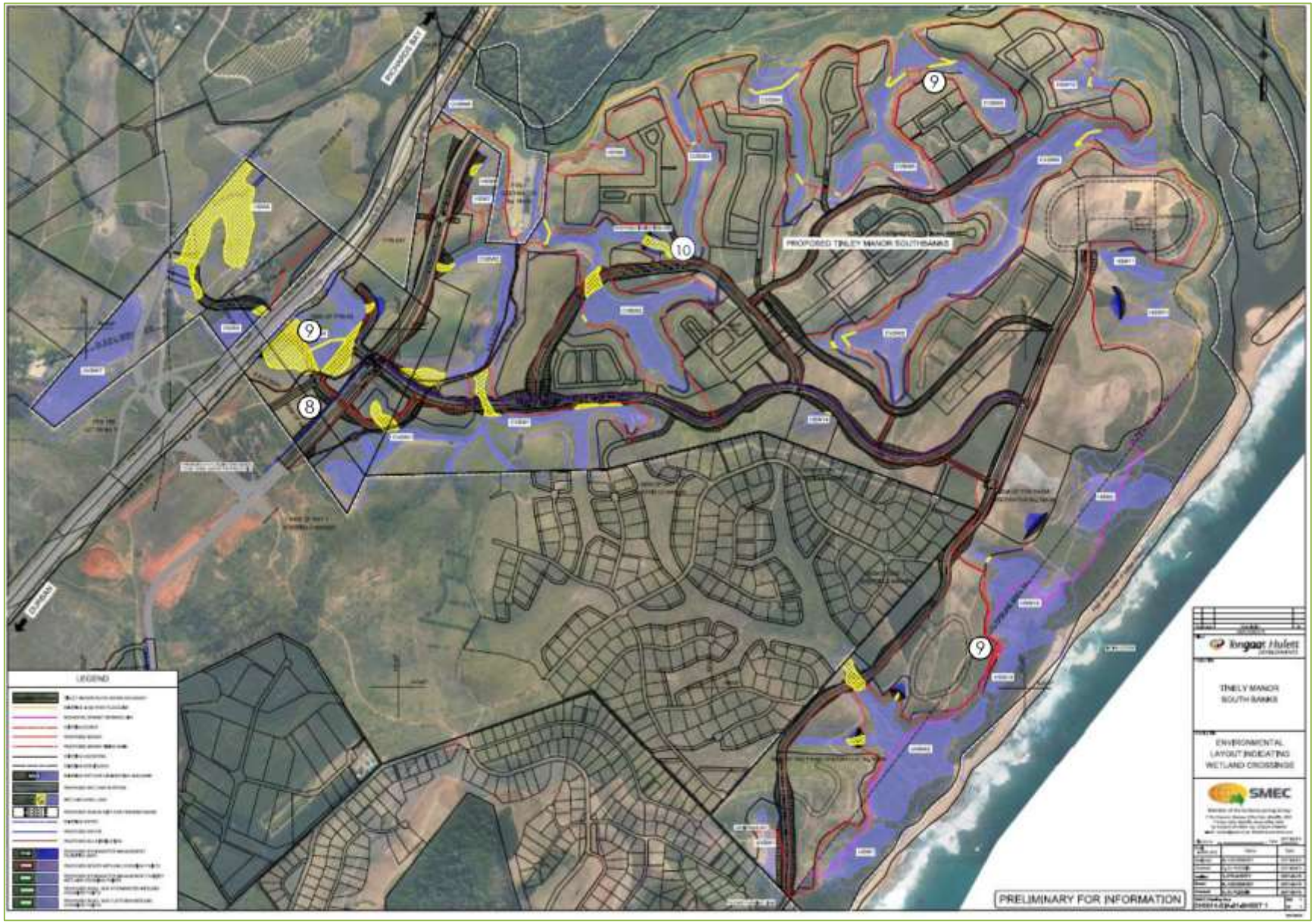


Figure 3-20: Changes to the Engineering Services Layout

3.5 Sub-Phasing and Implementation Timing of Tinley Manor Southbanks

Ten (10) plans are included in ***Appendix F*** illustrating the phasing and service infrastructure requirements for each sub-phase of Tinley Manor Southbanks. The phasing requirements are summarised in ***Table 3-6***.

The following is noted for the implementation of Phase 1:

- THD will implement the internal water pipelines and water can be provided by SSW from the Tafeni Reservoir via the existing 250 mm water main with no further upgrades required to the Tafeni Reservoir and without the implementation of the proposed 600 mm bulk water main;
- THD will implement the internal sewer reticulation and sewage can be received by SSW with no upgrades required to the Sheffield WWTW;
- Access to the site will be via the existing P228; and
- Electricity supply will need to be confirmed with KDE.

Table 3-6: Development Phasing and Service Infrastructure Requirements

Phase	Estimated Construction Date	Land Use	Infrastructure Required									
			Water		Sewer		Roads and Access		Irrigation		Electrical	
			Infrastructure	Responsible Party	Infrastructure	Responsible Party	Infrastructure	Responsible Party	Infrastructure	Responsible Party	Infrastructure	Responsible Party
Phase 1	2018	Residential	Internal Network	THD	Internal Sewer	THD	P228 Upgrade	KZN DoT to implement	Storage Dam, Pump Stations and Irrigation Network	THD	MV Service cable to substation, Medium Voltage, Low voltage and street lighting	THD
							Internal Roads	THD to implement				
Phase 2	2020	Residential	Tafeni Reservoir 4.5Mℓ cell	SSW through SLA	Internal Sewer	THD	Internal Roads	THD to implement	Internal Irrigation	THD	Medium Voltage, Low Voltage and Street Lighting	THD
			600 mm diameter bulk water main	SSW through SLA	Trunk Sewer Main	THD						
			Internal Network	THD								
Phase 3	2022	Residential	Internal Network	THD	Internal Sewer	THD	Internal Roads	THD to implement	Internal Irrigation	THD	Medium Voltage, Low Voltage and Street Lighting	THD
Phase 4	2024	Mixed Use Commercial	Internal Network	THD	Internal Sewer	THD	Internal Roads	THD to Implement	Internal Irrigation	THD	MV Service cable to substation, Medium Voltage, Low voltage and street lighting	THD
		Residential										
Phase 5	2026	Residential	Tafeni Reservoir 4.5Mℓ cell	SSW through SLA	Internal Sewer	THD	Internal Roads	THD to Implement	Internal Irrigation	THD	Medium Voltage, Low Voltage and Street Lighting	THD
			Internal Network	THD	Upgrade of the Sheffield WWTW, Sewer Pump Station and Rising Main	THD & SSW through SLA	Simple Diamond Interchange	SANRAL				
Phase 6	2028	Residential	Internal Network	THD	Internal Sewer	THD	Internal Roads	THD to Implement	Internal Irrigation	THD	Medium Voltage, Low Voltage and Street Lighting	THD
Phase 7	2030	Residential	Internal Network	THD	Internal Sewer	THD	Internal Roads	THD to Implement	Internal Irrigation	THD	Medium Voltage, Low Voltage and Street Lighting	THD
Phase 8	2032	Residential	Internal Network	THD	Internal Sewer	THD	Internal Roads	THD to Implement	Internal Irrigation	THD	Medium Voltage, Low Voltage and Street Lighting	THD
		Resort										
Phase 9	2034	Commercial	Internal Network	THD	Internal Sewer	THD	Internal Roads	THD to Implement	Internal Irrigation	THD	Medium Voltage, Low Voltage and Street Lighting	THD
		Residential			Sewer Pump Station and Rising Main	THD						
Phase 10	2036	Mixed Use Commercial	Tafeni Reservoir 4.5Mℓ cell	SSW through SLA	Internal Sewer	THD	Internal Roads	THD to Implement	Internal Irrigation	THD	Medium Voltage, Low Voltage and Street Lighting	THD

4 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.

4.1 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 mixed-use development with 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, hence site alternative options are limited.

4.2 Design and Concept Layout Alternatives

During the early stages of the Environmental Scoping Study that culminated into the compilation of the final ESR, it was proposed that layout alternatives would be considered which would explore several options and proposals for the land use of the site. However, due to the existing constraints including wetlands, estuary, coastal dune forest, sensitive pockets of vegetation, roads and topography (as detailed in ***Section 3.1)***, the options to consider alternative layouts were limited.

Through many meetings between the Developer, engineers, urban planners, various technical specialists and scientists and various service providers, the Tinley Manor Southbanks Concept Plan was developed over time with the ultimate intention of creating a sustainable development taking cognisance of the property's environmental asset base.

Several concept layout alternatives were considered by the multi-disciplinary team with further optimisation at each iteration process, resulting in the current proposed Concept Plan of 2017. It should be noted that the Concept Plan should not be seen as the final detailed design layout or the final approved plan in terms of the town planning process for the development, but is only to be used a guideline to create an understanding of the conceptual framework for the ultimate development and detailed planning of Tinley Manor Southbanks.

Revisions to the Tinley Manor Southbanks Concept Plan have centred around the following key aspects:

4.2.1 Layout Alternative One – Coastal and Development Access Alternatives

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.

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 node, this 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 within 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.

Therefore, Layout Alternative One presents two alternative Concept Layouts as follows:

LAYOUT ALTERNATIVE ONE (a) – CONCEPT PLAN GATED ESTATE & RESTRICTED BEACH ACCESS

Figure 4-1: Layout Alternative One (a) – Concept Plan

- Curvilinear road system serving predominantly mono-functional land use.
- Mix of low density, single house per subdivision.
- Detached building typology, one or two storey.
- Predominantly suburban residential with

LAYOUT ALTERNATIVE ONE (b) – CONCEPT PLAN WITH PUBLIC ACCESS TO ESTATE AND PUBLIC PEDESTRIAN ACCESS TO BEACH

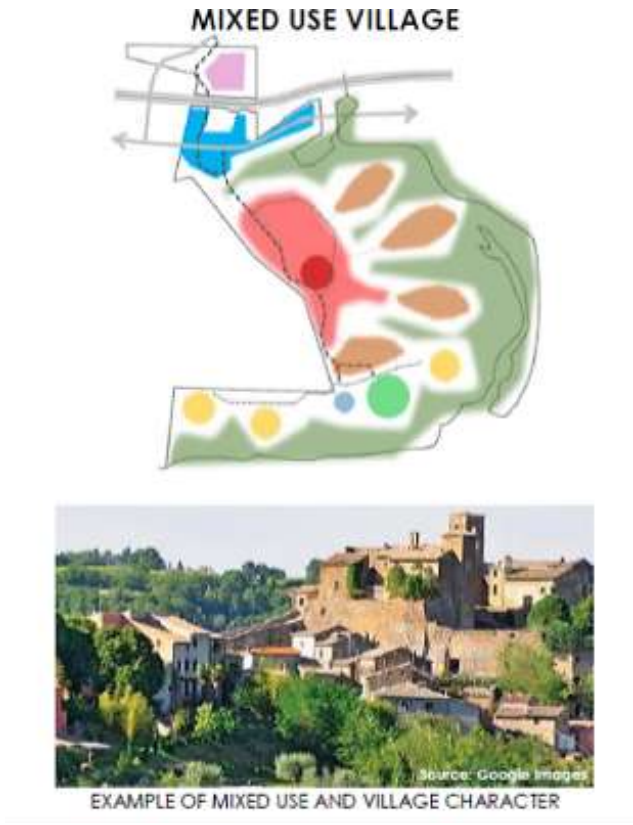


Figure 4-2: Layout Alternative One (b) – Concept Plan

- Integrated hierarchical grid road system serving mixed use neighbourhoods.
- Mixed densities including high and low density options.
- Mix of attached multi storey and detached low

supporting commercial and social facilities in central locations.
- Gated development with single estate access and restricted public access to beach zone through the estate.

rise building typologies.
- Mixed use urban with well-defined and functional public spaces.
- Public mixed use commercial and beach / coastal nodes and village centre serving individual secured smaller mixed density clusters / neighbourhoods.

4.2.2 Layout Alternative Two - Stormwater Management Facilities Alternatives

The original SMP and Concept Plan allowed for the attenuation of stormwater to be done via dry stormwater management facilities located within wetlands (***Figure 4-3***). The logic being that current industry norms suggest the positioning of stormwater management 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 management 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 management 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. Discharge points would be needed therefrom to ensure a diffused, controlled discharge into the watercourse from the stormwater management facility. It should be noted that stormwater management facilities 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 stormwater management facilities would be required, as not all the structures can 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 and recommendations made, are commended, the exclusion of the free ecosystem flood attenuation services provided by the extensive rehabilitated wetland system as part of an attenuation system was queried. The use of ‘dry’ stormwater management 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.

The above comment was noted by both SMEC South Africa, as well as the Urban Planning Team, and after discussion, it was agreed to exclude all stormwater management facilities from wetlands. Instead, that the stormwater management facilities 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. Only where unavoidable are stormwater management facilities located within wetlands.

Therefore, Layout Alternative Two presents two alternative Layouts as follows:

LAYOUT ALTERNATIVE TWO (a) – LAYOUT PLAN WITH STORMWATER MANAGEMENT FACILITIES LOCATED IN WETLANDS

Figure 4-3: Layout Alternative Two (a) – Layout Plan

- Stormwater Management Facilities located largely within wetlands.

LAYOUT ALTERNATIVE TWO (b) – LAYOUT PLAN WITH STORMWATER MANAGEMENT FACILITIES (INCLUDING SWALES LOCATED IN & OUT OF WETLANDS

Figure 4-4: Layout Alternative Two (b) – Layout Plan

- Stormwater Management Facilities located predominantly outside of wetlands.

4.2.3 Layout Alternative Three - Irrigation Dam Storage Alternatives

In order to ensure the Wetland and Open Space Rehabilitation Plan is realised, water for irrigation of the large open space network is required. It is necessary to store this water for utilisation.

Therefore, Layout Alternative Three presents three (3) potential locations for the irrigation dam:

LAYOUT ALTERNATIVE THREE (a) – LOCATION OF IRRIGATION DAM (a)

LAYOUT ALTERNATIVE THREE (b) – LOCATION OF IRRIGATION DAM (b)

LAYOUT ALTERNATIVE THREE (c) – LOCATION OF IRRIGATION DAM (c)

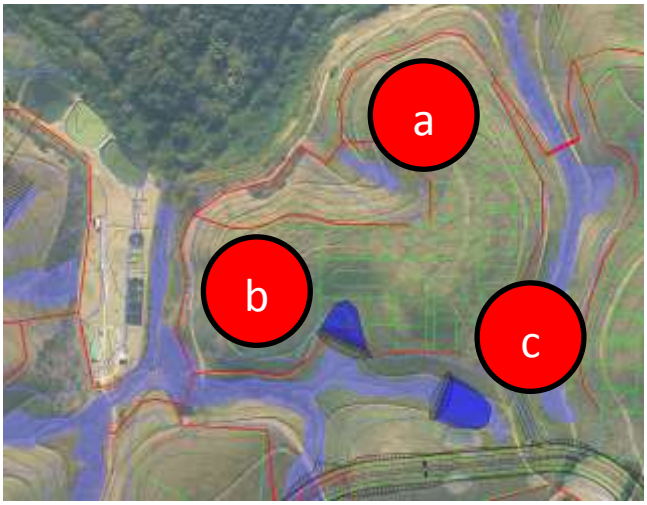


Figure 4-5: Layout Alternative Three (a, b & c) – Irrigation Dam Locations

Alternative A

- Site too steep.
- Insufficient storage < 1.5 Mℓ.

Alternative B

- Site flatter.
- Can store daily flow + 50% spare.
- Dam height < 5 m.
- Encroaches into wetland buffer.

Alternative C

- Flattest site.
- Can store daily flow + 100% spare.
- Encroaches into the wetland.
- Dam height < 5 m.

4.2.4 Layout Alternative Four – 'Area 9' Alternatives

The revised Concept Plan (2017) sees the development footprint run adjacent to the Coastal Dune Forest. The Vegetation Assessment identified an area of concern referred to as 'Area 9' (***Figure 4-6***). 'Area 9' consists of sensitive woody vegetation as illustrated in ***Figure 4-7***.

Figure 4-6: Location of Area 9

Figure 4-7: Sensitive woody vegetation located at 'Area 9'

Therefore, Layout Alternative Four presents two alternative Layouts as follows:

LAYOUT ALTERNATIVE FOUR (a) – LAYOUT PLAN WITH DEVELOPMENT FOOTPRINT TRAVERSING THE WOODY VEGETATION

Figure 4-8: Layout Alternative Four (a) – Layout Plan

- Development footprint (concept block layout) traverses woody vegetation.

LAYOUT ALTERNATIVE FOUR (b) – LAYOUT PLAN WITH DEVELOPMENT FOOTPRINT OUTSIDE THE WOODY VEGETATION

Figure 4-9: Layout Alternative Four (b) – Layout Plan

- Development footprint (concept block layout) outside woody vegetation.

4.2.5 Summary

It is 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 (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. Therefore, the following specific alternatives relating to the Concept Plan under assessment have been considered:

1. Gated vs public access;
2. Location of Stormwater Management Facilities within and outside of wetlands;
3. Location of the Irrigation Dam; and
4. Location of developable area within woody vegetation.

It is reiterated that some of the items as considered in ***Section 3.3*** can only be finalised in the detailed town planning, but that the need and position for such has been acknowledged and assessed.

4.3 Type of Activity Alternatives – Irrigation Source Alternatives

As mentioned in ***Section 4.2.3***, in order to ensure the Wetland and Open Space Rehabilitation Plan is realised, water for irrigation of the large open space network is required. It is necessary to source water for irrigation of the open space network. The following water sources were investigated:

- ***Activity Alternative 1*** – The use of potable water from the Municipal system for irrigation;
- ***Activity Alternative 2*** – Utilising the existing borehole owned and operated by SSW for sourcing water for irrigation;
- ***Activity Alternative 3*** – Abstracting water from the Umhlali River and Estuary for irrigation; and/or

- ***Activity Alternative 4*** – Utilising treated wastewater from the Sheffield WWTW for irrigation.

Detail with regard to each alternative considered for sourcing water for irrigation has been presented in ***Section 3.2.6***.

4.4 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; and
- Rehabilitation and closure.

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

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.

4.5 No-go Alternative

This 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.

For the socio-economic impacts associated with the 'no-go' alternatives, the benefits described in the Needs and Desirability Section (***Section 2.3***) will not be achieved.

4.6 Summary of Alternatives Assessed

This EIA study therefore considers the following alternatives (***Table 4-1***):

Table 4-1: Description of alternatives

Alternative	Description
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 mixed-use development. 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.	
Design and Layout Alternatives	
Alternative Layout 1 - Coastal and Development Access Alternatives	• Layout Alternative 1 (a) – Gated residential estate – 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. • Layout Alternative 1 (b) – Public access mixed-use development – 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.
Alternative Layout 2 - Stormwater Management Alternatives	• Layout Alternative 2 (a) – The original Concept Plan considered stormwater management facilities to be located within wetlands. • Layout Alternative 2 (b) – The revised Concept Plan presented in this EIA allows for stormwater attenuation facilities to be located predominantly outside of wetlands.
Alternative Layout 3 – Irrigation Dam Alternatives	• Layout Alternative 3 (a) – Irrigation Dam at location (a). • Layout Alternative 3 (b) – Irrigation Dam at location (b). • Layout Alternative 3 (c) – Irrigation Dam at location (c).

Alternative	Description
Alternative Layout 4 – 'Area 9' Alternatives	• Layout Alternative 4 (a) – Development footprint within Woody Vegetation. • Layout Alternative 4 (b) – Development footprint outside of Woody Vegetation.
Activity Type Alternatives	
Source of Water for Irrigation Alternatives	A number of alternatives exist for the source of water for irrigation. Alternatives to be assessed include: • Activity Alternative 1 – Potable Water. • Activity Alternative 2 – Use of Sheffield WWTW Borehole. • Activity Alternative 3 – Abstracting water from the Umhlali River and Estuary. • Activity Alternative 4 – Use of treated wastewater from the Sheffield WWTW.
Operational Alternatives	
The EMPr details operational best practice approaches to be adopted. The Developer and each end-use Developer will need to investigate sustainable operational practices.	
No-Go Option	
This 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 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.	

5 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)[5];
- 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)(as amended) (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.

5.1 National Environmental Management Act (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 National Department of Environmental Affairs (DEA) delegated authority to the KZN EDTEA to authorise the relevant activities relating to Electricity Distribution on the 1st October 2015. A copy of the Delegated Authority is included in ***Appendix A***.

The activities associated with this development, for which environmental authorisation is required are detailed in ***Table 5-1***.

It is noted that the applicable activities presented in ***Table 5-1*** 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*

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

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 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, a full comparison of the 2010 and 2014 EIA Regulations is included in ***Appendix E***.

Therefore, the EIA documentation as submitted to date, addresses all relevant EIA listed activities both in terms of the 2010 and 2014 iteration of the EIA Regulations.

It is important to re-iterate that the site is deemed to be an urban area. According to the iLembe District Spatial Development Plan (2015), the Tinley Manor area is designated as "Urban Town".

Table 5-1: 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** 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, irrigation pipelines 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. Specific pipeline infrastructure is depicted in ***Figure 7-13*** and the specific diameter of pipelines crossing wetlands is provided in ***Figure 7-14*** and ***Figure 7-15.*** The anticipated pipeline diameters vary from with 600 mm being the largest diameter pipeline expected. Trench depths are not expected to exceed 2 m, and, widths are not expected to exceed 5 m in wetlands.
Activity 10	The construction of facilities or infrastructure for the transmission and distribution of electricity 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, stormwater management facilities, wetland rehabilitation structures 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.

Listed Activities		
		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. storage dam; pump stations, pipelines and storage facilities); • Electrical cabling (underground or the pylon footprints for aboveground cabling); • Stormwater management facilities; and • Roads and bridges. Specific co-ordinates of all watercrossings are provided in ***Figure 7-13***, ***Figure 7-14*** and ***Figure 7-15***.
Activity 12	The construction of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50,000 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 management facilities. Furthermore, one irrigation dam is proposed to be constructed. In isolation each of these facilities are less than 50,000 m^3, however, the combined capacity of these facilities may exceed 50,000 m^3. The location of the irrigation dam is depicted in ***Figure 4-5*** (Option c preferred) and the location of the stormwater management facilities is provided in ***Figure 7-30***.
~~**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.~~	This activity is deemed not applicable, as the storage and handling of dangerous goods will be kept below 80 m^3 during the construction and operational phase. Activities which would lead to exceedance of this threshold (e.g. fuel stations) will apply separately (within the context of the information provided in this process).
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.	According to the Coastal Assessment, no development will occur within the Coastal Public Property; except for the installation of boardwalks which will exceed 50 m^2.

Listed Activities		
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: **vi. infrastructure covering 50 m^2 or more.**	The proposed project will see the construction of service infrastructure (such as sewer lines, pipelines, electrical cabling and/or road infrastructure as well as buildings and other such infrastructure (exceeding 50 m^2) within 100 m of the sea and/or Umhlali Estuary. This infrastructure includes: the installation of boardwalks, pedestrian pathways, and emergency vehicular access both within 100 m of the Umhlali Estuary, and, within 100 m inland of the high-water mark of the sea.
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 as part of the coastal dune rehabilitation proposed, however this is deemed maintenance. The activity is specifically applied for the installation of boardwalks within the coastal dunes and any erosion stabilisation that may be required associated with this.
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. dam storage; pump stations, pipelines and storage facilities); - Electrical cabling; - Stormwater management facilities; and - Roads and bridges. Specific co-ordinates of all water crossings are provided in ***Figure 7-13, Figure 7-14*** and ***Figure 7-15***.
~~**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.~~	This Activity is no longer applied for as the area is classified as 'urban'.
~~**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).~~	The removal of protected plants requiring a DAFF permit does not trigger this Activity and this Activity is no longer applied for.

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 not applicable and has been removed.
Activity 39	The expansion of **iii. bridges;** **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 road infrastructure (i.e. sugarcane roads) such as 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~~	This Activity is not applicable as it is construction / development of infrastructure and not expansion of existing such infrastructure.
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 sugarcane road networks. The P228 road is, as indicated above, not included within the scope of this application as it is within the control of the KZN DoT and the upgrades / modifications thereto are within their jurisdiction.

Listed Activities		
~~**Activity 56**~~	~~Phased activities for all activities listed in this Schedule, which commenced on or after the effective date of this Schedule, where any 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.~~	THD's Tinley Manor landholdings (Northbanks and Southbanks) are being undertaken in a phased manner, with the Southbanks being the first phase 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. However, the KZN EDTEA indicated that this Activity is not applicable in this instance and is subsequently no longer applied for.
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.~~	This activity is not applicable as the storage and handling of dangerous goods will be kept below 80 m^3 during the construction and 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. The Department of Water & Sanitation (DWS) have indicated that a Section 21 (g) "disposing of waste in a manner which may detrimentally impact on a water resource" – application is required for the potential overflow of the sewer pump stations on the site. Guidance from the KZN EDTEA on the applicability of this Activity is requested.
~~**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. This includes both sub-stations and distribution cables linking to the development and within the development. However, the site is classified as an "urban area", therefore, this Activity is no longer applied for.
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 485 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	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		
	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 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 4	The construction of a road wider than 4 metres with a reserve less than 13,5 metres (a) in KwaZulu-Natal: ii. In urban areas (cc) seawards of the development setback line or within urban protected areas.	Applicable for the formalisation of the two (2) emergency vehicular access roads proposed within the Coastal Dune Forest and beyond the Limited Development Line, although it is noted that these roads are existing sugarcane roads and will not be the construction of new roads.
~~**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.~~	This Activity was considered 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. However, indigenous vegetation pruning and/or removal for the installation of boardwalks has been discussed with the ecologist and is not expected to exceed 300 m^2, therefore, this Activity is not applied for.
~~**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.~~	This Activity was considered 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. However, indigenous vegetation pruning and/or removal for the installation of boardwalks has been discussed with the ecologist and is not expected to exceed this threshold, therefore, this Activity is not applied for.

Listed Activities		
~~**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.~~	THD's Tinley Manor landholdings (Northbanks and Southbanks) are being undertaken in a phased manner, with the Southbanks being the first phase 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. However, the KZN EDTEA indicated that this Activity is not applicable in this instance and is subsequently no longer applied for.

5.2 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 any community 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.

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

The National Environmental Management: Integrated Coastal Management Act (NEM:ICMA) (Act No. 24 of 2008)(as amended) 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 NEM:ICMA requires that activities that are potentially harmful to the coastal zone are considered as part of the NEMA EIA processes (***Section 5.1***) including potential cumulative impacts.

The competent authority needs to consider the following aspects, amongst others:

- If coastal public property, coastal access land or the coastal protection zone will be affected by the proposed action;
- Estuarine management plans, Coastal Management Programmes, coastal management lines and coastal management objectives;
- The socio-economic impact if that activity or action is authorised or not authorised;
- The likely effect of dynamic coastal processes (such as wave, current and wind action, erosion, accretion, sea-level rise, storm surges and flooding) on the activity; and
- Whether the development of activity is likely to cause irreversible or long-lasting adverse effects on the coastal environment that cannot be properly mitigated; will prejudice the achievement of any coastal management objective; or will not be in the interests of the community as a whole.

5.4 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 licenced 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 for irrigation purposes)*;*

(b) *storing of water* (applicable for the construction of stormwater management facilities and the irrigation dam);

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

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

(g) *disposing of waste which may detrimentally impact on a water resource (*applicable for the construction of the three sewer pump stations proposed).

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 will be conducted and the final version thereof will be submitted to the DWS in the coming months. A pre-application meeting was held with the **DWS** on **08 April 2016** to determine the specific licencing requirements. The iWULA is in the process of being compiled for submission to the DWS.

5.5 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.

5.6 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.

Kinvig & Associates, the Vegetation specialists appointed for this project, are pursuing the necessary permit/licencing requirements from DAFF and Ezemvelo KZN Wildlife on behalf of the Applicant.

6 DESCRIPTION OF THE RECEIVING ENVIRONMENT

BIOPHYSICAL

6.1 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 6-1 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 6.4***.

Table 6-1: 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**

6.2 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.

6.3 Geology and Soils[6]

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.

[6] *The following information has been extracted from the Geotechnical Assessment undertaken for the Tinley Manor Southbanks Coastal Development undertaken by Drennan, Maud and Partners (2013) 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.

6.4 Agricultural Potential[7]

The land is currently under agriculture with much of the existing crops being sugarcane (***Figure 6-1***).

Figure 6-1: Existing sugarcane cultivation on site

The Tinley Manor Northbanks and Southbanks produce approximately 330 ha of sugarcane under dryland production. The aim is to harvest on a 14 to 16 month cycle but due to demand by the sugar mill these harvest periods vary and can be as little as 6 months. With improved management especially if irrigation is included these yields can be significantly improved.

[7] *Information extracted from Agricultural Potential Study of Tinley Manor Soutbanks undertaken by Mottram and Associates (2014), provided in Appendix C 1.*

6.5 Vegetation and Fauna[8]

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.

6.5.1 Incised Wetland Areas

The incised wetland areas are restricted to the steepest portions of the site. These areas are represented in ***Figure 6-2***.

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 Sheffield Waste Water Treatment Works (WWTW), which is present within the development site, 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.

[8] *Information obtained from Tinley Manor Southbanks Vegetation Assessment (2015) prepared by SiVEST, provided in Appendix C 4. An Addendum to the Vegetation Assessment (2017) is also presented in Appendix C 4, prepared by the same specialist, Dr Richard kinvig, now at Kinvig & Associates.*

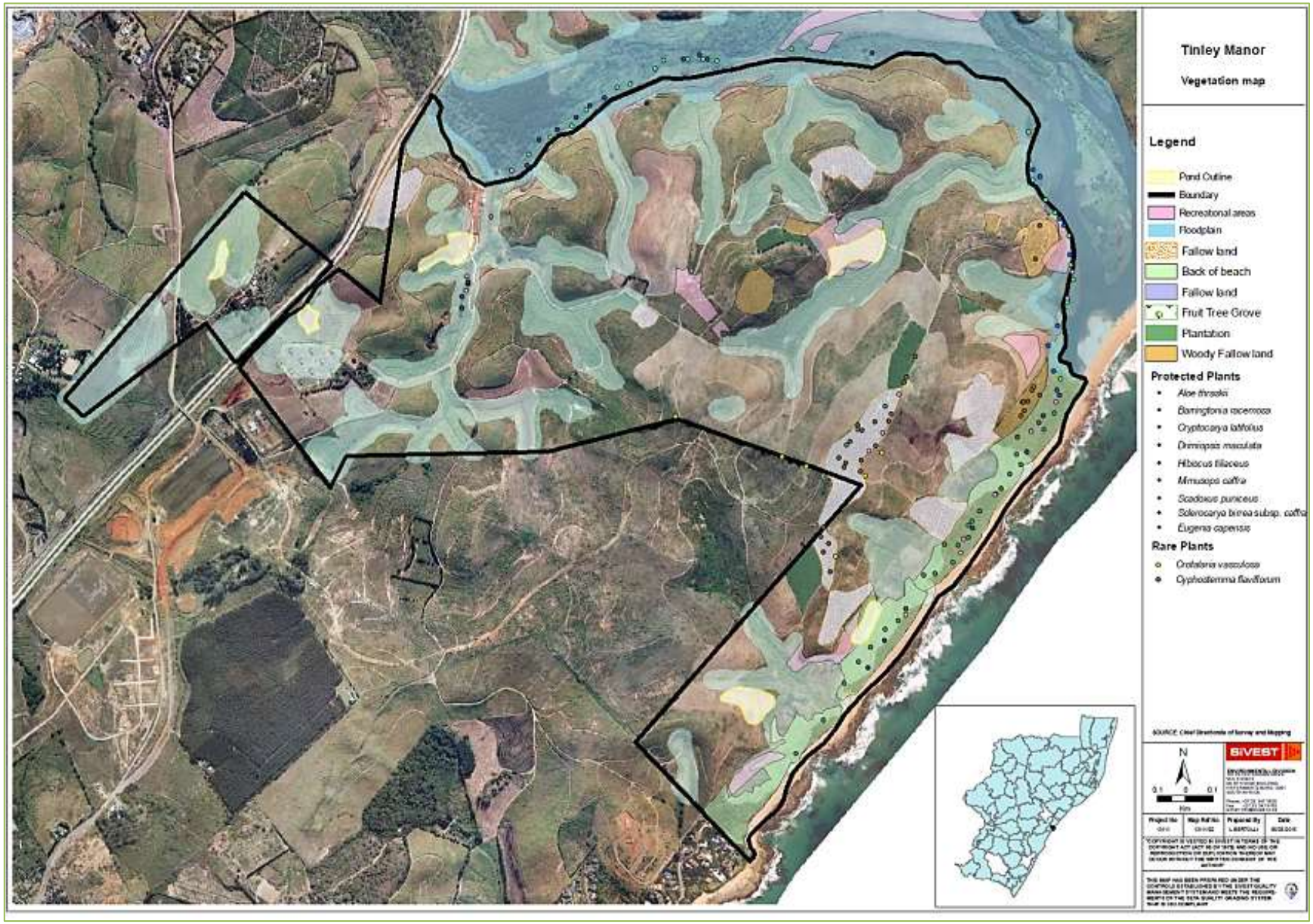


Figure 6-2: Vegetation map

6.5.2 Open Channel 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 abundance 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*.

6.5.3 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 the riparian zone being designated as sensitive. This area is denoted in ***Figure 6-2*** 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 in ***Figure 6-2***), is also deemed not suitable for development.

6.5.4 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 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 latter 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.

6.5.5 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.

6.5.6 *Primary Dune and Coastal Dune Scrub / Forest*

In terms of size and value the primary dune and coastal dune shrub / 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 6-3*** below.

On the base of the secondary dune, agricultural practices for the most part have ceased and these are demarcated in ***Figure 6-2***. The vegetation contained within this area is as described in ***Section 6.5.5***.

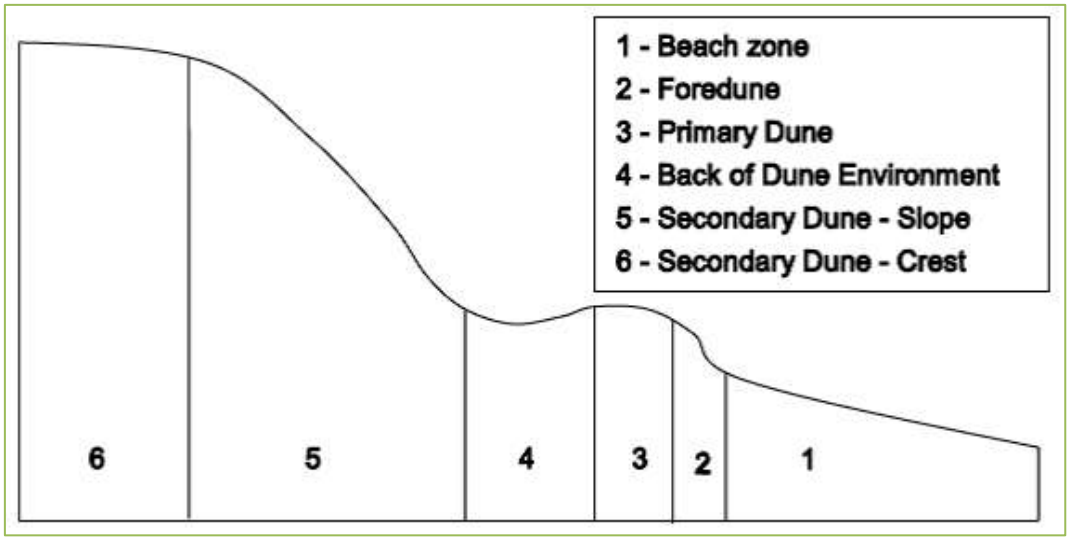


Figure 6-3: A schematic representation of the Primary Dune and Coastal Dune Scrub / Forest

6.5.6.1 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 found commonly in 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.

6.5.6.2 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 alpine*, 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.

6.5.6.3 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.

6.5.6.4 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*.

6.6 Water Resources[9]

6.6.1 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.

6.6.2 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.

6.6.3 Wetlands

The following wetland hydrogeomorphic units were identified in the study area (***Figure 6-4*** to ***Figure 6-7***):

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

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 6-2***.

[9] *Information obtained from the Tinley Manor Southbanks Wetland Assessment (2017) prepared by SiVEST provided in Appendix C 5.*

Table 6-2: 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.*

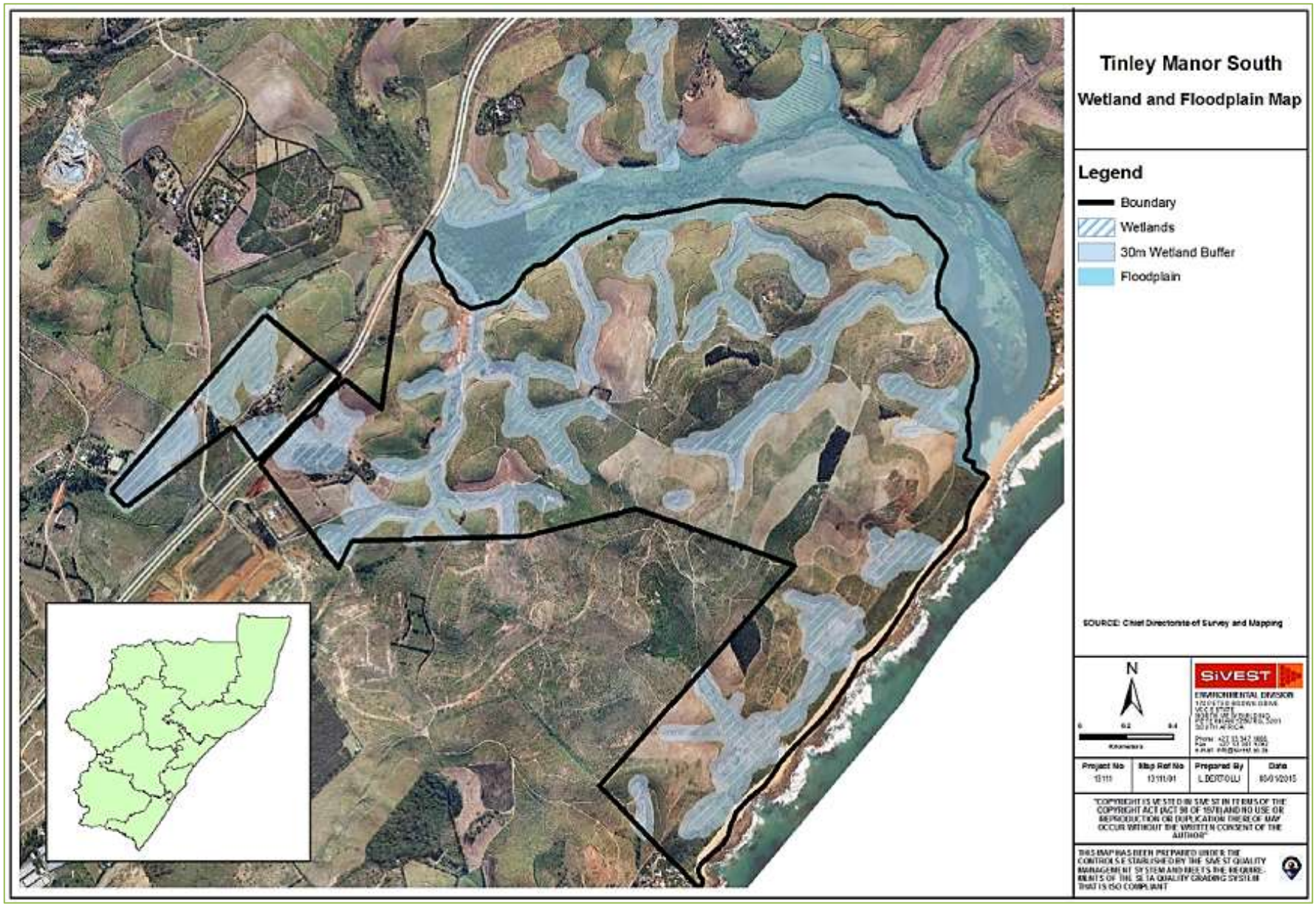


Figure 6-4: Wetland and floodplain map

Figure 6-5: Map of wetlands on the north of the site

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

Figure 6-7: 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 provides 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 seasonally 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.

6.6.4 River and Estuary[10]

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 6-8***), 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

[10] *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.

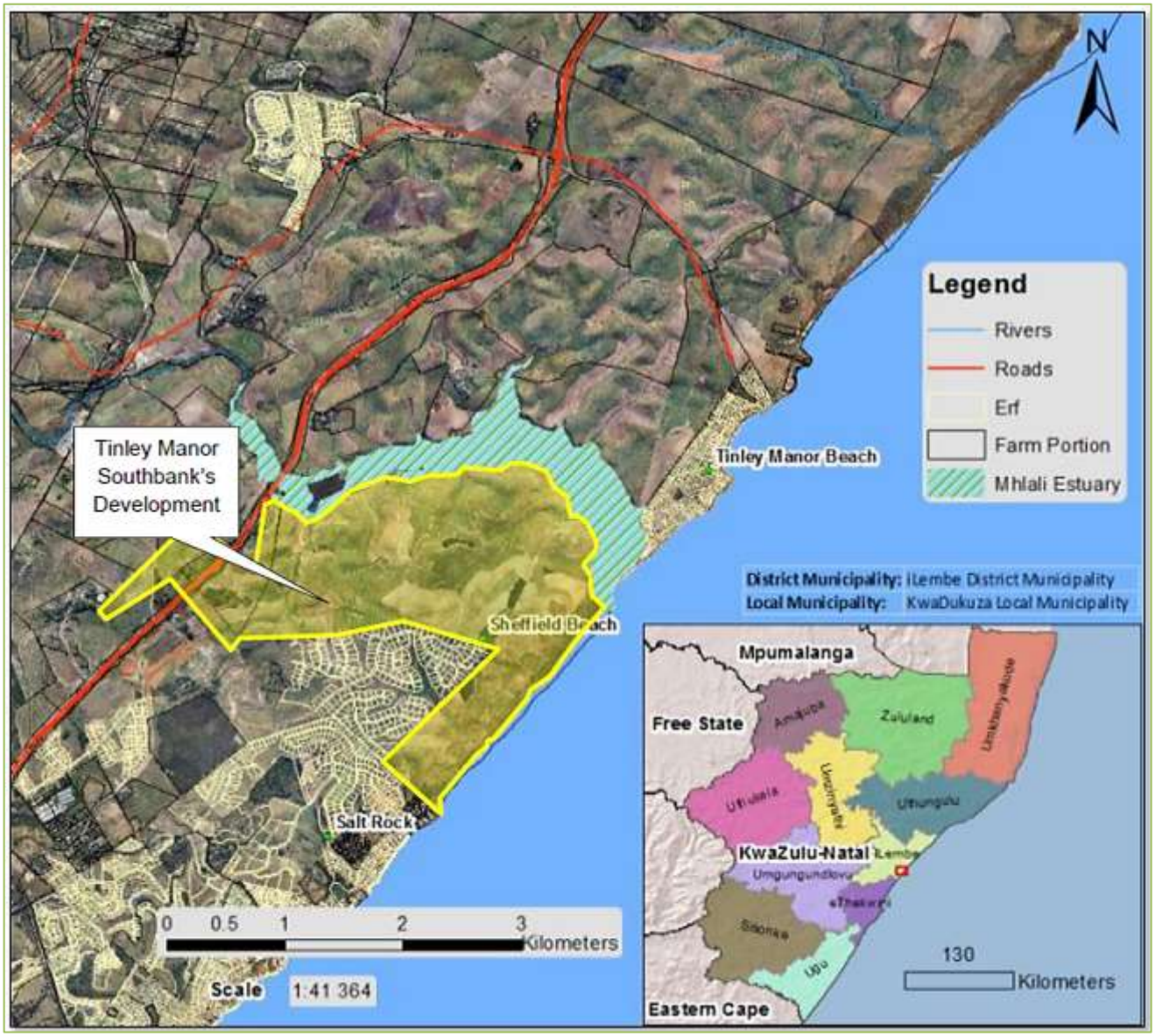


Figure 6-8: Location of the Umhlali Estuary

6.7 Coastal Zone[11]

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 River 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 have been 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.

The coastal hazard line was determined by initially calculating the wave run up position along the coast based on a chosen offshore wave height and return period using an offshore 1:10 year wave height of 7.1 m, combined with three (3) scenarios of anticipated sea level rise, namely, 300 mm, 600 mm and 1,000 m. For this step a sea level rise scenario of 1 m was adopted. The next two (2) steps entailed a slip failure analysis

[11] *Extracted from the Coastal Assessment Report (2017) prepared by Coastwise Consulting.*

and the addition of a calculated 20 m allowance of shoreline retreat to reflect a typical short-term storm erosion buffer. Step four determined the long-term erosional trends of the shoreline, which is this instance was zero considering this stretch of shoreline is relatively stable. The limited development line was thereafter calculated considering the environmental assets along the coast and included all important coastal habitats landwards of the coastal hazard line.

This approach was aligned with national and provincial thinking at the time in respect to the application of the then proposed coastal setback line or now, 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.

The coastal hazard line was determined by initially calculating the wave run up position along the coast based on a chosen offshore wave height and return period using an offshore 1:10 year wave height of 7.1 m, combined with three (3) scenarios of anticipated sea level rise, namely 300 mm, 600 mm and 1,000 m. For this step a sea level rise scenario of 1 m was adopted. The next two (2) steps entailed a slip failure analysis and the addition of a calculated 20 m allowance of shoreline retreat to reflect a typical short-term storm erosion buffer. Step four determined the long-term erosional trends of the shoreline, which is this instance was zero considering this stretch of shoreline is relatively stable. The limited development line was thereafter calculated considering the environmental assets along the coast and included all important coastal habitats landwards of the coastal hazard line.

The draft CML is thereafter informed by these projections of risk, spatial information on ecological or other sensitivities adjacent to the coast, as well as the location and extent of existing development and existing executable development rights. It should be noted that in the Western Cape, distinction is made between developed area versus undeveloped areas with the CML following the landward boundary of the modelled long-term risk projections or areas identified as sensitive from a coastal perspective. These sensitive areas include Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA) related to coastal processes, as well as large wetland areas functionally part of the coastal zone as illustrated in ***Figure 6-9***.

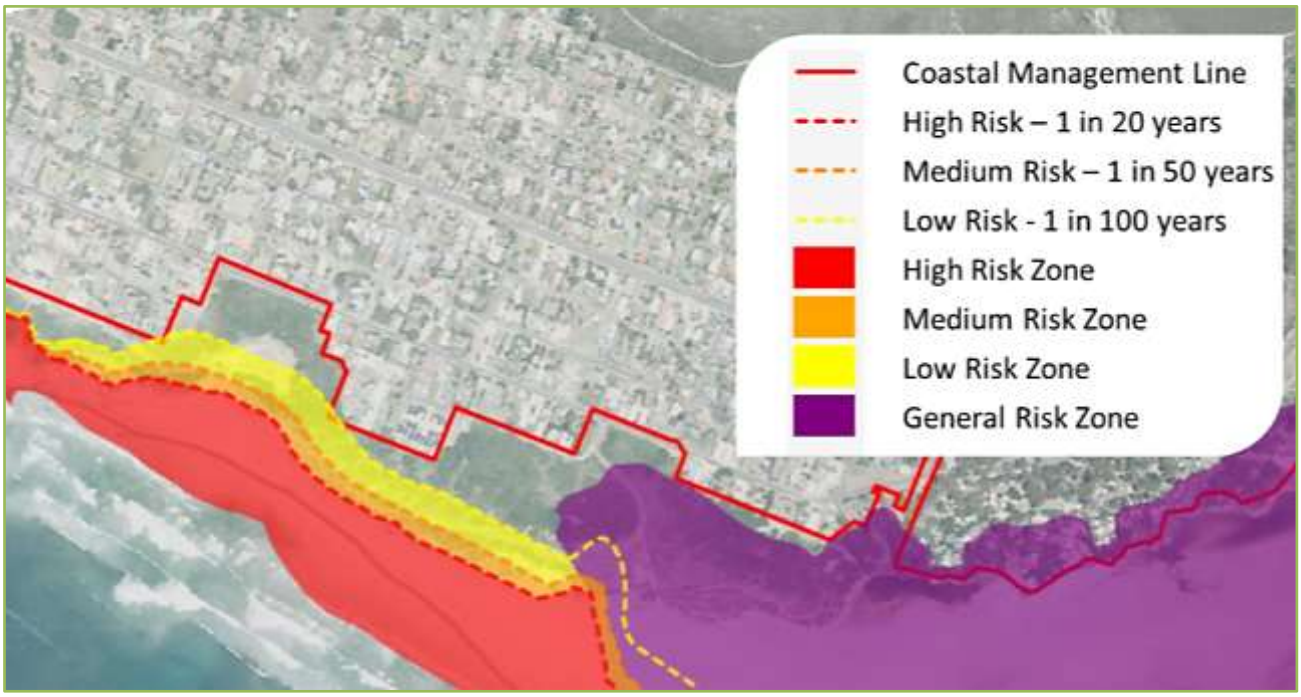


Figure 6-9: Example of Western Cape Coastal Management Line delineation process showing risk zones (taking cognisance of critical biodiversity areas adjacent the estuary and modelled risk adjacent the coastal zone) and draft coastal management line

For ease of reference the three (3) anticipated sea level rise scenarios are included and can be used as a proxy for risk, until the above pilot process is completed as is detailed below. It is also anticipated that the

CML will follow the limited development line, as included in the initial feasibility assessment. As such, the proposed development footprint, in addition to all services has taken cognisance of this delineation and is appropriately setback.

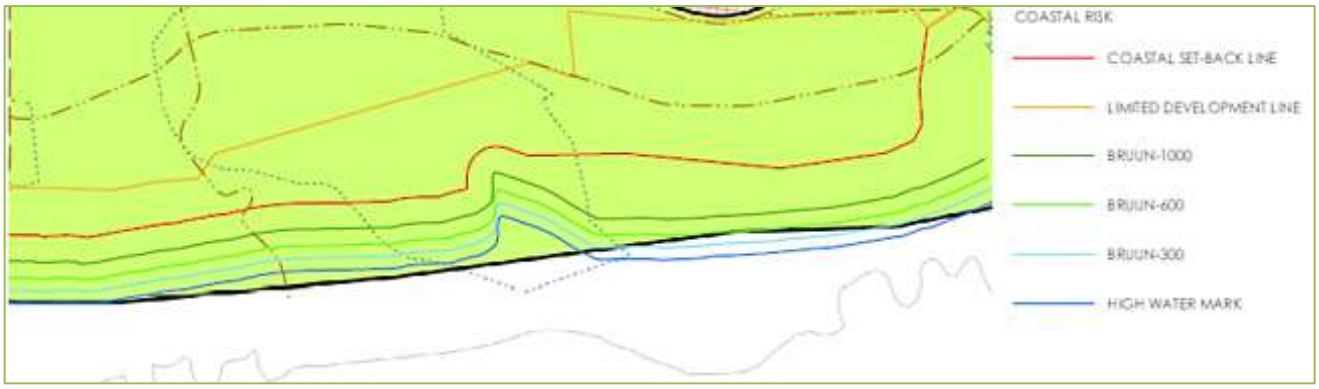


Figure 6-10: Three sea level rise scenarios deemed to be used as a proxy for the anticipated risk zones in respect to the proposed development of the Tinley South Coastal Development

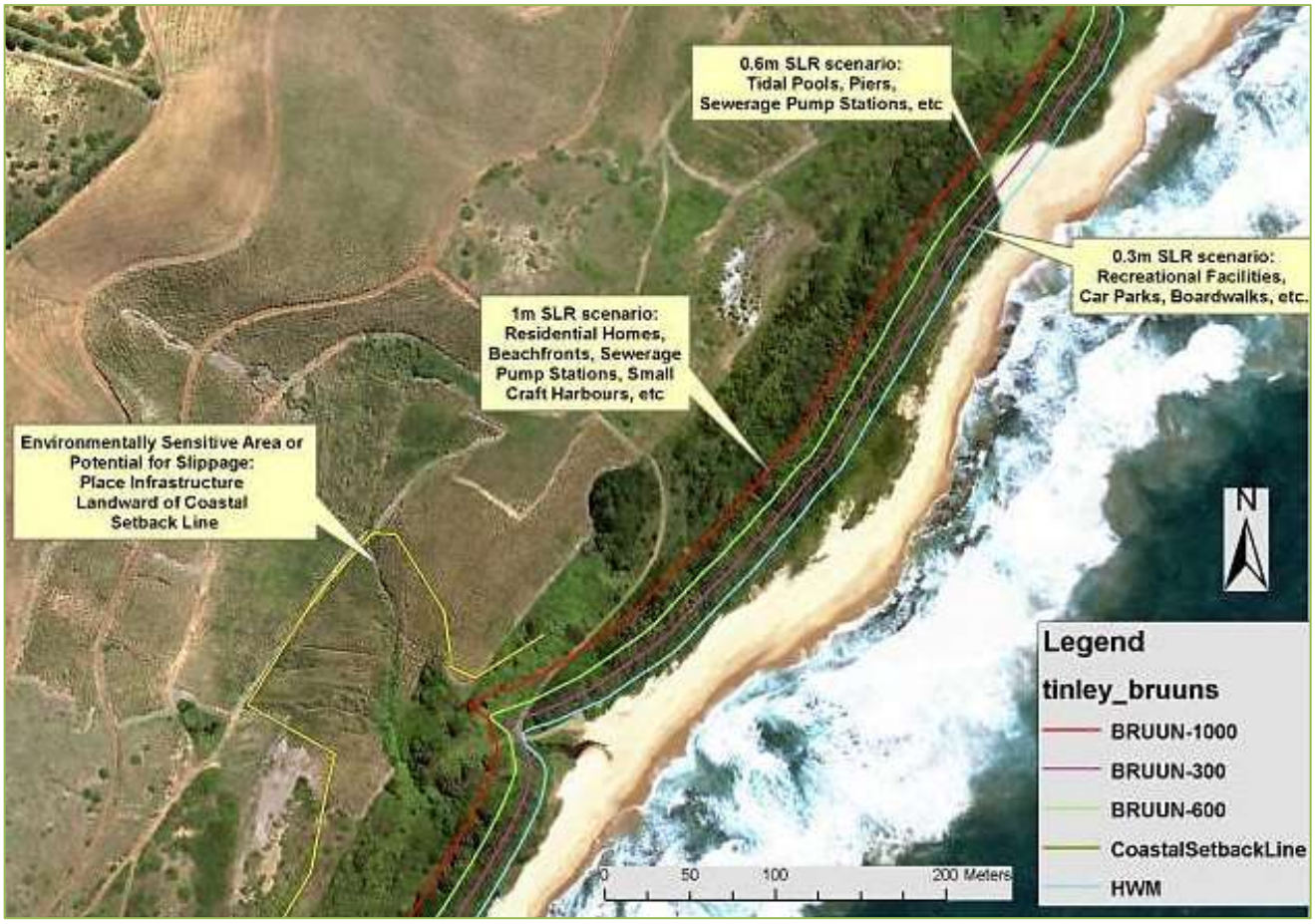


Figure 6-11: Three sea level rise scenarios as well as areas potentially identified for slippage and incorporated within the proposed limited development line

It is noted that no development is proposed within coastal public property, as illustrated in ***Figure 6-12***, which in this instance is the coastal area that is seaward of the High Water Mark.

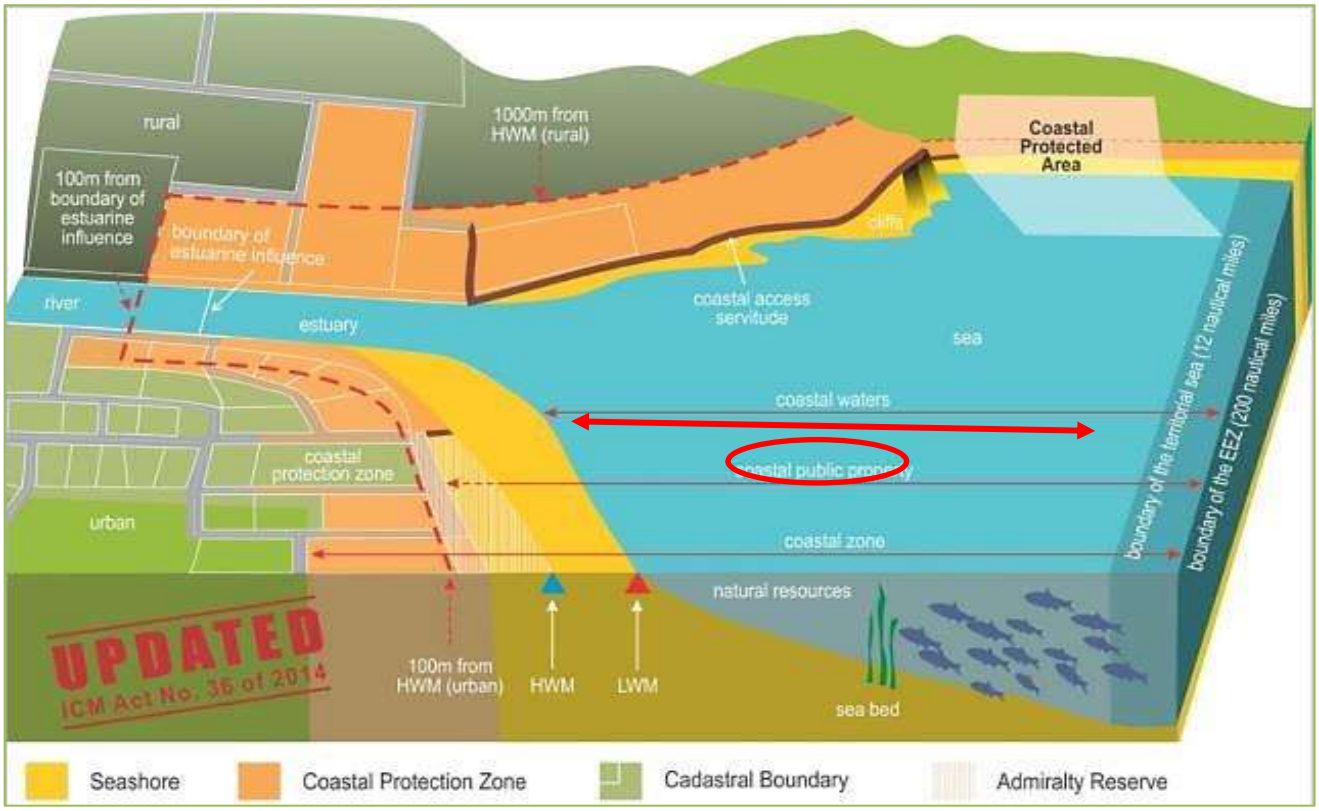


Figure 6-12: Coastal Zones as per the Integrated Coastal Management Act highlighting the boundaries of Coastal Public Property

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.

6.8 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 6-13 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.

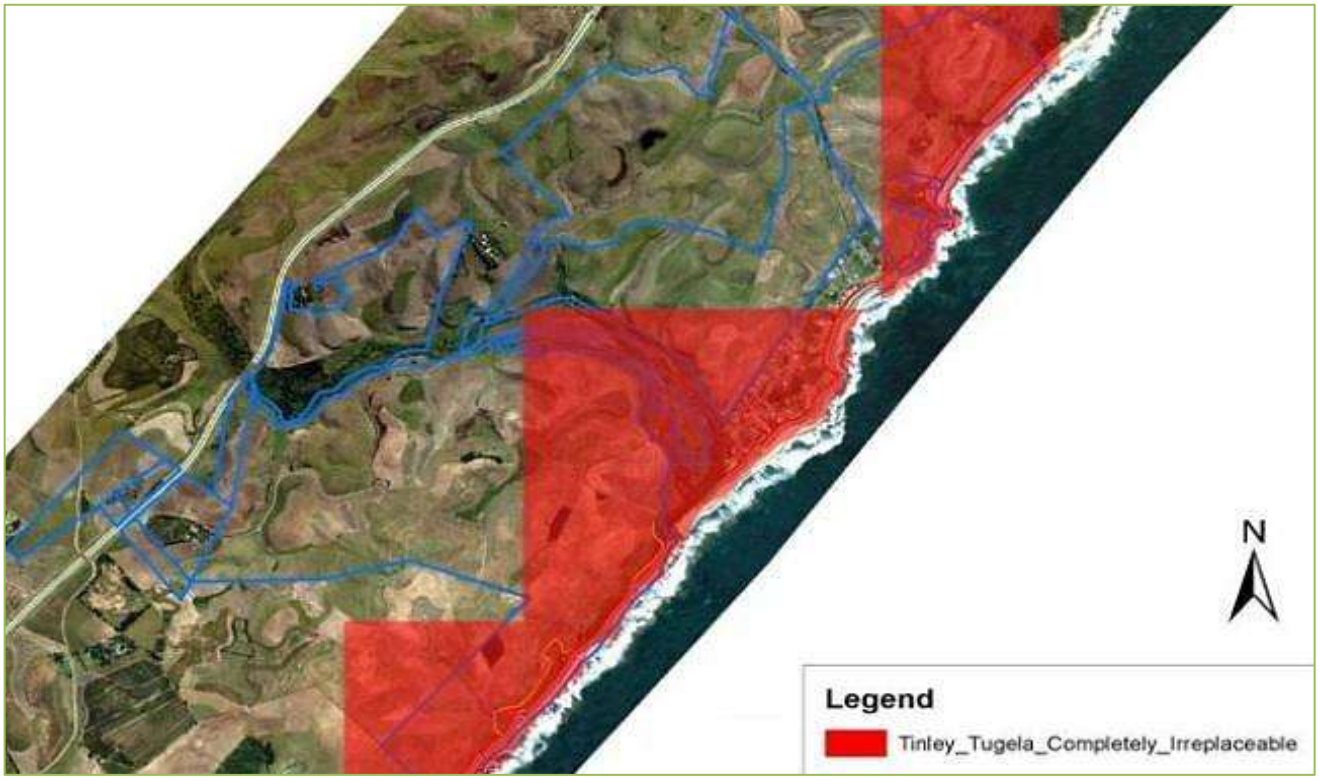


Figure 6-13: KwaZulu-Natal Biodiversity Conservation Plan for the site

Figure 6-14 provides an update of the C-Plan data utilising Ezemvelo KZN Wildlife's updated 2016 Datasets. Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) are now illustrated.

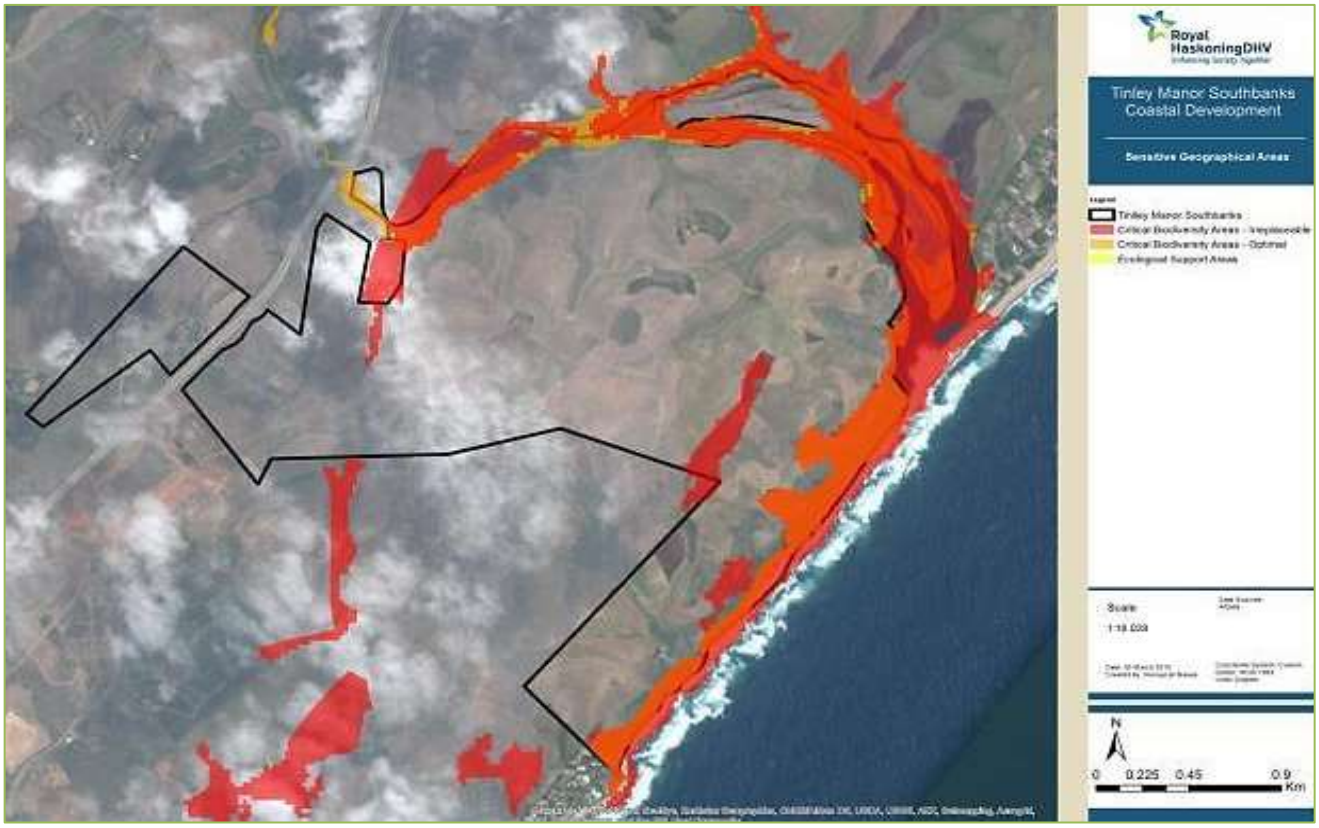


Figure 6-14: Sensitive Geographical Areas within the site as per the Ezemvelo KZN Wildlife 2016 Datasets

Figure 6-13 and ***Figure 6-14*** 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 used this high level consideration as a starting point and subsequently refined these findings through site specific analysis.

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 6-15***) identified through the specialist investigations are a critical factor in restoring the environmental role of the site can be addressed through a considered and well planned development concept.

Figure 6-15: 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 with other fragmented patches of coastal forest on the site.

SOCIAL

6.9 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.

6.10 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.

6.11 Heritage Considerations[12]

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.

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

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.

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.

6.12 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.

6.13 Socio-Economic Profile of the Receiving Environment[13]

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.

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

6.13.1 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 indentured 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 6-3***.

Table 6-3: 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 6-16***.

Figure 6-16: 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.

6.13.2 Education and Employment

The education levels of the market area are indicated below in ***Figure 6-17***.

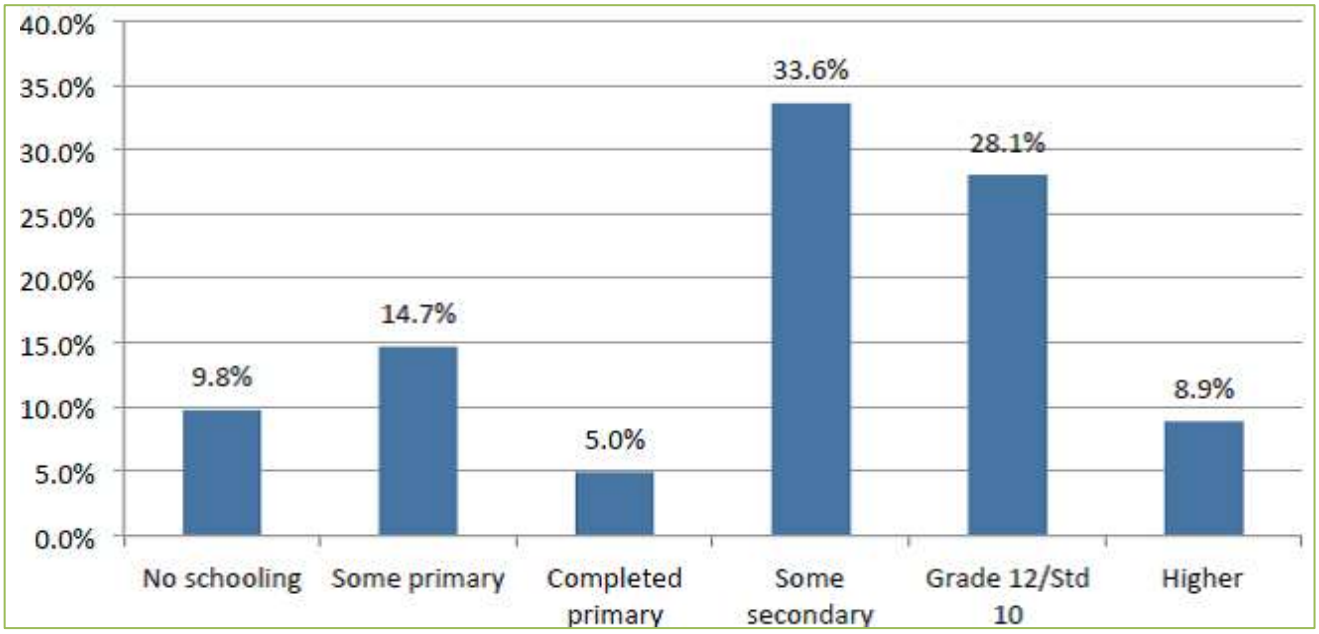


Figure 6-17: Education profile (2011)

From ***Figure 6-17*** 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 6-4***. 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 6-4: 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.

6.13.3 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 6-18***.

Figure 6-18: 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.

6.13.4 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 6-19***.

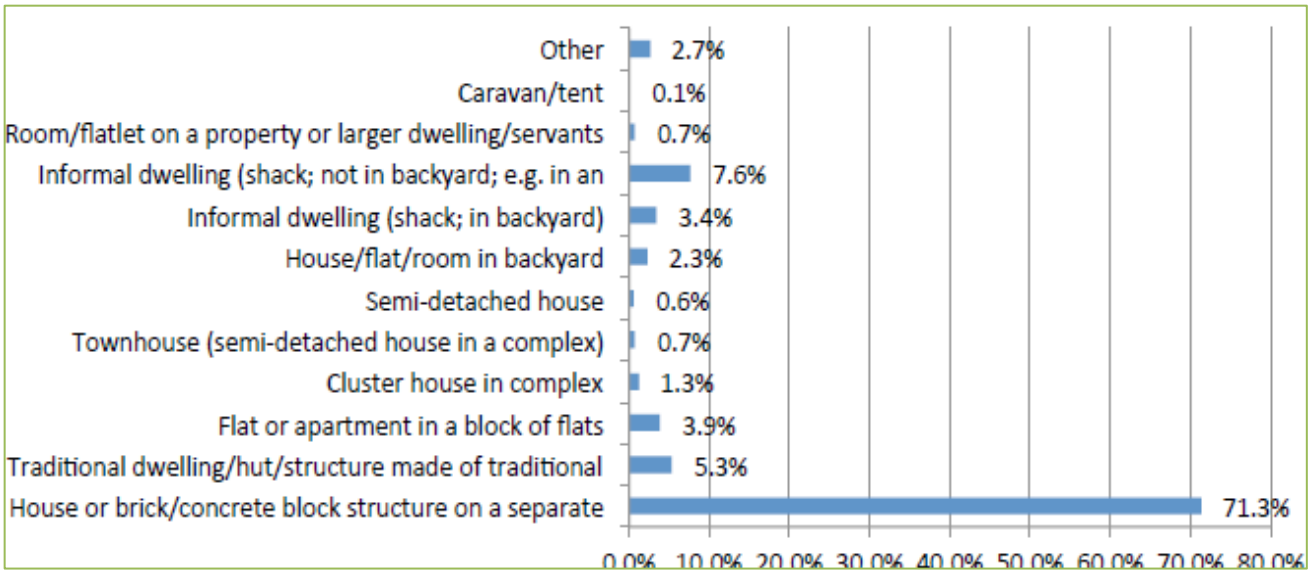


Figure 6-19: Dwelling type (2011)

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 6-20***.

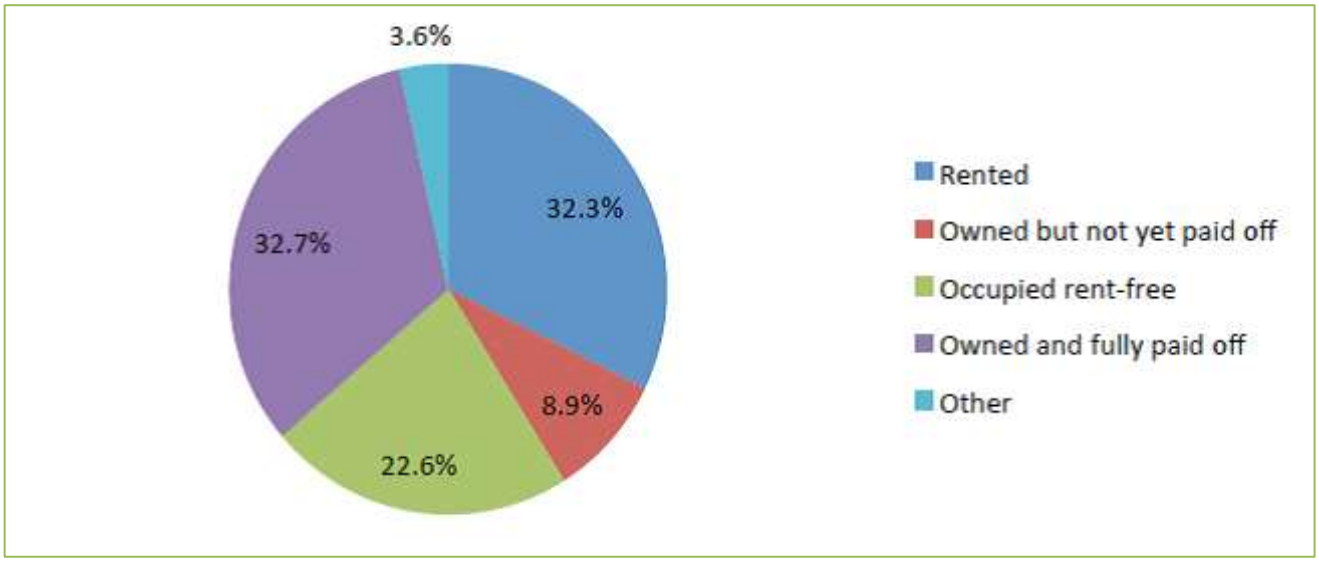


Figure 6-20: Tenure status (2011)

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.

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***);
- Visual Assessment (***Appendix C 13***); 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 Tinley Manor Southbanks 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 water use authorisations 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.

In KZN, the land used for sugarcane production has increased over the last 3 years by 17 835 ha, an increase of 15% and this includes land taken out for urban development. Thus the impact of urban development on sugarcane production is insignificant. Tongaat Hulett only owns 8% of the total quantum of land that supplies cane to its mills, so even a total loss of this 8% is deemed to be insignificant.

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.

By 2017 it is planned to have a total of 68 397 ha of new plantings of sugarcane as compared with the 2009 areas. This is extremely significant and it is noteworthy that these new areas being developed are in the rural hinterland. It is also pertinent to note that over the past 6 years Tongaat Hulett has invested over R 8 million in sugarcane supply-related projects.

This combined with a rural development and food security strategy of new sugarcane development providing an anchor for services, investment, training, etc., allows for other more intensive food-related crops to be grown for local consumption. Thus removing the property from agricultural production will have little or no impact on food security in the region.

Subsequent to these assessments, it must be noted that the Department of Agriculture released the land from agriculture for development in August 2015.

Furthermore, Mottram and Associates were provided an opportunity to update their assessment in March 2017 based on the updated development layout. Mottram and Associates re-iterated that the conclusions and recommendations on the agricultural potential assessment remain the same.

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

The initial preliminary investigation drew attention to potential instability within various units encountered on site by the identification of likely previous slope failures.

Further investigation during the detailed investigation identified areas where parameters are favourable within the respective units for potential instability. These are discussed further below with respect to the individual units on site.

7.2.1.1.1 Recent Aeolian Dune Sand and Underlying Berea Formation

In general, the topography across the eastern coastal portion of the site was characterised by moderately to steeply sloping valley sides ranging between 10–17°. However, some slopes, highlighted on the site plan, are significantly steeper and range from 18–28°. These areas are typically marked by concave topography and as such suggest areas where previous slope instability has taken place.

Given the steepness of the slope, significant depth of unconsolidated material, likely perched water table aided by concave topography of the slope and natural angle of repose of the unconsolidated sandy material typically in the order of 28–30°, these areas are considered highly unstable and should be strictly avoided during development.

Moderately steep slopes (10–17°) can be developed provided all due caution and good engineering practices are exercised during construction as any injudicious cutting and/or loading or mass removal of binding vegetation within these areas, although only moderately sloping, can increase instability and induce slope failure.

7.2.1.1.2 Vryheid Formation

Areas underlain by Vryheid Formation, for the most part where found, are deeply weathered. As such, well preserved bedding planes along which orientation reading could be recorded were seldom encountered.

In general, the sedimentary bedrock dips in a south easterly direction at an average inclination of 12°. However, where bedding readings were retrieved the values were found to vary greatly from this across the site. This can be attributed to the volatile intrusion of the dolerite which has led to the disruption of the bedding of the Vryheid Formation host rock.

Within IP's 69, 81 and Exp 8, 22 and 26, shale, siltstone and sandstone bedding was found to dip at angles ranging between 5 – 40° and ranging in direction from northerly, south easterly and westerly. In some instances, the bedding was found to dip unfavourably out of the moderate to steep slopes. These areas have been highlighted on the site plan and should be considered as potentially unstable. Furthermore, the intrusive dolerite may likely have caused fractures within the bedrock generally promoting the development of clay lenses along open fracture planes which further increases the likelihood of slope failure.

With respect to the above for planning purposes all easterly facing slopes across the eastern and western portions of the site underlain by Vryheid Formation bedrock with natural slope angles greater than 1:3 (18°) should be considered as potentially unstable.

Similar slopes across the central, dolerite intruded, area should also be considered as potentially unstable. More detailed site specific slope stability analyses will be required once more detailed development plans are provided.

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.

However, in general slopes greater than 18° underlain by deeply weathered Vryheid Formation, Karoo Dolerite, or thick deposits of loose Berea Formation and capping Recent Aeolian dune sand should be considered as potentially moderately to highly unstable and should not be considered for development.

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 possible.

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

Selective percolation testing was carried out across the proposed development area during the course of the detailed investigation – the positions of which are indicated in the Geotechnical 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, it is 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

From laboratory results it is evident that the materials underlying the deeply weathered site are in general not good quality for use for construction purposes.

7.2.2 NHBRC Classifications

Based on analysis of the excavated inspection pits, DCP tests and laboratory results, various portions of the site have been generally classified in terms of the NHBRC Classifications as the following;

- Areas underlain by Recent Aeolian Dune Sand – Collapsible Soils (C2 – C3); and
- Areas underlain by potentially active residual Vryheid Fm – Heaving Soils (H2 – H3).

The extent of these generalised areas have been marked in the Geotechnical Assessment. However, it should be noted that cutting during earth-works may expose bedrock (R) or heaving soils underlying collapsible soils at platform level. As such during development of the site it will be necessary to more accurately determine site specific NHBRC Classifications once individual platforms have been created.

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 0*** 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, stormwater 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, it is 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.

7.2.3.4 Retaining Structures

As mentioned above, it is likely that significant cutting and filling will be required across the site during the earth-works phase of the development.

Where the above mentioned cut and fill batters cannot be accommodated due to space restrictions, cut and fill slopes must be supported by a suitably designed retaining walls.

Where inclined bedrock is intersected, especially where unfavourably dipping out of the slope, rock anchors and gunite may be required at the discretion of the Geotechnical Engineer.

The design of any retaining walls or rock stabilising measures should be carried out by an experienced Structural Engineer familiar with the site specific subsoil and ground water conditions.

The lateral support should incorporate adequate drainage behind, above and through the wall and be suitably damp proofed, especially within the sandy materials underlying the eastern portion of the site.

The following conservative soil shear strength parameters are recommended for use in retaining wall design;

- Angle of internal friction (Ö) – 28°
- Soil cohesion (c) – 0 kPa

Site specific assessment and shear box testing will be required once a development plan is provided.

The Geotechnical Specialist was provided an opportunity to update the assessment based on the revisions to the Concept Plan in 2017, the specialist has submitted a letter stating that the change in Concept Plan does not affect the findings of the initial assessment and that the report is still valid.

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 in 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.

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. AMAFA has accepted this request.

Figure 7-1: Grave locations

The Heritage Specialist was provided an opportunity to update the assessment based on the revisions to the Concept Plan in 2017, the specialist has submitted a letter stating that the change in Concept Plan does not affect the findings of the initial assessment and that the report is still valid. The letter has been submitted to AMAFA via the SAHRIS website for further comment.

7.4 Vegetation Assessment[14]

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

[14] *Note: The initial Vegetation Assessment was conducted by Dr Richard Kinvig at SiVEST. Subsequent addendums to the report have been prepared by Dr Richard Kinvig, now at Kinvig & Associates.*

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 Amendments to the Concept Plan

7.4.2.1 Change from draft EIAR (February 2015) to final EIAR (February 2016) – first Amendment

The majority of the changes are associated with additional development occurring on areas which are currently under sugarcane cultivation. These changes will not be assessed and thus are not discussed further in this document.

A total of ten (10) changes have been proposed that will see the encroachment of development into areas which are not currently under sugarcane cultivation. These areas are highlighted in white and numbered from 1 to 10 (***Figure 7-2***). These areas are discussed on their own in the Addendum to the Vegetation Assessment prepared by Kinvig and Associates Environmental Consultants (refer to ***Appendix C 4***) and are summarised below.

Figure 7-2: Vegetation areas affected by amended Concept Plan (first amendment)

There has been an overall increase in the amount of land that will be developed however, as a total it only equates to 4.98% (21.81 ha) increase of the development area. This is minimal considering that the vast majority of the new proposed development falls within the existing sugarcane cultivation area (16.29 ha). The remaining area falls within secondary areas, which are currently dominated by alien invasive species and pioneer / ruderal species (5.52 ha). The total Open Space Network or conservation area for the revised Concept Plan is 59% of the total land holding, which is significant and high in comparison to other developments, where Open Space usually contributes around 30–40%.

Furthermore, the vegetation that occurs within the proposed Tinley Manor Southbanks Development is generally of a poor quality and the vegetation for the majority of the site (excluding the beachfront area and the lower reaches of the Estuary) is secondary in nature. The inference is thus that the vegetation is predominantly of a pioneer or ruderal nature with most species being early successional stage species.

There are limited rare and/or threatened species which occur within the boundary of the proposed development. The one species, *Crotalaria vasculosa* has only been ascribed a rare status as it is uncommonly recorded south of the Tugela River. Having said this, though, this species is a ruderal / pioneer species in areas where it is more common and is thus probably regularly overlooked in the context of the study area and surrounds. In the authors experience it has only been recorded in secondary grassland and this supports its pioneer status. It is thus a species unlikely to persist in later successional grassland.

The Protected tree species, namely *Mimusops caffra* (only protected tree species that will be affected) are all small species which have managed to establish as a result of fire being excluded as a management tool of the fallow lands. The areas in which they occur, would historically be grassland areas and thus should the drive of the developments Open Space Network be to rehabilitate areas to what they historically would have been, these species would be excluded. Thus, it is recommended that in “managed / maintained” areas of the development the individuals that are likely to be lost, should be relocated and incorporated into the overall landscape design philosophy of the development. These individuals are all small and will not pose an issue in terms of relocating them.

The only area where slight reservations are expressed is Area 8, which sits in the “back of beach” zone and forms part of a contiguous Open Space. This area is traditionally highly sensitive from an ecological perspective. In terms of the vegetation recorded, there are no species of conservation significance or concern within this area, and it is secondary in nature.

7.4.2.2 Change from final EIAR (February 2016) to amended EIAR (March 2017) – second Amendment

Following the amendments to the layout Dr. R. Kinvig undertook a site visit to the properties to ascertain whether there had been any material changes to the site since the original visits which were conducted in 2014 and 2015. It must be confirmed that from this cursory assessment that the amount of woody alien invasive vegetation, particularly in the fallow areas has increased significantly and resulted in a further reduction in the current value of these areas from a conservation and biodiversity perspective.

In addition to the proposed amendments to the concept plan layout, a detailed engineering layout is now available which was not available for the 2016 submission. A detailed drawing that incorporates, roads, embankments, pipelines, stormwater management facilities and other infrastructure have now been included and were assessed.

The changes to the layout are assessed in two (2) parts (i.e. changes to concept plan and more specifically the development footprint and the engineering services layout).

In terms of the revised Concept Plan, nine (9) areas have been identified where the changes are deemed to be of a magnitude that requires an assessment of the potential for the change to impact on the receiving environment (***Figure 7-3***).

In terms of the overall Engineering Services, 15 areas have been identified where the changes are deemed to be of a magnitude that requires an assessment of the potential for the change to impact on the receiving environment (***Figure 7-4***).

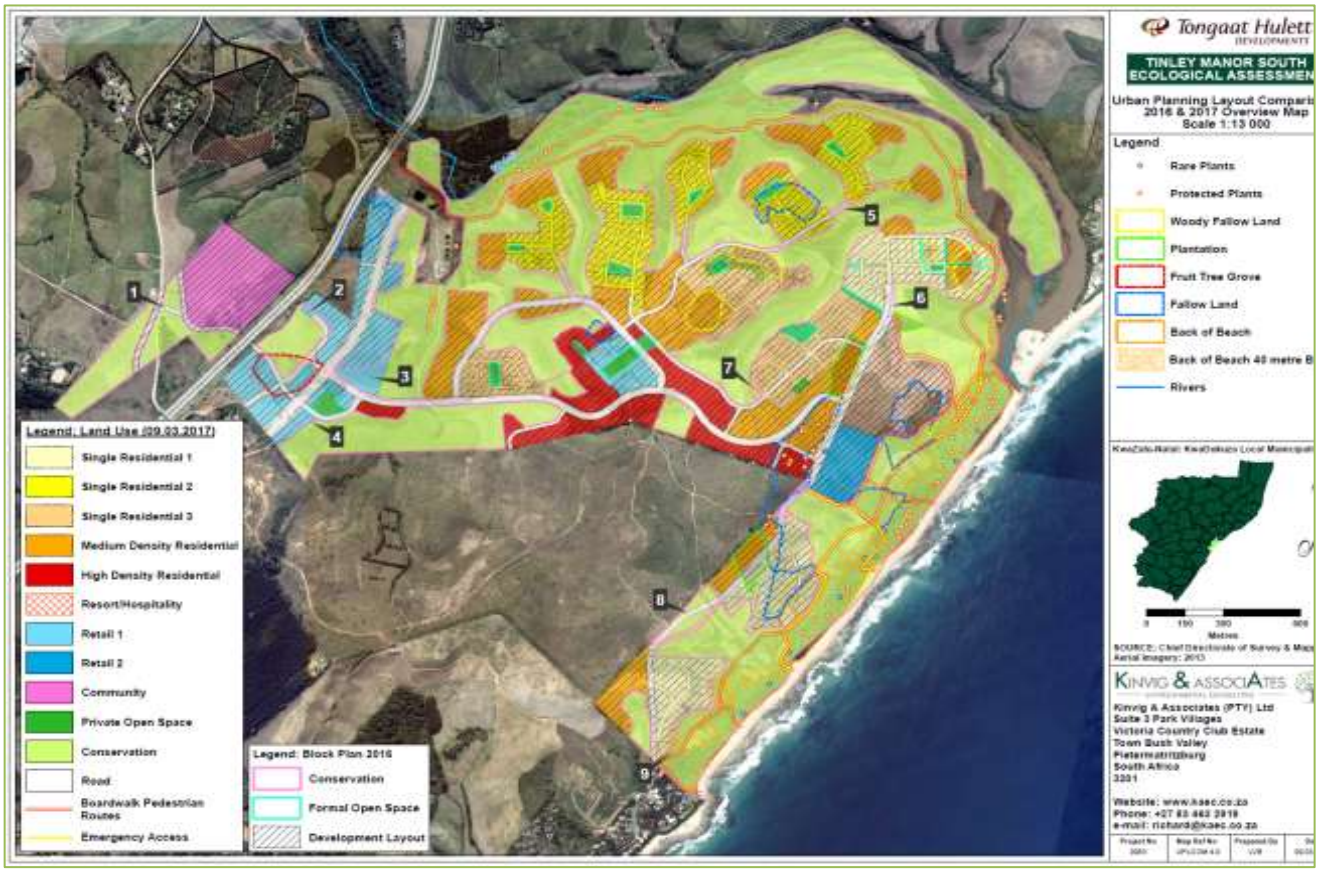


Figure 7-3: Nine areas for assessment due to changes in layout

Figure 7-4: Fifteen areas of assessment due to changes in engineering services

Table 7-2: Summary of Impacts due to Amendment to Layout and Engineering Services

Area No.	Impact
	Concept Plan
1	A road has been created over an area which was previously identified as Open Space in the 2016 layout. The proposed road addition is not significant from a vegetation perspective as the area it is proposed to traverse is currently under intensive agricultural production. The only potential issue is the fragmentation of the Open Space which may pose a slight management issue.
2	A slight increase in the Retail 1 has been proposed, with the addition of the road and its associated embankment. These changes all occur on land which is currently under intensive sugarcane production and does not impact on any vegetation and thus the proposed impact is of Low significance. The loss of Open Space is also small and is on the periphery of existing proposed development and thus is deemed to be of a Low significance.
3	The proposed change to the layout is to occur in an area which is currently under sugarcane cultivation. Thus the expansion is not deemed significant from a vegetation perspective. In terms of the loss of Open Space, the area is surrounded on three (3) sides by roads and development and thus no fragmentation or linkages are being lost.
4	The proposed change in Area 4 will result in the encroachment of development into an area which is currently under sugarcane.
5	The proposed change is the linking by a road to two development parcels. The proposed road linkage falls close to the crest of a hill and is across sugarcane land and thus no indigenous or sensitive vegetation will be impacted upon. The only implied negative is the separation of the Open Space, however, both these areas are large and thus no ecological issues would arise from the creation of such a road and the resultant separation of the open space. In addition, the road will only be a narrow road, one lane in each direction, and the earth-works required to construct the road will be limited, reducing the overall impact and sphere of influence as a result of its construction.
6	The proposed change is the increase in size of the road and included is the fill embankment that will be required to construct the road on grade. The area is predominantly under sugarcane cultivation, however, there is some *Eucalyptus* sp. that will be lost. The majority of these trees were already going to be removed in the 2016 layout. In addition, these trees are alien species which are not part of a licenced forestry plantation and therefore are required to be removed by law.
7	The expansion of the Single Residential 3 into this area is deemed not to be significant as the area upon which the expansion will take place is currently under sugarcane cultivation and no natural vegetation will be impacted upon.
8	The change identified in Area 8 illustrates the moving of the road up the slope. The new alignment will be in sugarcane. In terms of the ecological impacts the movement of the road up the slope and to the boundary of the property means that the Open Space will no longer be fragmented and it will now form a continuous and linked open space that will act as an ecological support zone to the back of beach area.
9	In terms of the change proposed in Area 9, the expansion of the development layout into an area of woody vegetation. The vegetation is comprised of indigenous woody species and alien invasive species. The woody vegetation would constitute a natural forest as there are more than three (3) trees touching and thus forming a contiguous canopy. In terms of the vegetation the loss of the area is considered to be of a High impact. The loss of vegetation in this zone, is considered to be a negative impact and it is the specialist's recommendation that the proposed relaxation and expansion of the development node does not occur into this area. It is recommended that the expansion occur above the existing roadway as the expansion would then be into areas which are already transformed and under sugarcane production. From an ecological perspective the forest fragment is already separated from the remainder of the back of beach vegetation by a road. In addition, if one were to consider the perimeter to area ratio of the forest it is exceedingly High which implies that the functionality of the fragment is low, and without intervention it is likely to reduce in size with an increase in alien invasive plant species occurring. With management and the closing of the road separating it from the remainder of the back of beach provides. Based on the recommendation put forward by the specialist, two alternatives are presented: a layout which traverses the woody vegetation and a layout which does not traverse the woody

Area No.	Impact
	vegetation to be assessed further in ***Section 8.3***.
Engineering Services Layout ***It is also important to record that even though there will be embankments created these will be vegetated in the same manner as the Open Space areas and thus can be considered to be Open Space, however, the calculations include embankments as part of the development coverage.***	
1	The proposed changes will all occur within areas which have been transformed. The area is either under sugarcane production or there is a fragment of alien invasive vegetation that will also be impacted upon.
2	The proposed change is the position and addition of the sewer line. The proposed change will occur within an area that was already proposed and incorporated into the Concept Plan of 2016. The vegetation that will be affected is proposed to be lost already. In addition, the vegetation is comprised of indigenous pioneer and increaser grass species, indigenous pioneer woody species (low abundance and richness) and alien invasive plant species.
3	The vegetation in this area is a mix of old sugarcane lands, with quite a significant proportion of the vegetation being alien invasive in nature. There were some pioneer and increaser grass species present.
4	The area proposed to receive the sewer line is already identified in the 2016 Concept Plan as being proposed to receive development, i.e. top structures. No protected plant species occur within this area and the rehabilitation and creation of Open Spaces will mitigate any potential negative impacts.
5	The proposed sewer infrastructure will run in an area of fallow land which is now dominated by alien invasive vegetation. The area has already been earmarked for development as it was incorporated into the 2016 Concept Plan.
6	This area was included in the original Concept Plan of 2016. The vegetation is woody in nature, however, it is comprised predominantly of *Chrysanthemoides monilifera* which is a pioneer species along the coastline which establishes on disturbed areas and within the ecotone of forests.
7	This area was already proposed to be developed in terms of the 2016 Concept Plan. The vegetation is comprised of predominantly woody species, which are either indigenous pioneer species or alien invasive species. The change to the road embankments will occur within the boundaries of the original Concept Plan.
8	The proposed sewer line will run along the existing cane track for the bulk of its length. The area through which it passes was already proposed to be developed and the vegetation that occurs within this area is not considered to be of significance. However, please note that prior to construction commencing in this area a walk through must be conducted as two (2) *Mimusops caffra* were recorded to fall within this area and a permit is required for their removal and/or relocation.
9	The proposed change will see the construction of a large berm (stormwater infrastructure), which will potentially result in the back flooding of an area (on a temporary basis). The vegetation is *Eucalyptus sp.* which are unlikely to be registered and thus are required to be removed. The other factor is that the area will still remain open space.
10	This proposed change relates to the increase in size of the collector road that runs within the original proposed Concept Layout of 2016. The area does have a number of protected tree species which falls within it. However, when doing a comparison in terms of significance, between the two layouts the proposed change is in alignment with the original documentation and recommendations of the vegetation assessment that confirmed the area could be developed. The caveat being that all the protected trees and single protected plant species are marked and relocated if possible, once the relevant permit and licencing have been forthcoming from the authorities, namely, DAFF and EKZN Wildlife.
11	The proposed changes to the road servitude are to take place within the original 2016 concept block layout, where the impact may affect areas which are not currently under sugarcane. The remainder of the change will occur over sugarcane.
12	The construction of the proposed sewer line will run along an existing contour aligned cane track and thus no vegetation will be impacted upon by the proposed sewer infrastructure. The impact significance of this change is therefore Low.
13	The construction of the Stormwater Management Facility (SMF) berm, large sewer pump

Area No.	Impact
	station and the associated secondary containment pond will occur in what we had ascribed to the back of beach vegetation zone. The proposed containment pond will prevent the possibility of sewer flowing into the forest or the surrounding vegetation should there be an issue with the pump station, such as a blockage or the loss of electricity for an extended period of time. This area as with the other pump stations will be fenced for security reasons and thus access will be restricted. Based on this it is recommended that the areas adjacent the fence line in this particular location are suitably landscaped with woody species to ensure that the areas are able to be aesthetically appealing. Given that the fence will need to be relatively high it is recommended that tree species such as *Apodytes dimidiata, Allophylus natalensis, Allophylus dregeana, Acokanthera oblongifolia, Chaetachme aristata, Clausena anisata, Rothmannia globosa, Trimeria rotundifolia, Teclea gerrardii, Peddiea africana* and *Maytenus peduncularis* are planted which will over time facilitate the establishment of the understorey and will eventually create a natural forest edge which will form a barrier and prevent the pump station and containment dam from being visibly intrusive. The vegetation is currently a mix of alien plant species and sugarcane has been planted throughout this area historically, and is currently planted to sugarcane. The proximity of the site to the forest (it is outside of the forest buffer zone of 40 m) means that caution must be taken during construction to ensure that any impacts imparted will be maintained in the low category. The specialist recommends that a walkthrough be taken prior to any construction proceeding to ensure that no protected tree and/or plants have established in the area, between the time of assessment and construction commencing. The impact in terms of the vegetation onsite is Low. This area, once construction is completed will become Open Space and therefore rehabilitation and supplementary planting will take place which will enhance the area and mitigate any potential impact that may be imparted.
14	The construction of a sewer pipe line will fall on the periphery of the existing Concept Plan and once constructed will be rehabilitated and will remain as Open Space, as are most of the sewer pipe lines, which all run on the very periphery of the Concept Plan. The proposed alignment is through transformed areas which are currently under sugarcane production and thus the potential for any significant impact on vegetation is Low.
15	The proposed sewer line which intersects the forest area is related to the proposed expansion of the Concept Plan, identified as 'Area 9' in the proceeding sub-section. If one considers the alignment of the sewer line it has been aligned along the road that intersects the forest. The current significance therefore would be Low, as no vegetation will be impacted upon by the sewer line alignment. However, based on the recommendations made in regard to the expansion of the development footprint it is suggested that the sewer pipe line be moved to the periphery of the 2016 development edge. The reason being is that once the sewer pipe line is constructed, the surface of the land will not be planted to woody vegetation for reasons of maintenance and access. Therefore, the forest fragment west of the current cane road will remain isolated and potentially will degrade to a state where it is dominated by alien invasive species, or management will need to be intensive to prevent this from occurring. Thus it would be best to remove the cane track and plant it with woody species to promote the two areas to become functionally linked and integrated. Following the professional team meeting post presentation of the draft addendum report, the layout has been altered to exclude the sewer pipe line from running along the existing cane track which separates the two woody species fragments. The sewer pipe has been aligned along the lower edge of the development and will thus fall outside of this forest fragment and the impact will remain the same, however the Ecological Integrity and Functionality of the fragment will be significantly enhanced and this is viewed as a major positive. Given that the cane road exists it is suggested that the road be carefully ripped and a mix of indigenous woody species be planted that will facilitate the linking of the two fragments and prevent the infestation of the road by alien invasive plant species once it has ceased to be utilised. It is recommended the following species are planted: *Putterlickia ventricosa, Maytenus peduncularis, Apodytes dimidiata, Mimusops caffra, Allophylus dregeana, Chaetachme aristata, Trimeria rotundifolia* and *Peddiea africana*. All of these species commonly occur in the vegetation that occurs on site, and we would therefore recommend that seed is collected and propagated on-site and once established (approximately 1 year after germination) plant these species out in the receiving area, in order for them to establish and start to grow and close up the road gap between the two forest fragments.

Area No.	Impact
	Irrigation Dam
	Following the original 2016 layout and application, it was deemed to be important that the development incorporates an irrigation network into the overall design to assist in dealing with the stormwater that will be created as a result of development and to harness the stormwater, which is commendable. In addition, the irrigation will need to be able to have a constant source of water which it can draw off. This water source has been identified as an irrigation impoundment that will be positioned within a valley line, which is currently under sugarcane. Thus the impact of this addition on vegetation is Low. Three options were tabled for the proposed impoundment however, as a result of technical discussions the proposed Option, and the one reflected in the layout was deemed by all specialists to be the most suitable.
	Boardwalks, Pedestrian Pathways & Emergency Access
Emergency Access	In order to try and create an opportunity for the utilisation and enjoyment of the Open Space System, a series of boardwalks and pathways have been proposed. The boardwalks will provide a dual function in that they will create access to the beach areas as well. It must be noted that for reasons of security and human safety there will need to be beach accesses for emergency motor vehicles only. These areas will be boomed to prevent use by non-emergency vehicles. Both these accesses are along existing roads, and these will simply be managed accesses, with limited maintenance to be undertaken going forward, which will involve the pruning of vegetation when and if it impedes the ability of vehicles to access the beach area. The roadways will be maintained and monitored for erosion or any impacts that they may impart, for example allowing alien vegetation to establish on their verges. With the removal and management of alien invasive species on the entire development the likelihood of this occurring is Low. The presence of the road ways leading to the beach are also of Low significance given that they are existing and will not impinge further on the vegetation status, as it currently stands. Apart from these two accesses the remaining boardwalks will be no wider than 3 metres and these boardwalks will be a combination of earthen tracks and elevated wooden boardwalks.
Elevated Boardwalks	The boardwalk sections will for the most part fall within the woody areas and across the sensitive environments, such as wetlands and along the estuary. Three accesses that have been proposed will need to be correctly pegged and demarcated prior to their construction by a qualified botanist. Two of the areas will be elevated boardwalks and fall into areas where alien vegetation has perforated the existing indigenous woody vegetation. Once the routes have been pegged the alien vegetation will be removed and a re-planting of indigenous species will occur along the periphery of the boardwalks to prevent re-infestation and promote the sense of place of the boardwalk being in the forest. The third boardwalk, Boardwalk 3 lies adjacent to fence lines of adjoining properties and the vegetation in this area is again disturbed as a result of the fence lines and the activities taking place on the adjoining properties. In addition, a significant portion of the proposed boardwalk is through alien invasive plant species infestations. The alignments may change ever so slightly to accommodate any indigenous trees and the reason for this is that the accuracy of handheld GPS units is approximately a range between 3 to 5 metres and thus the depicted alignment may change to rectify the alignment. Hence the need for a qualified specialist to insure that no indigenous trees are accidently removed or cut during the construction process. It is important to note that the construction of the boardwalks will be un-invasive as for the most part they traverse existing pathways, alien encroached areas or cleared areas. Access into and along the boardwalk areas for the purposes of construction must only be along existing paths and the ECO must ensure that the access is strictly controlled. The use of a motorized handheld auger to create the holes for the placement of the supporting (uprights that require being sunk into the ground) foundations will be the only machinery which is allowed into the sensitive areas. No other machinery must be allowed access into the sensitive areas. All materials required for construction of the boardwalks must be carried in on foot. All the above recommendations must be implemented. The implementation of the above will ensure that the potential impact of said boardwalks will be Low.
Pedestrian Pathways (not elevated)	The pathways that are proposed in the open spaces which are not in sensitive environments will make use of the existing tracks that run through the current cane lands and in areas where agricultural pursuits have ceased. These pathways will not require any significant amendments to be made to them as they will be founded on existing haulage roads.

Area No.	Impact
	In addition, the majority over 95% of these pathways are running on the contour and thus will not pose a threat in terms of storm water erosion or damage. Where they are running perpendicular across the contour, there may need for some limited interventions to prevent erosion of these pathways, however, this will be easily managed through employing berms and swales and vegetating the areas adjacent to these pathways with indigenous vegetation. The possible impacts of erosion and wash will be easily mitigated through minor interventions and thus the potential impact of these pathways is deemed to be Low. The presence of pathways will not interfere with the delivery of Ecological Goods and Services of the Open Space Areas, and in reality will fall within the ecotone (transitional area) between existing indigenous vegetation and the cultivated lands. This area is commonly an area where the control and management of alien invasive species is a priority and on-going requirement and therefore the presence of these pathways will provide suitable access for the maintenance staff. These pathways will alleviate the need for additional service roads and thus the impacts of the pathways versus the need for service access is strongly in favour of maintaining and having pathways. The presence of pathways will also prevent individuals from creating *ad hoc* access routes through the Open Spaces and thus containing all potential impacts (vegetation destruction, formation of informal paths, erosion and the potential for the establishment of alien invasive plant species) to a single small and manageable area that can be maintained and monitored with ease by the Management Association.

Figure 7-5: Amended Concept Plan in relation to sensitive vegetation

Figure 7-6: Engineering Services in relation to sensitive vegetation

Figure 7-7: Boardwalks, Pedestrian Access and Emergency Access in relation to sensitive vegetation

In terms of the overall changes to the layout between 2016 and 2017 a total increase in development area of 0.86 ha has accrued. The change to the indigenous vegetation on site is recorded as 0.34 ha, however, one needs to consider that the bulk of that change is taken up by encroachment into areas which are currently fallow and do not contribute at any significant level to the biodiversity of the site.

7.5 Wetland Assessment

7.5.1 Present Wetland Health

As presented in ***Section 6.6.3*** the following wetland hydrogeomorphic units were identified in the study area:

- 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 7-3*** 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 7-3: 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 7-4*** 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 7-4: 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 7-5*** 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 7-5: 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 7-6*** 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 7-6: 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.

The proposed road layout does take cognisance of the delineated wetland areas for the most part (***Figure 7-8***).

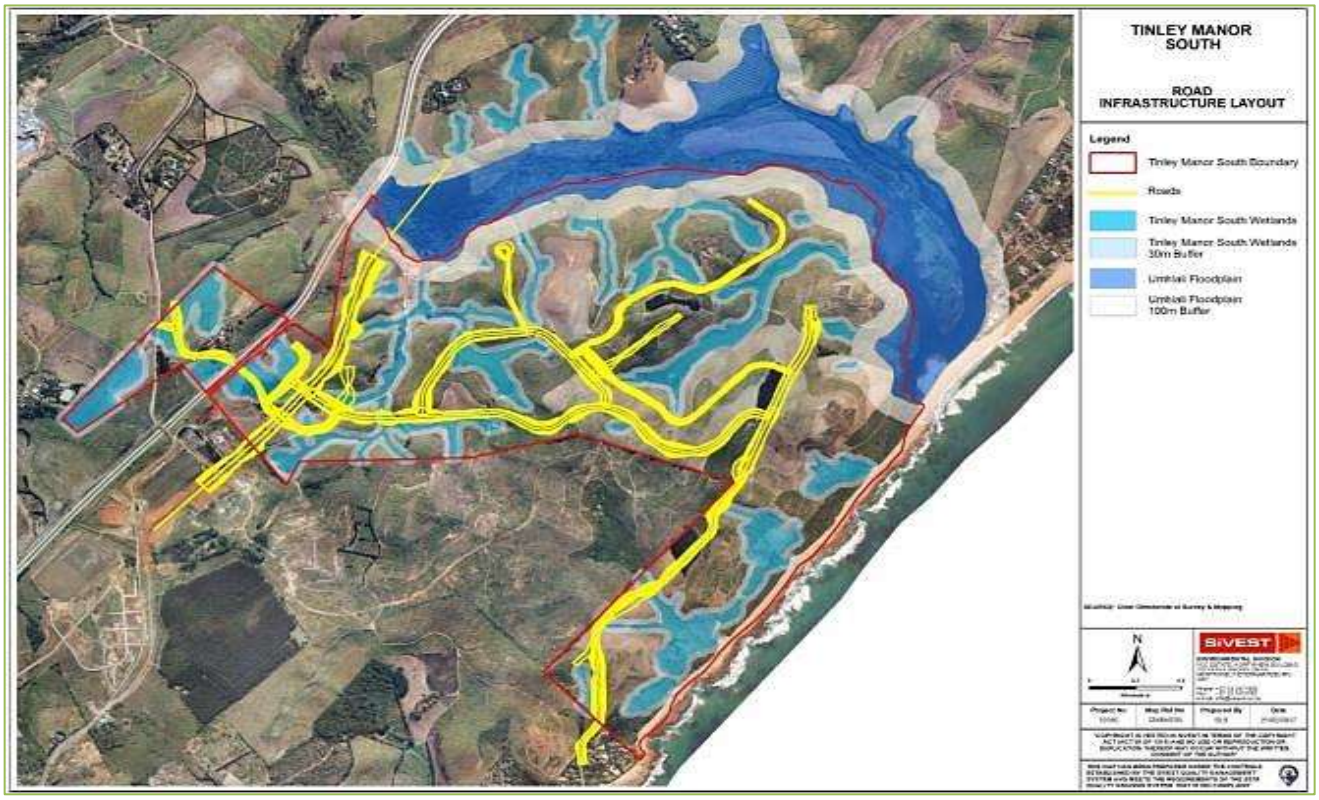


Figure 7-8: Wetland and road layout

7.5.2.2 Stormwater Management Facilities Infrastructure

A number of stormwater management facilities have been designed across the site and these have been placed so as to be outside of the wetlands that are present on site, as far as possible, while making use of the wetland buffers to ameliorate the potential impacts that water released from these structures could have.

Figure 7-9: Stormwater management facilities in relation to wetlands

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 7-10***). The water supply for the site will be sourced from existing pipelines 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.

Figure 7-10: 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.

7.5.2.4 Irrigation Infrastructure

With a development of this nature, it is a requirement that the rehabilitation be irrigated during the establishment phase of the development (see ***Figure 7-11*** below).

On-site wetland areas will be lost due to the irrigation dam construction.

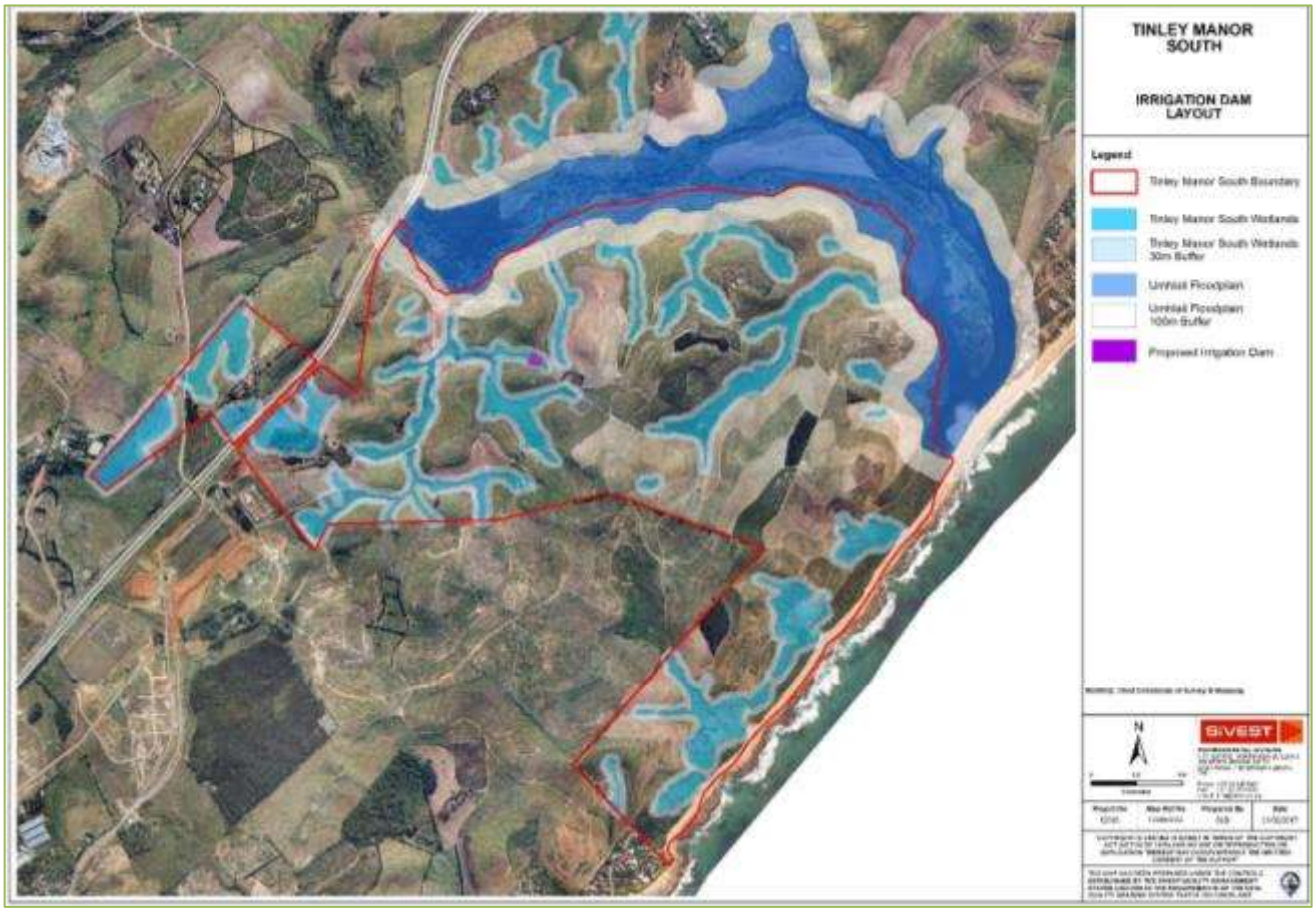


Figure 7-11: Irrigation dam in relation to wetlands

7.5.3 Potential Impacts and Recommendations

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.

7.5.3.1 Impacts Associated with Wetland Loss

The layout for the project proposes to encroach into the wetlands and associated buffers of numerous HGM units. This impact has the possibility of reducing the ability of the wetland to perform many of the functions typically associated with such ecosystems. Loss of wetland area has implications for stormwater management and control, sediment trapping and the treatment or trapping of pollutants and sediments. Loss of wetland area also has the potential to reduce the biodiversity value of a system further.

The proposed Tinley Manor Southbanks will result in a permanent loss of some wetland areas. For wetland off-sets, the no-net wetland loss principle is generally accepted as best practice when dealing with the issues of wetland loss. This means that wetland loss must be replaced by wetland gain so that the net wetland loss is zero. The replacement of wetlands at a ratio of 1:1 is generally regarded as being insufficient to mitigate wetland loss as wetland rehabilitation cannot reproduce pristine wetlands. Internationally, a minimum ratio of 1:1.5 is generally required to achieve 1:1 compliance on the ground. However, this minimum ratio is only considered appropriate in situations where rehabilitation has a low risk of failure, especially if the wetlands in question are degraded and of low conservation value from an ecosystem services perspective. After receiving comments from key stakeholders it has been agreed to implement an area for area approach using a 1:3 off-set ratio, as recommended by Ezemvelo KZN Wildlife. The area for area approach involves rehabilitating or reinstating an area of wetland equal to the wetland area being lost at the required off-set ratio.

Given the above, SiVEST have completed a Rehabilitation Plan (February 2017) that aims to guide the rehabilitation of wetlands across the site, and thus fulfil the off-set requirements mentioned above. The wetlands to be rehabilitated are all those that will not be lost, as shown in ***Figure 7-12*** below.

The current layout for Tinley Manor South indicates that **8.29 ha** of wetland area will be lost and **24.87 ha** of wetland area is required to be rehabilitated to off-set the direct loss of wetland area, whilst the total wetland area available for rehabilitation is **75.98 ha**, this is some **51.11 ha** more than the required minimum. This equates to a **1:9.17** off-set ratio, which is significantly greater than the stipulated 1:3 off-set ratio. Thus the overall wetland losses can be can be considered to be adequately off-set and the significance of the impact reduced to acceptable levels.

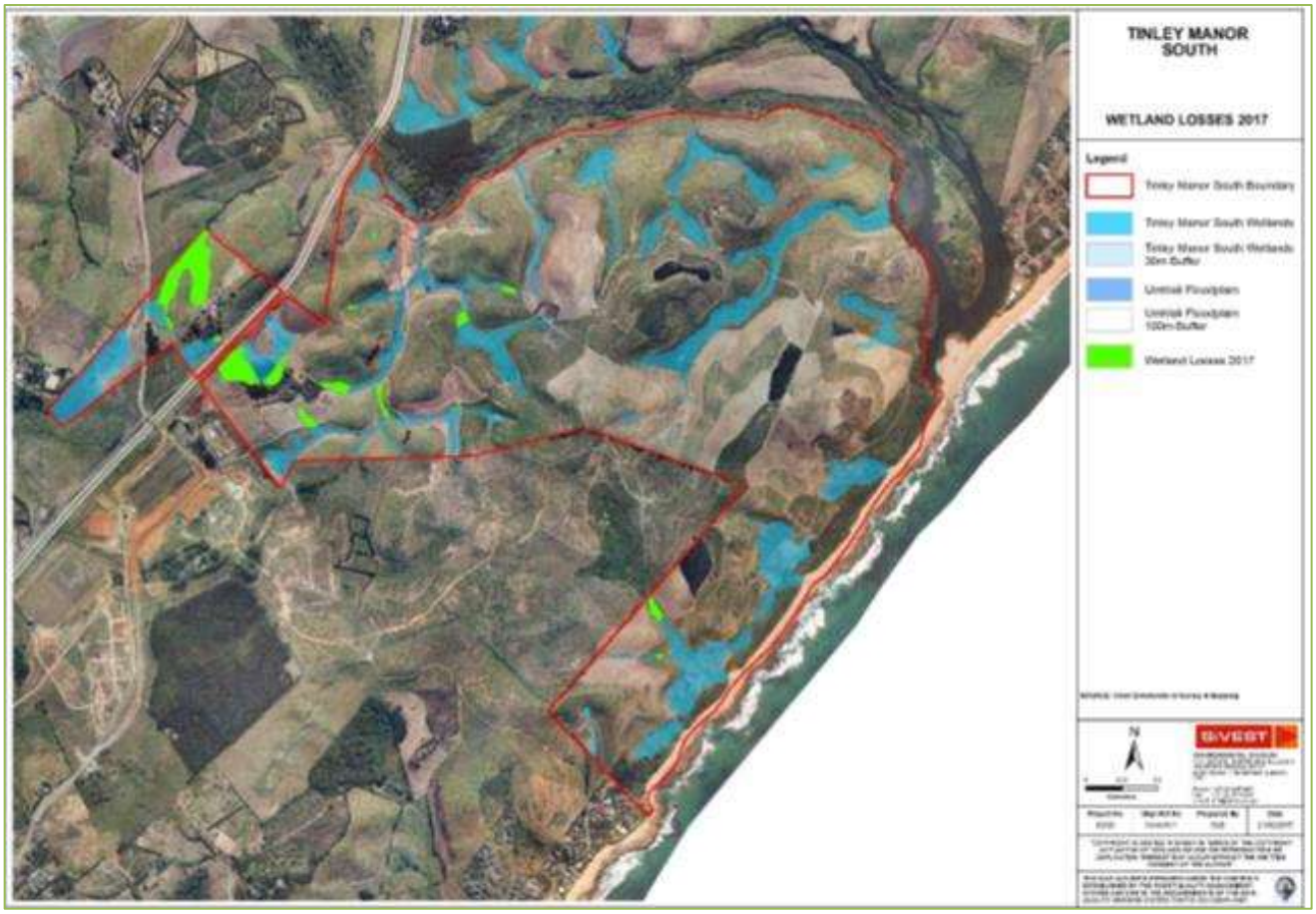


Figure 7-12: Wetland areas to be 'lost'

Included in the above impacts, and associated mitigation, the land form has placed limitations on the ability of the stormwater engineers to attenuate stormwater created by the proposed development, and they have therefore requested the option of placing some management facilities within wetland systems in order to adequately deal with the peaks and flows of a potential 1 in 100 year flood event.

Analysis of the available options has yielded a number of management structures that could be placed in wetland. However, given that the management facilities would lead to a destruction of the wetlands at the site of the management facilities, a calculation of wetland for conversion to stormwater management facilities was undertaken. The calculation of wetland that will be lost under the current stormwater management plan has been included in the calculation of losses detailed above, and specifically indicated in ***Figure 7-12***. The above calculations still allow for an off-set greater than 1:3, and therefore the loss of some wetland areas for stormwater management facilities is considered acceptable.

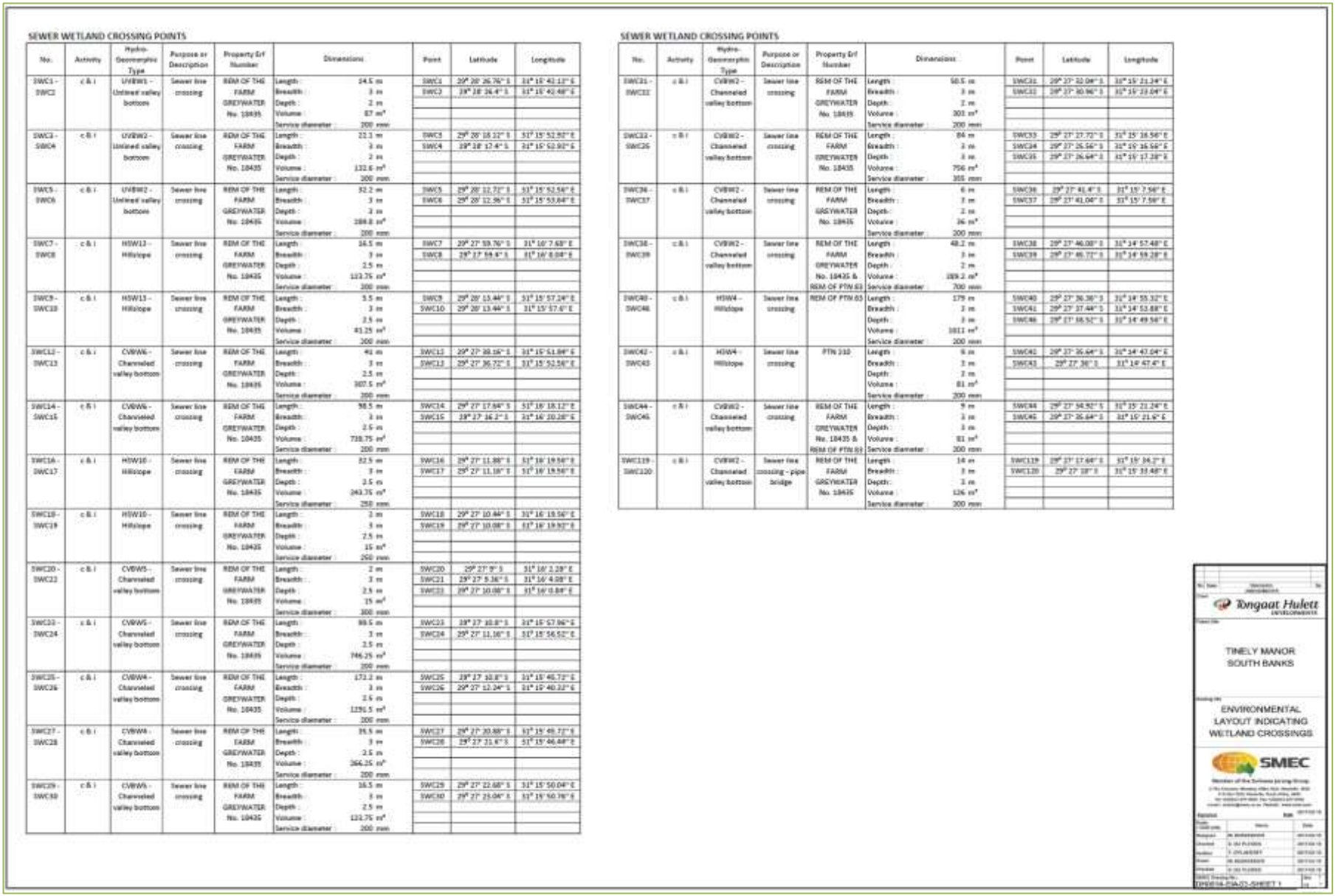
All wetland crossings are illustrated in ***Figure 7-13***. An enlarged version of the wetland crossing drawing is provided in Appendix F. Co-ordinates, dimensions and/or diameters of each of the wetland crossings are provided in and ***Figure 7-14***, ***Figure 7-15*** and ***Figure 7-16***. These are also provided in ***Appendix F***. The maximum ROW for wetland crossings is 10 m on either side of the approved wetland crossing co-ordinate impact. Trench depth and trench widths will vary depending on the type of crossing. The maximum trench depth and trench width in wetlands is expected to be 2.5 m (depth) X 5 m (width).

The Wetland and Open Space Rehabilitation Plan (***Appendix B 4***) required engineering interventions to be placed within wetlands (e.g. weirs) to improve the functioning of remaining wetlands. The location of these interventions within wetlands is also presented in ***Figure 7-13***. However, the presence of these structures are to improve the functionality of the wetlands and are not considered as wetland loss.

Typical designs for these interventions are detailed in ***Appendix B 4***.

A Wetland Conservation Management Plan and Monitoring Programme is also presented in ***Appendix B 4***.

Figure 7-13: Wetland Crossings Drawings



SEWER WETLAND CROSSING POINTS

No.	Activity	Hydro-Geomorphic Type	Purpose or Description	Property Erf Number	Dimensions		Point	Latitude	Longitude
SWC1 - SWC2	c & i	UVBW1 - Unlined valley bottom	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	14.5 m	SWC1	29° 28' 26.76" S	31° 15' 41.13" E
					Breadth :	3 m	SWC2	29° 28' 26.4" S	31° 15' 42.48" E
					Depth :	2 m			
					Volume :	87 m³			
					Service diameter :	200 mm			
SWC3 - SWC4	c & i	UVBW2 - Unlined valley bottom	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	22.1 m	SWC3	29° 28' 18.12" S	31° 15' 52.92" E
					Breadth :	3 m	SWC4	29° 28' 17.4" S	31° 15' 52.92" E
					Depth :	2 m			
					Volume :	132.6 m³			
					Service diameter :	200 mm			
SWC5 - SWC6	c & i	UVBW2 - Unlined valley bottom	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	52.2 m	SWC5	29° 28' 12.72" S	31° 15' 52.56" E
					Breadth :	3 m	SWC6	29° 28' 12.96" S	31° 15' 53.64" E
					Depth :	2 m			
					Volume :	188.8 m³			
					Service diameter :	200 mm			
SWC7 - SWC8	c & i	HSW12 - Hillslope	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	16.5 m	SWC7	29° 27' 59.76" S	31° 16' 7.68" E
					Breadth :	3 m	SWC8	29° 27' 59.4" S	31° 16' 8.88" E
					Depth :	2.5 m			
					Volume :	123.75 m³			
					Service diameter :	200 mm			
SWC9 - SWC10	c & i	HSW13 - Hillslope	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	5.5 m	SWC9	29° 28' 13.44" S	31° 15' 57.24" E
					Breadth :	3 m	SWC10	29° 28' 13.44" S	31° 15' 57.6" E
					Depth :	2.5 m			
					Volume :	41.25 m³			
					Service diameter :	200 mm			
SWC12 - SWC13	c & i	CVBW6 - Channeled valley bottom	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	41 m	SWC12	29° 27' 38.16" S	31° 15' 51.84" E
					Breadth :	3 m	SWC13	29° 27' 36.72" S	31° 15' 52.56" E
					Depth :	2.5 m			
					Volume :	307.5 m³			
					Service diameter :	200 mm			
SWC14 - SWC15	c & i	CVBW6 - Channeled valley bottom	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	98.5 m	SWC14	29° 27' 17.64" S	31° 16' 18.12" E
					Breadth :	3 m	SWC15	29° 27' 16.2" S	31° 16' 20.28" E
					Depth :	2.5 m			
					Volume :	738.75 m³			
					Service diameter :	200 mm			
SWC16 - SWC17	c & i	HSW10 - Hillslope	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	32.5 m	SWC16	29° 27' 11.88" S	31° 16' 19.56" E
					Breadth :	3 m	SWC17	29° 27' 11.16" S	31° 16' 19.56" E
					Depth :	2.5 m			
					Volume :	243.75 m³			
					Service diameter :	250 mm			
SWC18 - SWC19	c & i	HSW10 - Hillslope	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	2 m	SWC18	29° 27' 10.44" S	31° 16' 19.56" E
					Breadth :	9 m	SWC19	29° 27' 10.08" S	31° 16' 19.92" E
					Depth :	2.5 m			
					Volume :	15 m³			
					Service diameter :	200 mm			
SWC20 - SWC22	c & i	CVBW5 - Channeled valley bottom	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	2 m	SWC20	29° 27' 9" S	31° 16' 2.28" E
					Breadth :	3 m	SWC21	29° 27' 9.36" S	31° 16' 4.08" E
					Depth :	2.5 m	SWC22	29° 27' 10.08" S	31° 16' 0.84" E
					Volume :	15 m³			
					Service diameter :	300 mm			
SWC23 - SWC24	c & i	CVBW5 - Channeled valley bottom	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	99.5 m	SWC23	29° 27' 10.8" S	31° 15' 57.96" E
					Breadth :	3 m	SWC24	29° 27' 11.16" S	31° 15' 56.52" E
					Depth :	2.5 m			
					Volume :	746.25 m³			
					Service diameter :	200 mm			
SWC25 - SWC26	c & i	CVBW4 - Channeled valley bottom	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	172.2 m	SWC25	29° 27' 10.8" S	31° 15' 46.72" E
					Breadth :	3 m	SWC26	29° 27' 12.24" S	31° 15' 40.22" E
					Depth :	2.5 m			
					Volume :	1291.5 m³			
					Service diameter :	200 mm			
SWC27 - SWC28	c & i	CVBW4 - Channeled valley bottom	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	35.5 m	SWC27	29° 27' 20.88" S	31° 15' 49.72" E
					Breadth :	3 m	SWC28	29° 27' 21.6" S	31° 15' 46.44" E
					Depth :	2.5 m			
					Volume :	266.25 m³			
					Service diameter :	200 mm			
SWC29 - SWC30	c & i	CVBW5 - Channeled valley bottom	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	16.5 m	SWC29	29° 27' 22.68" S	31° 15' 50.04" E
					Breadth :	3 m	SWC30	29° 27' 23.04" S	31° 15' 50.76" E
					Depth :	2.5 m			
					Volume :	123.75 m³			
					Service diameter :	200 mm			

SEWER WETLAND CROSSING POINTS

No.	Activity	Hydro-Geomorphic Type	Purpose or Description	Property Erf Number	Dimensions		Point	Latitude	Longitude
SWC31 - SWC32	c & i	CVBW2 - Channeled valley bottom	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	50.5 m	SWC31	29° 27' 32.04" S	31° 15' 21.24" E
					Breadth :	3 m	SWC32	29° 27' 30.96" S	31° 15' 23.04" E
					Depth :	2 m			
					Volume :	303 m³			
					Service diameter :	200 mm			
SWC33 - SWC34	c & i	CVBW2 - Channeled valley bottom	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	84 m	SWC33	29° 27' 27.72" S	31° 15' 16.56" E
					Breadth :	3 m	SWC34	29° 27' 25.56" S	31° 15' 16.56" E
					Depth :	3 m	SWC35	29° 27' 26.64" S	31° 15' 17.28" E
					Volume :	756 m³			
					Service diameter :	355 mm			
SWC36 - SWC37	c & i	CVBW2 - Channeled valley bottom	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435	Length :	6 m	SWC36	29° 27' 41.4" S	31° 15' 7.56" E
					Breadth :	3 m	SWC37	29° 27' 41.04" S	31° 15' 7.56" E
					Depth :	2 m			
					Volume :	36 m³			
					Service diameter :	200 mm			
SWC38 - SWC39	c & i	CVBW2 - Channeled valley bottom	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435 & REM OF PTN 63	Length :	48.2 m	SWC38	29° 27' 46.08" S	31° 14' 57.48" E
					Breadth :	3 m	SWC39	29° 27' 46.72" S	31° 14' 59.28" E
					Depth :	2 m			
					Volume :	289.2 m³			
					Service diameter :	700 mm			
SWC40 - SWC46	c & i	HSW4 - Hillslope	Sewer line crossing	REM OF PTN 63	Length :	179 m	SWC40	29° 27' 36.36" S	31° 14' 53.32" E
					Breadth :	3 m	SWC41	29° 27' 37.44" S	31° 14' 53.88" E
					Depth :	3 m	SWC46	29° 27' 38.52" S	31° 14' 49.56" E
					Volume :	1611 m³			
					Service diameter :	200 mm			
SWC42 - SWC43	c & i	HSW4 - Hillslope	Sewer line crossing	PTN 310	Length :	6 m	SWC42	29° 27' 35.64" S	31° 14' 47.04" E
					Breadth :	3 m	SWC43	29° 27' 36" S	31° 14' 47.4" E
					Depth :	2 m			
					Volume :	81 m³			
					Service diameter :	200 mm			
SWC44 - SWC45	c & i	CVBW2 - Channeled valley bottom	Sewer line crossing	REM OF THE FARM GREYWATER No. 18435 & REM OF PTN 63	Length :	9 m	SWC44	29° 27' 34.92" S	31° 15' 21.24" E
					Breadth :	3 m	SWC45	29° 27' 35.64" S	31° 15' 21.6" E
					Depth :	3 m			
					Volume :	81 m³			
					Service diameter :	200 mm			
SWC119 - SWC120	c & i	CVBW2 - Channeled valley bottom	Sewer line crossing - pipe bridge	REM OF THE FARM GREYWATER No. 18435	Length :	14 m	SWC119	29° 27' 17.64" S	31° 15' 34.2" E
					Breadth :	3 m	SWC120	29° 27' 18" S	31° 15' 33.48" E
					Depth :	3 m			
					Volume :	126 m³			
					Service diameter :	200 mm			

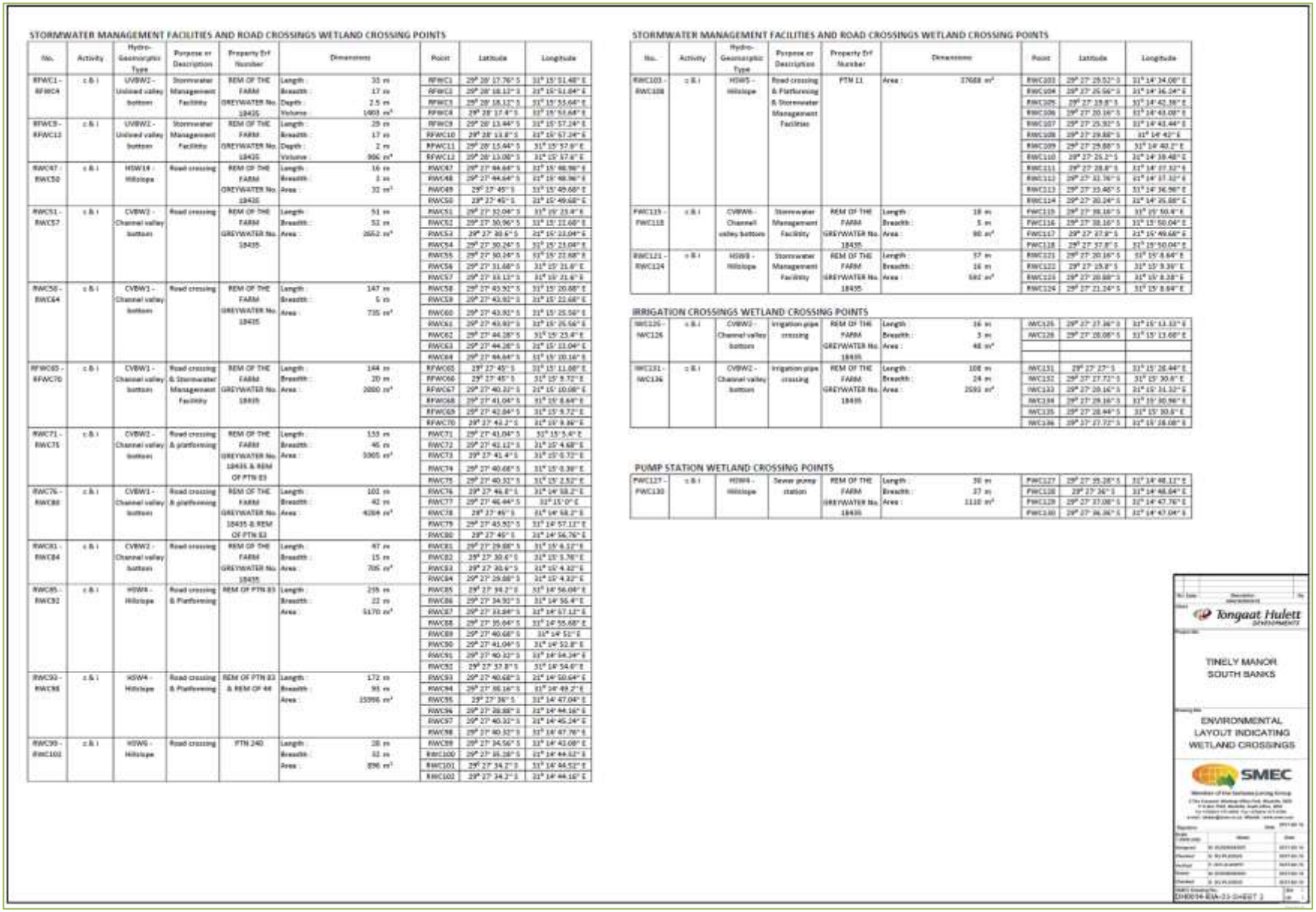
Tongaat Hulett DEVELOPMENTS

TINELY MANOR SOUTH BANKS

ENVIRONMENTAL LAYOUT INDICATING WETLAND CROSSINGS

SMEC

Figure 7-14: Co-ordinates and dimensions of wetland crossings – Sheet 1



STORMWATER MANAGEMENT FACILITIES AND ROAD CROSSINGS WETLAND CROSSING POINTS

No.	Activity	Hydro-Geomorphic Type	Purpose or Description	Property Erf Number	Dimensions	Point	Latitude	Longitude
RFWC1 - RFWC4	c & i	UVBW2 - Unlined valley bottom	Stormwater Management Facility	REM OF THE FARM GREYWATER No. 18435	Length : 33 m Breadth : 17 m Depth : 2.5 m Volume : 1901 m³	RFWC1	29° 28' 17.76" S	31° 15' 51.48" E
						RFWC2	29° 28' 18.12" S	31° 15' 51.84" E
						RFWC3	29° 28' 18.12" S	31° 15' 53.64" E
						RFWC4	29° 28' 17.4" S	31° 15' 53.64" E
RFWC9 - RFWC13	c & i	UVBW2 - Unlined valley bottom	Stormwater Management Facility	REM OF THE FARM GREYWATER No. 18435	Length : 29 m Breadth : 17 m Depth : 2 m Volume : 986 m³	RFWC9	29° 28' 13.44" S	31° 15' 57.24" E
						RFWC10	29° 28' 13.8" S	31° 15' 57.24" E
						RFWC11	29° 28' 13.44" S	31° 15' 57.6" E
						RFWC12	29° 28' 13.08" S	31° 15' 57.6" E
RWC47 - RWC50	c & i	HSW14 - Hillslope	Road crossing	REM OF THE FARM GREYWATER No. 18435	Length : 16 m Breadth : 3 m Area : 32 m²	RWC47	29° 27' 44.64" S	31° 15' 48.96" E
						RWC48	29° 27' 44.64" S	31° 15' 48.96" E
						RWC49	29° 27' 45" S	31° 15' 49.68" E
						RWC50	29° 27' 45" S	31° 15' 49.68" E
RWC51 - RWC57	c & i	CVBW2 - Channel valley bottom	Road crossing	REM OF THE FARM GREYWATER No. 18435	Length : 51 m Breadth : 51 m Area : 2652 m²	RWC51	29° 27' 32.04" S	31° 15' 23.4" E
						RWC52	29° 27' 30.96" S	31° 15' 23.68" E
						RWC54	29° 27' 30.6" S	31° 15' 23.04" E
						RWC54	29° 27' 30.24" S	31° 15' 23.04" E
						RWC55	29° 27' 30.24" S	31° 15' 22.68" E
						RWC56	29° 27' 31.68" S	31° 15' 21.6" E
						RWC57	29° 27' 31.32" S	31° 15' 21.6" E
RWC58 - RWC64	c & i	CVBW1 - Channel valley bottom	Road crossing	REM OF THE FARM GREYWATER No. 18435	Length : 147 m Breadth : 5 m Area : 735 m²	RWC58	29° 27' 43.92" S	31° 15' 20.88" E
						RWC59	29° 27' 43.92" S	31° 15' 22.68" E
						RWC60	29° 27' 43.92" S	31° 15' 25.56" E
						RWC61	29° 27' 43.92" S	31° 15' 26.64" E
						RWC62	29° 27' 44.28" S	31° 15' 23.4" E
						RWC63	29° 27' 44.28" S	31° 15' 23.04" E
						RWC64	29° 27' 44.64" S	31° 15' 20.16" E
RFWC65 - RFWC70	c & i	CVBW1 - Channel valley bottom	Road crossing & Stormwater Management Facility	REM OF THE FARM GREYWATER No. 18435	Length : 144 m Breadth : 20 m Area : 2880 m²	RFWC65	29° 27' 45" S	31° 15' 11.88" E
						RFWC66	29° 27' 45" S	31° 15' 9.72" E
						RFWC67	29° 27' 40.32" S	31° 15' 10.08" E
						RFWC68	29° 27' 41.04" S	31° 15' 8.64" E
						RFWC69	29° 27' 42.84" S	31° 15' 9.72" E
						RFWC70	29° 27' 42.2" S	31° 15' 9.86" E
RWC71 - RWC75	c & i	CVBW2 - Channel valley bottom	Road crossing & platforming	REM OF THE FARM GREYWATER No. 18435 & REM OF PTN 83	Length : 153 m Breadth : 46 m Area : 1065 m²	RWC71	29° 27' 41.04" S	31° 15' 5.4" E
						RWC72	29° 27' 42.12" S	31° 15' 4.68" E
						RWC73	29° 27' 41.4" S	31° 15' 0.72" E
						RWC74	29° 27' 40.68" S	31° 15' 0.36" E
						RWC75	29° 27' 40.32" S	31° 15' 2.52" E
RWC76 - RWC80	c & i	CVBW1 - Channel valley bottom	Road crossing & platforming	REM OF THE FARM GREYWATER No. 18435 & REM OF PTN 83	Length : 101 m Breadth : 42 m Area : 4284 m²	RWC76	29° 27' 46.8" S	31° 14' 58.2" E
						RWC77	29° 27' 46.44" S	31° 15' 0" E
						RWC78	29° 27' 46" S	31° 14' 58.2" E
						RWC79	29° 27' 45.92" S	31° 14' 57.12" E
						RWC80	29° 27' 46" S	31° 14' 56.76" E
RWC81 - RWC84	c & i	CVBW2 - Channel valley bottom	Road crossing	REM OF THE FARM GREYWATER No. 18435	Length : 47 m Breadth : 15 m Area : 705 m²	RWC81	29° 27' 29.88" S	31° 15' 6.12" E
						RWC82	29° 27' 30.6" S	31° 15' 5.76" E
						RWC83	29° 27' 30.6" S	31° 15' 4.32" E
						RWC84	29° 27' 29.88" S	31° 15' 4.32" E
RWC85 - RWC92	c & i	HSW4 - Hillslope	Road crossing & Platforming	REM OF PTN 83	Length : 255 m Breadth : 22 m Area : 5170 m²	RWC85	29° 27' 34.2" S	31° 14' 56.04" E
						RWC86	29° 27' 34.92" S	31° 14' 56.4" E
						RWC87	29° 27' 33.84" S	31° 14' 57.12" E
						RWC88	29° 27' 35.64" S	31° 14' 55.68" E
						RWC89	29° 27' 40.68" S	31° 14' 51" E
						RWC90	29° 27' 41.04" S	31° 14' 52.8" E
						RWC91	29° 27' 40.32" S	31° 14' 54.24" E
						RWC92	29° 27' 37.8" S	31° 14' 54.6" E
RWC93 - RWC98	c & i	HSW4 - Hillslope	Road crossing & Platforming	REM OF PTN 83 & REM OF 44	Length : 172 m Breadth : 91 m Area : 15996 m²	RWC93	29° 27' 40.68" S	31° 14' 50.64" E
						RWC94	29° 27' 38.16" S	31° 14' 49.2" E
						RWC95	29° 27' 36" S	31° 14' 47.04" E
						RWC96	29° 27' 39.36" S	31° 14' 44.16" E
						RWC97	29° 27' 40.32" S	31° 14' 45.24" E
						RWC98	29° 27' 40.32" S	31° 14' 47.76" E
RWC99 - RWC102	c & i	HSW6 - Hillslope	Road crossing	PTN 240	Length : 38 m Breadth : 11 m Area : 896 m²	RWC99	29° 27' 34.56" S	31° 14' 41.08" E
						RWC100	29° 27' 35.28" S	31° 14' 44.52" E
						RWC101	29° 27' 34.2" S	31° 14' 44.52" E
						RWC102	29° 27' 34.2" S	31° 14' 44.16" E

STORMWATER MANAGEMENT FACILITIES AND ROAD CROSSINGS WETLAND CROSSING POINTS

No.	Activity	Hydro-Geomorphic Type	Purpose or Description	Property Erf Number	Dimensions	Point	Latitude	Longitude
RWC103 - RWC108	c & i	HSW5 - Hillslope	Road crossing & Platforming & Stormwater Management Facilities	PTN 11	Area : 37668 m²	RWC103	29° 27' 25.92" S	31° 14' 34.08" E
						RWC104	29° 27' 25.56" S	31° 14' 36.24" E
						RWC105	29° 27' 19.8" S	31° 14' 42.36" E
						RWC106	29° 27' 20.16" S	31° 14' 43.08" E
						RWC107	29° 27' 25.92" S	31° 14' 43.44" E
						RWC108	29° 27' 29.88" S	31° 14' 42" E
						RWC109	29° 27' 25.68" S	31° 14' 40.2" E
						RWC110	29° 27' 25.2" S	31° 14' 38.48" E
						RWC111	29° 27' 28.8" S	31° 14' 37.32" E
						RWC112	29° 27' 32.76" S	31° 14' 37.32" E
						RWC113	29° 27' 33.48" S	31° 14' 36.96" E
						RWC114	29° 27' 20.24" S	31° 14' 26.88" E
RWC115 - RWC118	c & i	CVBW6 - Channell valley bottom	Stormwater Management Facility	REM OF THE FARM GREYWATER No. 18435	Length : 18 m Breadth : 5 m Area : 90 m²	RWC115	29° 27' 38.16" S	31° 15' 50.4" E
						RWC116	29° 27' 38.16" S	31° 15' 50.04" E
						RWC117	29° 27' 37.8" S	31° 15' 49.68" E
						RWC118	29° 27' 37.8" S	31° 15' 50.04" E
RWC121 - RWC124	c & i	HSW8 - Hillslope	Stormwater Management Facility	REM OF THE FARM GREYWATER No. 18435	Length : 57 m Breadth : 16 m Area : 582 m²	RWC121	29° 27' 20.16" S	31° 15' 8.64" E
						RWC122	29° 27' 15.8" S	31° 15' 9.36" E
						RWC123	29° 27' 20.88" S	31° 15' 8.28" E
						RWC124	29° 27' 21.24" S	31° 15' 8.64" E

IRRIGATION CROSSINGS WETLAND CROSSING POINTS

IWC125 - IWC126	c & i	CVBW2 - Channel valley bottom	Irrigation pipe crossing	REM OF THE FARM GREYWATER No. 18435	Length : 16 m Breadth : 3 m Area : 48 m²	IWC125	29° 27' 27.36" S	31° 15' 13.32" E
						IWC126	29° 27' 28.08" S	31° 15' 13.68" E
IWC131 - IWC136	c & i	CVBW2 - Channel valley bottom	Irrigation pipe crossing	REM OF THE FARM GREYWATER No. 18435	Length : 108 m Breadth : 24 m Area : 2592 m²	IWC131	29° 27' 27" S	31° 15' 28.44" E
						IWC132	29° 27' 27.72" S	31° 15' 30.6" E
						IWC133	29° 27' 29.16" S	31° 15' 31.32" E
						IWC134	29° 27' 29.16" S	31° 15' 30.96" E
						IWC135	29° 27' 28.44" S	31° 15' 30.6" E
						IWC136	29° 27' 27.72" S	31° 15' 28.08" E

PUMP STATION WETLAND CROSSING POINTS

PWC127 - PWC130	c & i	HSW4 - Hillslope	Sewer pump station	REM OF THE FARM GREYWATER No. 18435	Length : 38 m Breadth : 27 m Area : 1110 m²	PWC127	29° 27' 35.28" S	31° 14' 48.12" E
						PWC128	29° 27' 36" S	31° 14' 48.84" E
						PWC129	29° 27' 37.08" S	31° 14' 47.76" E
						PWC130	29° 27' 36.36" S	31° 14' 47.04" E

Tongaat Hulett DEVELOPMENTS

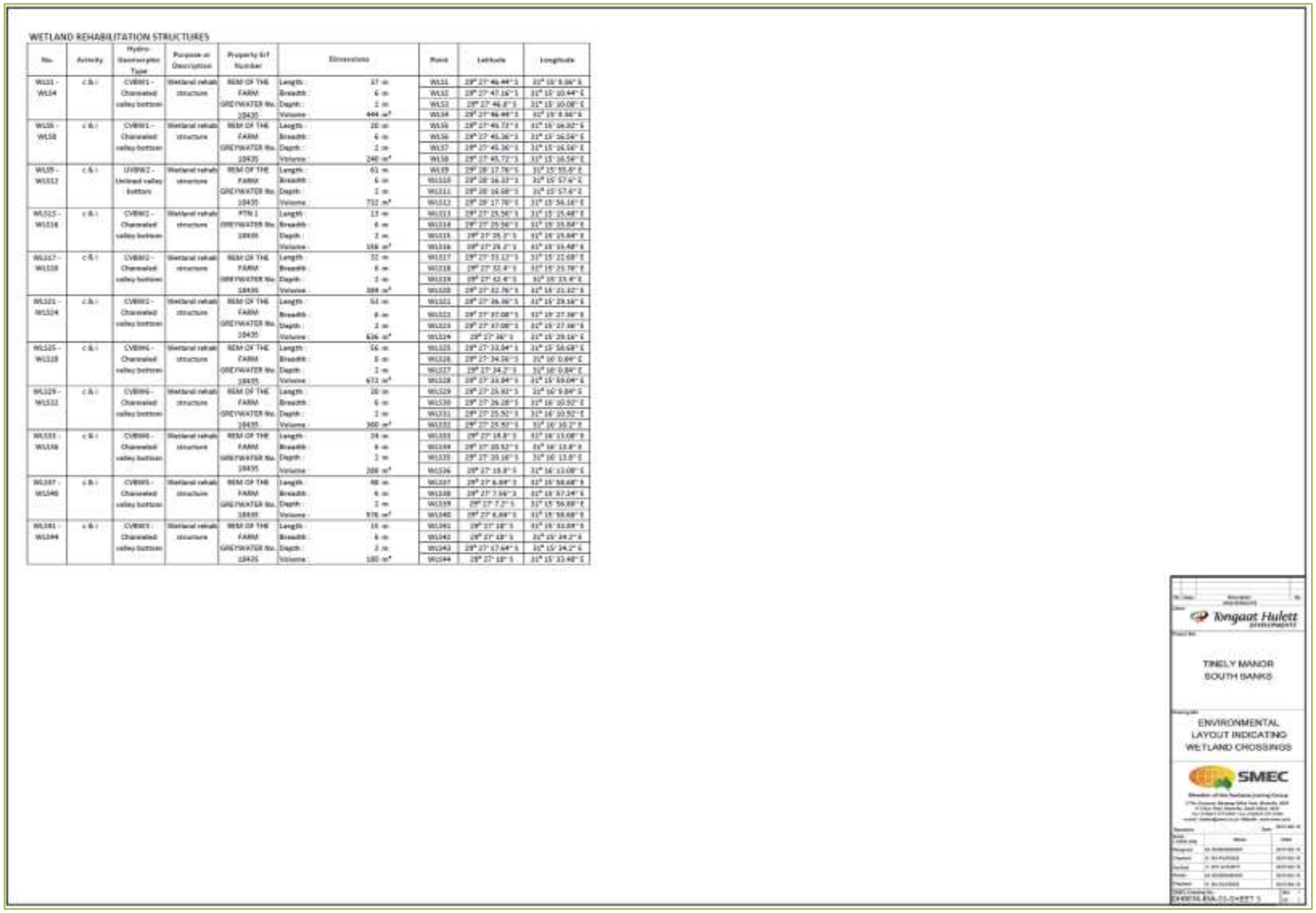
TINELY MANOR SOUTH BANKS

ENVIRONMENTAL LAYOUT INDICATING WETLAND CROSSINGS

SMEC

DH0094-EIA-33-SHEET 2

Figure 7-15: Co-ordinates and dimensions of wetland crossings – Sheet 2



WETLAND REHABILITATION STRUCTURES

No.	Activity	Hydro-Geomorphic Type	Purpose or Description	Property Erf Number	Dimensions		Point	Latitude	Longitude
WL01 - WL04	c & i	CVB/W1 - Channeled valley bottom	Wetland rehab structure	REM OF THE FARM GREYWATER No. 10435	Length :	17 m	WL01	29° 27' 46.44" S	31° 15' 9.06" E
					Breadth :	6 m	WL02	29° 27' 47.16" S	31° 15' 10.44" E
					Depth :	1 m	WL03	29° 27' 46.8" S	31° 15' 10.08" E
					Volume :	444 m³	WL04	29° 27' 46.44" S	31° 15' 9.66" E
WL05 - WL08	c & i	CVB/W1 - Channeled valley bottom	Wetland rehab structure	REM OF THE FARM GREYWATER No. 10435	Length :	20 m	WL05	29° 27' 46.72" S	31° 15' 16.92" E
					Breadth :	6 m	WL06	29° 27' 45.36" S	31° 15' 16.54" E
					Depth :	2 m	WL07	29° 27' 45.36" S	31° 15' 16.54" E
					Volume :	240 m³	WL08	29° 27' 45.72" S	31° 15' 16.54" E
WL09 - WL12	c & i	UVB/W2 - Unlined valley bottom	Wetland rehab structure	REM OF THE FARM GREYWATER No. 10435	Length :	61 m	WL09	29° 28' 17.76" S	31° 15' 55.67" E
					Breadth :	6 m	WL10	29° 28' 16.32" S	31° 15' 57.6" E
					Depth :	2 m	WL11	29° 28' 16.68" S	31° 15' 57.6" E
					Volume :	732 m³	WL12	29° 28' 17.76" S	31° 15' 56.16" E
WL13 - WL14	c & i	CVB/W2 - Channeled valley bottom	Wetland rehab structure	PTN 1 GREYWATER No. 10435	Length :	13 m	WL13	29° 27' 25.56" S	31° 15' 15.48" E
					Breadth :	6 m	WL14	29° 27' 25.56" S	31° 15' 15.84" E
					Depth :	2 m	WL15	29° 27' 25.2" S	31° 15' 15.84" E
					Volume :	156 m³	WL16	29° 27' 25.2" S	31° 15' 15.48" E
WL17 - WL18	c & i	CVB/W2 - Channeled valley bottom	Wetland rehab structure	REM OF THE FARM GREYWATER No. 10435	Length :	32 m	WL17	29° 27' 33.12" S	31° 15' 22.68" E
					Breadth :	6 m	WL18	29° 27' 32.4" S	31° 15' 23.76" E
					Depth :	2 m	WL19	29° 27' 32.4" S	31° 15' 23.4" E
					Volume :	384 m³	WL20	29° 27' 32.76" S	31° 15' 22.32" E
WL21 - WL24	c & i	CVB/W2 - Channeled valley bottom	Wetland rehab structure	REM OF THE FARM GREYWATER No. 10435	Length :	52 m	WL21	29° 27' 36.36" S	31° 15' 29.16" E
					Breadth :	6 m	WL23	29° 27' 37.08" S	31° 15' 27.36" E
					Depth :	2 m	WL23	29° 27' 37.08" S	31° 15' 27.36" E
					Volume :	636 m³	WL24	29° 27' 36" S	31° 15' 29.16" E
WL25 - WL28	c & i	CVB/W1 - Channeled valley bottom	Wetland rehab structure	REM OF THE FARM GREYWATER No. 10435	Length :	56 m	WL25	29° 27' 33.84" S	31° 15' 58.68" E
					Breadth :	6 m	WL26	29° 27' 34.26" S	31° 16' 0.84" E
					Depth :	2 m	WL27	29° 27' 34.2" S	31° 16' 0.84" E
					Volume :	672 m³	WL28	29° 27' 33.84" S	31° 15' 59.04" E
WL29 - WL32	c & i	CVB/W1 - Channeled valley bottom	Wetland rehab structure	REM OF THE FARM GREYWATER No. 10435	Length :	30 m	WL29	29° 27' 25.92" S	31° 16' 9.84" E
					Breadth :	6 m	WL30	29° 27' 26.28" S	31° 16' 10.92" E
					Depth :	2 m	WL31	29° 27' 25.92" S	31° 16' 10.92" E
					Volume :	360 m³	WL32	29° 27' 25.92" S	31° 16' 10.2" E
WL33 - WL36	c & i	CVB/W1 - Channeled valley bottom	Wetland rehab structure	REM OF THE FARM GREYWATER No. 10435	Length :	24 m	WL33	29° 27' 18.8" S	31° 16' 13.08" E
					Breadth :	6 m	WL34	29° 27' 20.52" S	31° 16' 13.8" E
					Depth :	2 m	WL35	29° 27' 20.16" S	31° 16' 13.8" E
					Volume :	288 m³	WL36	29° 27' 19.8" S	31° 16' 13.08" E
WL37 - WL40	c & i	CVB/W1 - Channeled valley bottom	Wetland rehab structure	REM OF THE FARM GREYWATER No. 10435	Length :	48 m	WL37	29° 27' 6.84" S	31° 15' 58.68" E
					Breadth :	6 m	WL38	29° 27' 7.56" S	31° 15' 57.24" E
					Depth :	2 m	WL39	29° 27' 7.2" S	31° 15' 56.88" E
					Volume :	576 m³	WL40	29° 27' 6.84" S	31° 15' 58.68" E
WL41 - WL44	c & i	CVB/W1 - Channeled valley bottom	Wetland rehab structure	REM OF THE FARM GREYWATER No. 10435	Length :	15 m	WL41	29° 27' 18" S	31° 15' 33.84" E
					Breadth :	6 m	WL42	29° 27' 18" S	31° 15' 34.2" E
					Depth :	2 m	WL43	29° 27' 17.64" S	31° 15' 34.2" E
					Volume :	180 m³	WL44	29° 27' 18" S	31° 15' 33.48" E

Tongaat Hulett

TINELY MANOR
SOUTH BANKS

ENVIRONMENTAL
LAYOUT INDICATING
WETLAND CROSSINGS

SMEC

Figure 7-16: Co-ordinates and dimensions of wetland crossings – Sheet 3

Other potential impacts and recommendations are presented in ***Table 7-7***.

Table 7-7: Potential impacts and recommendations

Key Concerns Raised	Discussion
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.
Road Impacts – Construction Phase	Roads will be required to be established during the construction phase. The roads will traverse the identified wetlands. Should this take place, road establishment may have negative physical impacts on the wetlands. 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.
Road Impacts – Operational Phase	Besides the permanent loss of wetland below the road fill, the road will have a number of indirect impacts on the health of the wetland. These include: • The concentration of wetland flow through culverts and the erosion and scouring of the wetland below the culvert(s); and • The fragmentation of the wetland by the road, which represents a serious barrier to faunal movement along the wetland.
Pipe and Boardwalk Crossings	Pipes will need to be installed across wetlands. The construction of boardwalks across wetland is also proposed and will have similar construction-related impacts. Other impacts include the compaction and clearing of areas outside of the pipe/boardwalk fill footprint during the construction phase and associated indirect impacts that include erosion and alien plant encroachment into the wetland.
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.

Key Concerns Raised	Discussion
	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.
Increased Run-off, Erosion and Sedimentation Impacts During Construction	During the construction phase, portions of the catchment supplementing the wetland units will be cleared for construction. The removal of the current vegetation will temporarily increase surface run-off throughout the cleared site and increase the erosion potential of the soils on site. If stormwater run-off and erosion control measures are not implemented during the construction phase, the exposure of the bare soils to the elements will likely lead to the erosion of the soils on site. This is especially true during heavy rainfall events, which will encourage the formation of rills and dongas -thus concentrating flow down-slope. The concentration of run-off down-slope within rills and dongas will increase the likelihood of the erosion and/or sedimentation of the wetlands. The negative effects of erosion and scouring on the wetlands will include; increased concentration and canalisation of flow within the wetlands, the reduction in diffuse flow and the extent of wetness within the wetland, the alteration of the vegetation communities due to decreased wetness and erosion disturbances and ultimately the reduction in the wetland's functionality and health. In addition to erosion within the wetland, sediment plumes/fans are likely to impinge on the wetland area if no erosion and stormwater control measures are implemented. The unnatural sedimentation of the wetland area will disturb the in wetland vegetation and encourage the proliferation of pioneers and alien invasive species ultimately reducing the health and functionality of the wetland.
Increased Run-off, Erosion and Sedimentation Impacts During Operations	Although there is likely to be some management onsite and all outlets will have erosion protection, the amount of surface run-off inputs entering the onsite wetland during a storm event may still increase and the magnitude of the flood peak within this system will also increase as a result of the general increase in the rate of flow. The surface run-off inputs and the increased peak discharge will increase the risk of erosion within the wetland over time as the systems adjust to the modified mean and peak flows.
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.

7.5.4 Amendments to the Concept Plan

7.5.4.1 Change from draft EIAR (February 2015) to final EIAR (February 2016) – first Amendment

There was less wetland area encroached upon as a result of the amended layout.

7.5.4.2 Change from final EIAR (February 2016) to amended EIAR (March 2017) – second Amendment

Road Infrastructure

The road layout has changed very little, but subsequent to the initial layout, the earth-works (cut and fill) has been calculated, and the width of impact has therefore changed at various points along the road lengths. The crossing points remain the same, but the quantum of wetland loss has changed and this is highlighted below.

Stormwater Management Infrastructure

The stormwater management facilities layout changed completely. The original layout included a number of smaller facilities within wetlands, but detailed design has shown that these were insufficient, and a greater number of stormwater management facilities were required. Alternative solutions had to be found in order to

minimise wetland losses, and a number of swales have been include in the layout. A number of stormwater facilities are also situated within wetlands where unavoidable.

Water and Sewerage Infrastructure

The number of sewer pump stations required were reduced from 4 pump stations in the previous submission to 3 pump stations in this submission. With the reduction in pump stations, the sewer network layout changed slightly as well, but the impacts remain the same as the previous submission.

Irrigation Infrastructure

In the previous submission there was no plan in place for irrigation of rehabilitation areas, but it was noted that water may be available from the water treatment works outflow. Subsequently, it has been noted that the water outflow from the water treatment works is not available for irrigation on a long-term basis, and therefore the water for rehabilitation irrigation would need to be collected from rainwater or from abstraction from the Umhlali River (which is not considered reasonable from a estuarine perspective), thus the inclusion of a dam to store water for irrigation purposes.

The loss of wetland for the dam was assessed. Given the above conclusion, a number of dam sites were assessed for their ability to provide the appropriate water volumes required for irrigating the rehabilitation works, and these alternatives are indicated in ***Section 4.2.3***. Option (a) could unfortunately not supply the required amount of water for the irrigation demand, and was thus deemed inappropriate, as it would have required additional dams at other sites. While Options (b) and (c) could store an adequate amount of water for irrigation demands, it was decided that the larger dam (option 3) would be preferable to ensure that enough water was stored to hedge against the drought conditions that have prevailed over the coastal area in the past few years.

The wetland specialist was not in disagreement with this recommendation as the impacts associated with the 'loss' of wetland area to allow for an instream storage could be mitigated and off-set through the availability of this water for rehabilitation of remaining wetlands.

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 $\mu g.L^{-1}$ (range 1.2 – 3.4 $\mu g.\ell^{-1}$) was recorded in the headwaters entering the Umhlali Estuary in 2009, which was similar to that measured in the southern channel, of 1.9 $\mu g.\ell^{-1}$ (range 1.1 – 3.3 $\mu g.\ell^{-1}$). Chlorophyll-a levels in the northern channel and near the mouth were slightly higher at 2.9 $\mu g.\ell^{-1}$ (range 1.0 – 5.4 $\mu g.\ell^{-1}$) and 2.1 $\mu g.\ell^{-1}$ (range 0.6 – 5.5 $\mu g.\ell^{-1}$), 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 occurs 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 Umhlali Estuary. A large proportion of the catch (58%) comprised penaeid prawns, predominantly *Penaeus indicus*, which indicated the important function of the Umhlali 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/m^2 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 7-8: Estuarine Health Index (EHI) scores allocated to the Umhlali 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 7-9: 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
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 7-17 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.

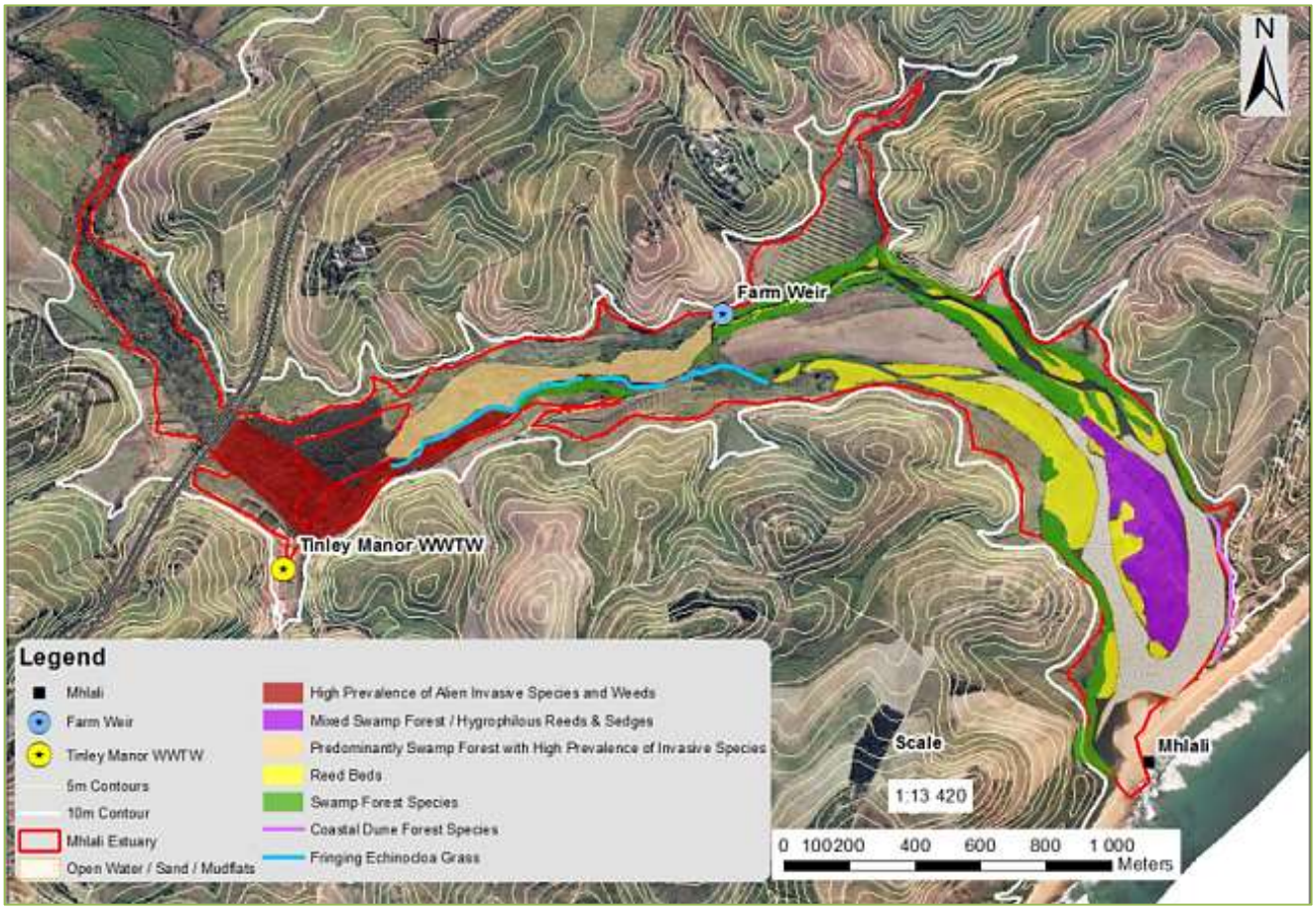


Figure 7-17: Conceptual habitat map for the Umhlali Estuary in relation to the proposed Tinley Manor Southbanks

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 Sheffield 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 Umhlali 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 7-10*** below.

Table 7-10: 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 are detailed in ***Table 7-11***.

[15] *Mather & Swart (2010) delineated the estuarine boundary at the 6 m amsl contour, with an environmental buffer to the 10 m amsl contour.*

Table 7-11: Estuarine impacts

Aspect	Impact
Erosion	The construction of the residential units, resorts, facilities and associated infrastructure will necessitate 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 practices 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.
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 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.
Freshwater Abstraction	Reduced freshwater inflow (mostly through abstraction) is a major threat facing South African estuaries, including the Umhlali Estuary, where dam construction and known abstraction occurs for irrigation purposes in the catchment area of the Umhlali River. Additional freshwater may be abstracted from the Umhlali River above the head of the estuary to supply construction activities for the Tinley Manor Southbanks, which is also likely to include wetland rehabilitation activities. The hydrodynamic functioning and ecological state of an estuary are critically dependent on fluvial input. The degree of impact on the downstream estuarine environment will depend on the volume, frequency and timing of water abstraction. In the context of the Umhlali, the cumulative impact of farm dams and direct abstraction of significant volumes of freshwater during the current drought-stressed conditions may result depressed in baseflows and aseasonal and/or prolonged closure of the estuary mouth with knock-on effects for the ecology of the system.

Aspect	Impact
	Overall reduction in flow will also result in reduction of estuarine habitat. Conversely, over an extended period, the gradual accumulation of water will lead to back flooding and prolonged inundation of littoral habitats, with potential shifts in vegetation community assemblages. While the discharge of treated wastewater from the nearby WWTWs may be thought of as a means to augment the depressed mean annual run-off or off-set freshwater abstraction, the concomitant increase in nutrients related to the discharge will produce a highly negative impact (DWA, 2014). Furthermore, treated effluent discharged from WWTWs becomes the primary constituent of river flow where natural baseflows have been greatly reduced through abstraction and impoundments, combined with drought conditions. This can have severe consequences in terms of eutrophication of the downstream environment, such as estuaries. This risk must be considered given the severe drought conditions currently being experienced in KZN and in the context of the proposed phased construction approach. Moreover, the recommended Ecological Flow Requirement (EFR) to achieve the Recommended Ecological Category is the present day flow (51.26 x 106 m^3) but without abstractions or WWTW inputs, and without the current system impacts. Additional abstraction from the system, together with increased nutrient loading, will undoubtedly result in deterioration of the system (DWA, 2014). This potential impact is rated at a national scale, as continual abstraction of large volumes of water that erode the ecological reserve will affect estuarine health and functioning, and all biota (both plants and animals), which would decrease the overall importance of the system for conserving estuarine biodiversity.
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 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.
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.

Aspect	Impact
	Materials deposited in the estuary and riparian areas may lead to the accumulation of sediment and debris, and cause consequent blockage and back flooding.
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.
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') 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.
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 Sheffield 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. 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

Aspect	Impact
	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.
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 Tinley 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 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 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.
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.

Aspect	Impact
	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 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.
Cumulative Impacts Associated with the Sheffield WWTW	The authorisation and construction of the Sheffield WWTW was approved through a formal EIA process, wherein the impacts associated with discharging treated wastewater to the Umhlali Estuary were assessed. A Water Use Licence Application (WULA) initiated by Sembcorp Siza Water is also in progress. Based on stringent water restrictions, Sembcorp Siza Water is seeking to reclaim as much water as possible from the incoming effluent for reuse. However, discharge into the estuarine environment must be anticipated. The impacts of treated waste water on the estuarine environment were assessed by the Estuarine Specialist as part of this EIA for the Tinley Manor Southbanks. Specific mitigation measures have been provided in consultation with a Waste Water Treatment Specialist for implementation at the Sheffield WWTW. However, management of the WWTW and implementation of these measures is the responsibility of Sembcorp Siza Water and not for THD.

7.6.6 Amendments to the Concept Plan

7.6.6.1 Change from draft EIAR (February 2015) to final EIAR (February 2016) – first Amendment

- The development is no longer a "gated" estate but rather a new village with numerous mixed uses and residential densities, and includes a coastal resort development opportunity (the number of resort sites has been reduced from four to one). Smaller, individual complexes can be found in each residential node.
  - The primary impact in this regard is a slight increase in the developable footprint due to the removal of the agricultural/market gardening concept (See bullet below).
  - In terms of construction, natural vegetation may not be removed and the estuarine buffer may not be encroached upon, including allowances for development platform slopes. This should also apply to wetland buffers and all areas considered 'conservation amenity'.
  - A larger number of smaller developments will require more effective management of certain activities (e.g. waste management / refuse removal, water conservation, vegetation clearing) to prevent degradation of the coastal and estuarine environments. Every effort must be made to ensure that environmental best practice is followed, through lease agreements signed between estate managers/land owners and residents.
  - Access points from each development node to the estuary shoreline must be prevented as far as is practically possible. This is to reduce vegetation destruction, habitat and wildlife disturbance, pressure on estuarine living resources (e.g. fishing, bait collection). Access must be well-managed i.e. access routes consolidated and limited to a few strategically placed access points.
  - All residents and visitors should be made aware of the value and biodiversity of the Umhlali Estuary.
  - The necessary authorities should be consulted regarding monitoring of the area in terms harvesting (e.g. inspection of fishermen). It would be beneficial for conservation stewards / rangers to be assigned to monitor activities and alert the authorities.
  - Secondly, the potential increase in hard surfaces, including potential expansion of the road network, will result in increased stormwater run-off.
  - The integrated stormwater management system must be updated to accommodate the increased run-off volumes and effectively reduce flow velocities as well as ensure polishing of contaminated water.
  - Under no circumstances should stormwater be discharged directly into the Umhlali Estuary.
  - A monitoring program should be implemented for all water features, including the estuary, to assess changes in water quality and to ensure timely mitigation / emergency measures are implemented.

- The site emergency response plan may not, under any circumstances, involve discharge of contaminated water in stormwater attenuation ponds (e.g. nutrients, sewerage, etc.) to the estuary.

- The Agricultural Village concept, which included market gardening, banana plantations, and irrigation ponds, is obsolete. Almost all of these areas have been incorporated into the development footprint, and the remainder has been included in the conservation amenity.
  - The planned agricultural zones and irrigation ponds presented a potential threat to the Umhlali Estuary in the form of erosion of sediment and siltation of the estuary, nutrient loading leading to eutrophication of the water body, and as sources of substances toxic to aquatic life (i.e. herbicides, pesticides).
  - The removal of these areas significantly reduces the potential risks associated with the previously proposed agricultural activities.
  - This is beneficial to ensuring the health of the Umhlali Estuary, provided that an adequate and effective stormwater management system is employed (as above).
- Rehabilitation of the parts of the northern bank in terms of eradicating alien vegetation is no longer applicable as this area is outside the refined cadastral boundary of the development.
  - Rehabilitation of this area would contribute positively to enhancing the ecological state of the Umhlali Estuary.
  - In its current state, this area provides a seed source for the establishment and infestation by invasive species of open areas within the proposed development area.
  - Clearing of land for construction must take place in a phased manner to prevent the creation of open soil that is vulnerable to alien plant infestation.
  - Open areas must be rehabilitated with indigenous vegetation as soon as possible following construction completion.
  - An on-going alien vegetation eradication programme must be developed for the construction phase as well as the life span of the Southbanks Development.
- Specially designated recreational areas adjacent to the estuary are obsolete and have for the most part been included in the conservation amenity
  - This will have a small but positive impact on the Umhlali Estuary such that the size of the conserved habitat area is increased.
  - The removal of designated recreational areas ensures that only ecologically sensitive recreational activities are permitted in these areas, e.g. hiking, bird watching, cycling etc.
- All wetland areas, areas earmarked for rehabilitation, and dune and estuarine vegetation, have been consolidated under a single conservation amenity layer. Formal open space areas are located within the various nodes.
  - The conservation amenity, and its constituents, must be managed in a holistic manner in line with the principles of protecting sensitive habitats, rehabilitating degraded habitats, enhancing biodiversity, and maintaining buffer areas to development or disturbance.
  - A comprehensive management and rehabilitation plan should be developed for the conservation amenity, which should include permissible and non-permissible activities for each type of conservation area, i.e. wetlands, degraded areas, dunes and estuary. Activities within the conservation area should be limited to ecologically sensitive recreational activities, e.g. hiking, bird watching, paddling, cycling, etc.
  - The vegetation palette for formal open spaces and recreational areas should only comprise locally indigenous plant species.
  - It is strongly recommended that the application of pesticides and herbicides in these areas be strictly prohibited.

The deviations from the original design concept and layout, upon which the original impact assessment and specialist comments were made, are not considered to have a significant additional impact on the estuary provided that the above-mentioned recommendations, as well as those in the Specialist Report, are heeded.

The specialists are satisfied that the said features have been informed by experts in the field of wetland rehabilitation and landscape design.

7.6.6.2 Change from final EIAR (February 2016) to amended EIAR (March 2017) – second Amendment

Table 7-12 provides a summary of the implications of the amendments to the Concept Plan to the Estuarine Assessment.

Table 7-12: Description of changes to the layout and their applicability to the Umhlali Estuary

Documented Changes	Applicability
Land Use Planning (See *Figure 3-19*)	
Road reserves for all major roads widened to accommodate latest road designs ①	Stormwater run-off will increase with increased area of hardened surface. However, this is deemed to be adequately addressed in the estuary impact report.
The road reserve in the south-east corner amended to provide for future access, pedestrian access and / or emergency access point to adjacent existing development ②	The risk of disturbance to the estuarine functional area and supporting habitats may increase and potentially increase steadily overtime with improved access to the area and estuary.
The coastal access road northwards from P228 through the site has been classified as a Class 3 road, therefore no access is permitted to adjacent sites. Accordingly, the Retail 1 site at corner of this access road and the proposed Primary Spine Road has been expanded southwards to accommodate road access off the Spine Road ③	N/A
Provision of additional indicative future road and / or pedestrian access and / or emergency access options to adjacent land or development ④	The risk of disturbance to the estuarine functional area and supporting habitats may increase and potentially increase steadily overtime with improved access to the area and the estuary.
Coastal portion of the Secondary Spine Road widened and realigned to accommodate latest road designs ⑤	Stormwater run-off will increase with increased area of hardened surface. However, this is deemed to be adequately addressed in this estuary impact report.
Minor refinements to concept block outline based on preliminary design of roads and / or services networks ⑥	N/A - All design changes are maintained outside the 10 m topographical contour which extends beyond the estuarine functional zone (5 m contour).
Education site inland of N2 now called Community site ⑦	N/A
Yields amended to reflect more detailed work undertaken during the course of 2016 – the number of units therefore increases from 4,336 to 4,532.	The increase in units will result in increased population numbers in the area in general. The risk of disturbance to the estuarine functional area and supporting habitats may increase.
Engineering Services: (See *Figure 3-20*)	
Bulk Water Line - The bulk waterline alignment changed from the Seaton Delaval Reservoir to the Tafeni Reservoir. bulk water main will follow the alignment of the P228 and be constructed within the road reserve ⑧. The bulk water main does not form part of this application.	N/A
Sewer The number of sewer pump stations required was reduced from four to three pump stations. Subsequently, slight changes in the sewer network layout were made. ⑨	N/A - All design changes are maintained outside the 10 m topographical contour which extends beyond the estuarine functional zone (5 m contour).
Irrigation An irrigation network and dam have been added to the application ⑩.	The issue of freshwater abstraction (and abstraction from the estuary) is deemed to be adequately covered in this estuary impact report (i.e. abstraction is not supported).
Stormwater Management Facilities (SMF) The stormwater management facilities layout was	N/A – All design changes are maintained outside the 10m topographical contour which extends

Documented Changes	Applicability
changed completely. Alternative solutions had to be found in order to minimise wetland losses. A number of swales have been included in the Stormwater Management Plan.	beyond the estuarine functional zone (5 m contour). Changes to the SMF and the impact on the wetlands are captured in the wetland impact report. The issue of stormwater management is deemed to be adequately addressed in the estuary impact report.
Road Layout Slight modifications to the road layout (as also captured in the concept block layout). This includes: Possible cross connections into Seaton Delaval ④ Road reserve for possible extension of Colwyn Drive to allow another access point ② Realignment of the beach road (this provides the 3rd possible access to Seaton Delaval) ⑤ Widening of road reserves to align with Traffic Impact Assessment ① Provision of wide enough road reserve for the KwaDukuza District Municipality future planned North-South Link Road ①	N/A - All design changes are maintained outside the 10 m topographical contour which extends beyond the estuarine functional zone (5 m contour). Stormwater run-off will increase with increased area of hardened surface. However, this is deemed to be adequately addressed in the estuary impact report.

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 7-13***.

Table 7-13: 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.

The 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 Concept Plan of 2017, 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 3*** are detailed in ***Table 7-14***.

Table 7-14: Coastal impacts, mitigation and implementation

Impact	Description	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.	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 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. In the amendments to the engineering design, a sewer pump station and accompanying containment facility / overflow pond is proposed (sewer pump station 3) adjacent to the Coastal Dune Forest. The installation of waterborne sanitation adjacent to the coastal zone, while preferable to the installation of other systems, is still fraught with potential impacts as a result of sewer pump station malfunction as a result of numerous factors (power failure, varied yields, etc.). Its location outside of the coastal zone and identified adjacent sensitive areas is commended considering the generally accepted economic and design need to locate such	Waterborne sanitation is proposed to be implemented. Additional residential areas and road network proposed to be developed could imply potential additional solid waste and increased contaminated run-off which would need to be mitigated as detailed above. The move away from the previously proposed agricultural concept implies reduced negative impacts from fertilizers and pesticides.

Impact	Description	Implementation
	infrastructure at the lowest point. 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. 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.	
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.	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 concept 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. 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.	Sustainable urban drainage principles have been applied in the stormwater management plan. Other issues have been fully incorporated into the landscape guidelines.

Impact	Description	Implementation
Coastal Vegetation and Natural Habitats	The area under study is currently undeveloped, however, historical land use and agricultural practices have resulted in a number of negative environmental impacts and almost complete land transformation. Current negative impacts identified related to potential continued agriculture practices include further habitat loss, continued loss of sense of place, continued drainage of wetlands and potential eutrophication and chemical contamination from farming practices. Remnant coastal forest and riparian vegetation, while protected from a legislative perspective, could potentially be under threat of transformation through unsympathetic farming practices. The proposed development concept takes due cognisance of the original coastal feasibility assessment undertaken and previous versions of the impact assessment and depicts and incorporates a number of buffered sensitive coastal areas, highlighting them as environmental assets and no-go areas. The relatively intact vegetated dune cordon has been delineated and development proposed only in those areas where no natural vegetation remains. Furthermore, the environmental assets layer also incorporates areas identified for rehabilitation and expansion and low impact recreation. 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.	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 a mixed-use development within and adjacent to the coastal area is likely to negatively impact on fauna and flora. This includes the likely impact on marine living resources, which are likely to be affected by increased pedestrian traffic along the shoreline and estuary.	Applicable / responsible coastal access has been proposed with access to and within sensitive areas managed / controlled via pedestrian systems and elevated boardwalks, where possible.
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.	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

Impact	Description	Implementation
		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.	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. While not part of this specific EIA, the investigation of the provision of a safe swimming beach to accommodate the needs of both the resort and local residents is noted. Should this investigation and subsequent development application be successful, it is noted that the nature of usage of this beach will still be constrained and unable to support high intensity usage, predominately as a result of the adjacent topography as well as lack of vehicular access. It is noted that emergency vehicular access to the proposed public beach and accompanying amenity will be required, as a direct result of the potential risks associated with the use of this beach.

7.7.1 Coastal Access

Access to the coast within this phase of the development is currently limited to “restricted” pedestrian access from the south via Sheffield Beach with there being little access through the actual farmlands. This is primarily due to the nature of the beach, ocean and coastal dune along this portion of the coast.

Notwithstanding the existing limited access and there being no major historical access issues, provision is being made to enhance access to the beach through the development although this will be relatively localised in nature given the environmental and physical constraints.

It is noted that a significantly sized medium impact mixed-use zone is proposed to be provided to the north of the existing town of Tinley Manor providing for the establishment of additional recreational, amenity and beach access at the Tinley Manor Launch Site and which will provide for a more regional role.

7.7.1.1 Boardwalks

A naturally vegetated dune cordon is considered to be the best form of defence in the face of sea level rise and increased impact of coastal storms. The Tinley South Banks indigenous corridor also plays an important role in:

- preserving “sense of place”;
- preventing encroachment of sand into areas leeward of the beach;
- providing a buffer against coastal winds and salt spray; and
- provides a corridor for botanical genetic movement and expansion.

Given the proposed location of the boardwalk within the sensitive coastal environment, site-specific conditions (topography and vegetation) must to be taken into account to ensure minimum impact on the receiving environment whilst ensuring acceptable levels of access, amenity and utility.

Potential impact of boardwalks is detailed below:

- ***Negative:***
  - Potential additional maintenance requirements dependent on materials used;
  - Initial impact on vegetation and surrounds during construction;
  - Potential source of both pollution and alien vegetation ingress as a result of access as well as initial construction disturbance; and
  - Potential impact on drainage and disruption of soils.
- ***Positive:***
  - Allows for continued protection of vegetated dune environment (natural defence);
  - Preserves sense of place and enhances the coastal landscape character;
  - Reduces trampling of natural flora;
  - Manages / controls access; and
  - Reduces the potential of dune ‘blow-outs’ as a result of inappropriately designed access.
- ***Cumulative:***
  - Facilitation of access to the coastal environment;
  - Access to the beach provided where previously access was not possible; and
  - Increased understanding of coastal processes and features via potential education programmes.

7.7.2 Amendments to the Concept Plan

7.7.2.1 Change from draft EIAR (February 2015) to final EIAR (February 2016) – first Amendment

- ***Climate change vulnerability*** – No additional impacts noted or mitigation proposed. The proposed development remains back from the identified coastal hazard zone as well as limited development line.
- ***Pollution*** – The additional residential areas and road network proposed to be developed could imply potential additional solid waste and increased contaminated run-off which would need to be mitigated as

previously detailed. The move away from the previously proposed agricultural concept implies reduced negative impacts from fertilizers and pesticides.

- ***Stormwater run-off and contamination*** – The incorporation of portions of the identified stormwater management facilities within proposed development areas as the remaining areas inclusion within the conservation zoned open space are noted with concern. The former reducing the size of ponds dictated by the Stormwater Management Plan while the latter, proposing development within the conservation zone setting potentially dangerous precedent. This matter has been addressed as part of the Stormwater Management Plan.
- ***Soil erosion*** – No additional impacts noted or mitigation proposed.
- ***Protection of coastal vegetation and natural habitats*** – No additional impacts noted or mitigation proposed other than slightly reduced size of conservation / green areas.
- ***Use of natural resources*** – The number of potential users could potentially increase with the increased developable area as well as the change in land use from resort to residential. The need to manage the remaining open space system holistically is therefore reiterated. Applicable / responsible coastal access previously proposed with access to and within sensitive areas managed/ controlled via pedestrian systems and elevated boardwalks, should be maintained.
- ***Sense of place*** – No additional impacts noted or mitigation proposed.
- ***Amenity / recreational opportunities*** – While not part of this specific environmental impact assessment, the investigation of the provision of a safe swimming beach to accommodate the needs of both the resort and local residents is noted. Should this investigation and subsequent development application be successful, it is noted that the nature of usage of this beach will still be constrained and unable to support high intensity usage, predominately as a result of the adjacent topography as well as lack of vehicular access. It is noted that emergency vehicular access to the proposed public beach and accompanying amenity will be required, as a direct result of the potential risks associated with the use of this beach.
- ***Coastal access*** – Initial concerns regarding the previous gated-estate concept were noted and subsequently addressed. Mitigation measures previously proposed still apply.

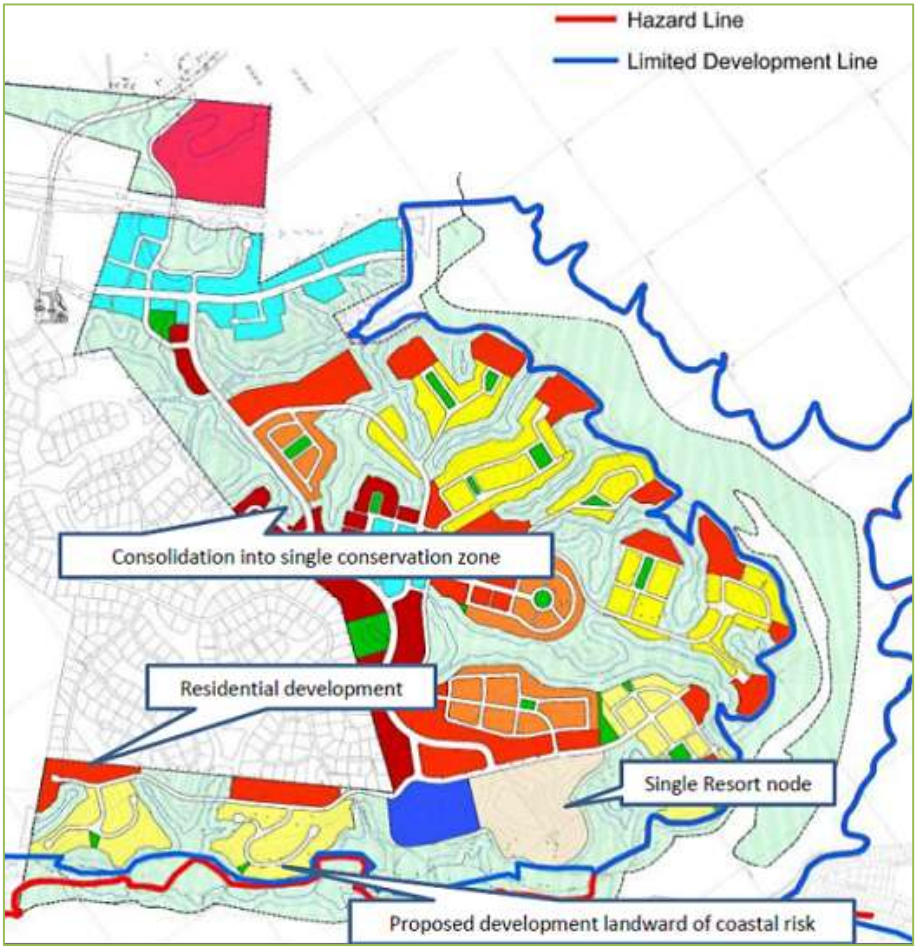


Figure 7-18: Annotated revised Concept Plan including Hazard and Limited Development Line

The deviations from the original design concept and layout, upon which the original impact assessment and specialist comments were made, are not considered to have a significant additional impact on the coastal environment provided that the above-mentioned recommendations are heeded.

7.7.2.2 Change from final EIAR (February 2016) to amended EIAR (March 2017) – second Amendment

Table 7-15 provides a summary of the implications of the amendments to the Concept Plan to the Coastal Assessment.

Table 7-15: Description of changes to the layout and their applicability to the Coastal Zone

Documented Changes	Applicability
Land Use Planning (See *Figure 3-19*)	
Road reserve for all major roads widened slightly along the length of the road, all polygons were 'shaved' to reflect the new road reserve ①	Not specifically applicable to the coastal zone.
The road in the south-east corner amended to facilitate a connection to the neighbouring settlement ②	This amendment will encourage accessibility along the coast as well as access to the coast.
The main access road north-south reclassified as a Class 3 road, therefore no access permitted to adjacent sites, Retail 1 site extended south to accommodate access off main east-west spine ③	Not specifically applicable to the coastal zone.
Indicative future link options to neighbouring settlements ④	Not specifically applicable to the coastal zone.
Lower coast road widened and realigned ⑤	This amendment will encourage accessibility along the coast as well as access to the coast.
Some minor amendments to concept block outline based on detailed design explorations ⑥	These amendments are all located landward of identified coastal risk.
Yields amended to reflect more detailed work undertaken during the course of 2016 – the number of units therefore increases from 4,336 to 4,532.	The increase in the number of units could imply potential additional solid waste and stormwater run-off but all potential impacts are adequately mitigated.
Engineering Services: (See *Figure 3-20*)	
Bulk Water Line The bulk waterline alignment changed from the Seaton Delaval Reservoir to the Tafeni reservoir. Bulk water main will follow the alignment of the P228 and be constructed within the road reserve. The bulk water main does not form part of this application.	Not specifically applicable to the coastal zone.
Sewer The number of sewer pump stations required was reduced from four to three pump stations. Subsequently, slight changes in the sewer network layout were made. ⑦	The impact of the location of one of the sewer pump stations in proximity to the coastal zone assessed and mitigation measures proposed.
Irrigation An irrigation network and dam have been added to the application ⑧	Not specifically applicable to the coastal zone.
Stormwater Management Facilities (SMF) The stormwater management facilities layout was changed completely. Alternative solutions had to be found in order to minimise wetland losses. A number of swales have been included in the Storm Water Management Plan.	Not specifically applicable to the coastal zone.
Road Layout Slight modifications to the road layout (as also captured in the concept block layout). This includes: Possible cross connections into Seaton Delaval ④ Road reserve for possible extension of Colwyn drive to allow another access point ② Realignment of the beach road (this provides the 3rd	Amendments will encourage accessibility both to and along the coast as well as support physical access to the coast.

Documented Changes	Applicability
possible access to Seaton Delaval) ⑤ Widening of road reserves to align with Traffic Impact Assessment ① Provision of wide enough road reserve for the KwaDukuza District Municipality future planned North South Link Road ①	

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 7-19***.

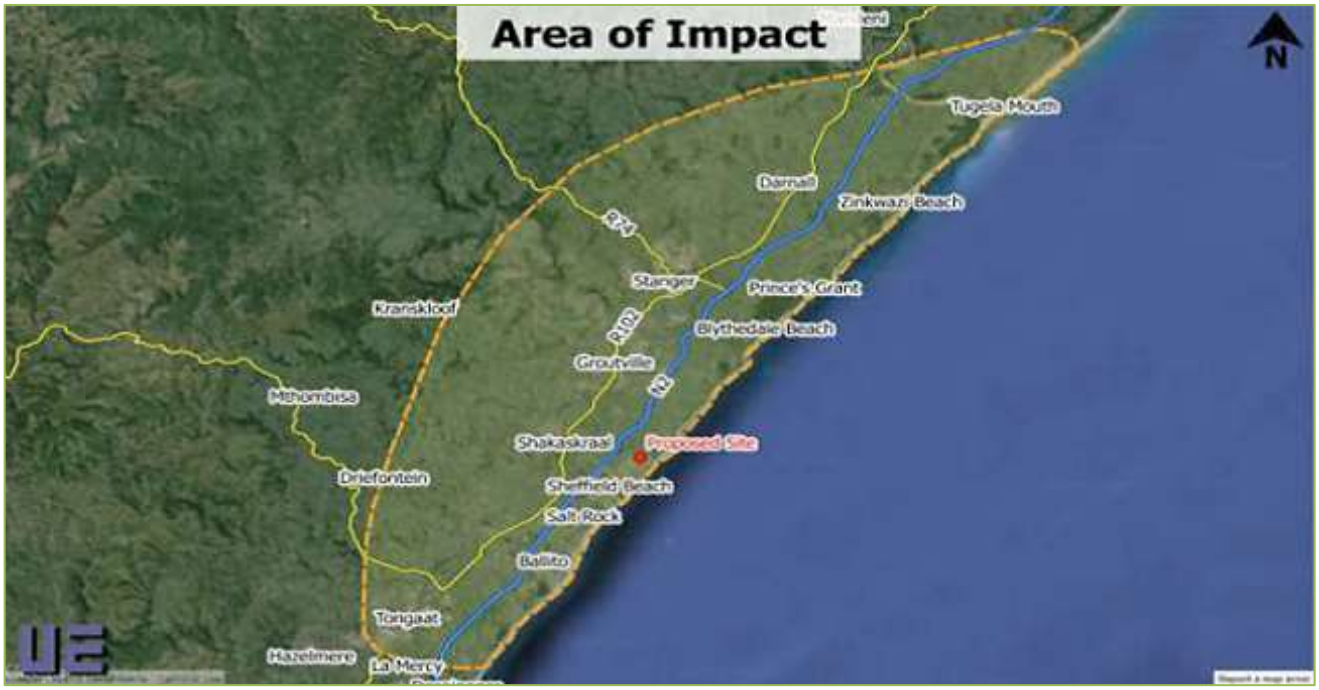


Figure 7-19: Primary and secondary impact areas

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 R 9.8 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 R 75 million by 2020 and this is expected to increase to R 2.9 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 R 12 billion of new business sales will be created directly and indirectly in the regional economy;
- This will translate to a total value addition of R 4 billion to Gross Geographic Product;
- The households benefitting from economic activity created by the capital expenditure will see their income increase by R 2.1 billion;
- The capital expenditure phase will create a total of 46 784 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 R 291 670 000, 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 R 323 million of new business sales will be created directly and indirectly in the regional economy;
- This will translate to a total value addition of R 220 million to Gross Geographic Product;
- The households benefitting from economic activity created by the capital expenditure will see their income increase by R 74 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.

Urban-Econ has reviewed the changes to the layout of Tinley Manor Southbanks and have undertaken the impact modeling on the proposed new layout. The proposed new layout has an associated total capital expenditure of R9.8 billion. While this is lower than the initial capital figure R12 billion used in the 2013 report the impact remains very positive.

7.9 Traffic Impact Assessment[16]

7.9.1 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); and
- P228 interchange towards Sheffield Beach (planned).

The planned future P228 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. This road falls under the jurisdiction of the KwaZulu-Natal Department of Transport.

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. This road falls under the jurisdiction of the KwaZulu-Natal Department of Transport.

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. This road falls under the jurisdiction of the KwaZulu-Natal Department of Transport.

[16] *The information in this section has been taken from the TIA for Tinley Manor Southbanks (2016) and Technical Notes (2017) prepared by Aurecon and can be found in Appendix C 9.*

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. This road falls under the jurisdiction of the KwaZulu-Natal Department of Transport.

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. This road falls under the jurisdiction of the KwaZulu-Natal Department of Transport.

7.9.1.2 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 7-20***.

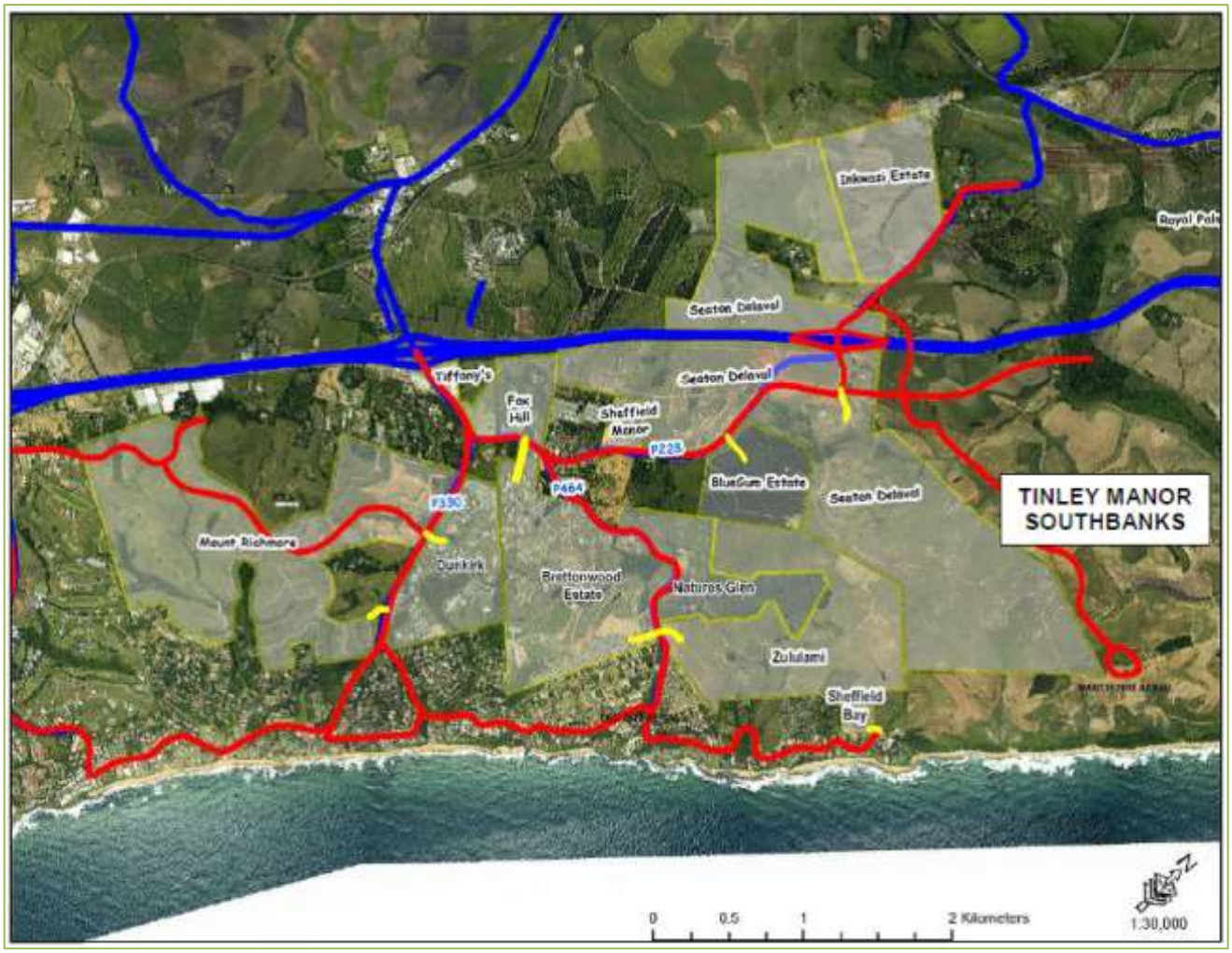


Figure 7-20: Adjacent and surrounding developments

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 or 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.

7.9.1.3 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.

7.9.1.4 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 7-21***) 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.

Traffic counts were undertaken again in August 2015 at the following locations (***Figure 7-22***) and the TIA updated accordingly:

- N2/Salt Rock interchange (P330) (both intersections);
- N2/Tinley Manor (P467) interchange (both intersections);
- The P330/P474 intersection;
- The P474/P228 intersection;
- The P228/P467 intersection; and
- N2 Northbound and Southbound at Umhlali River.

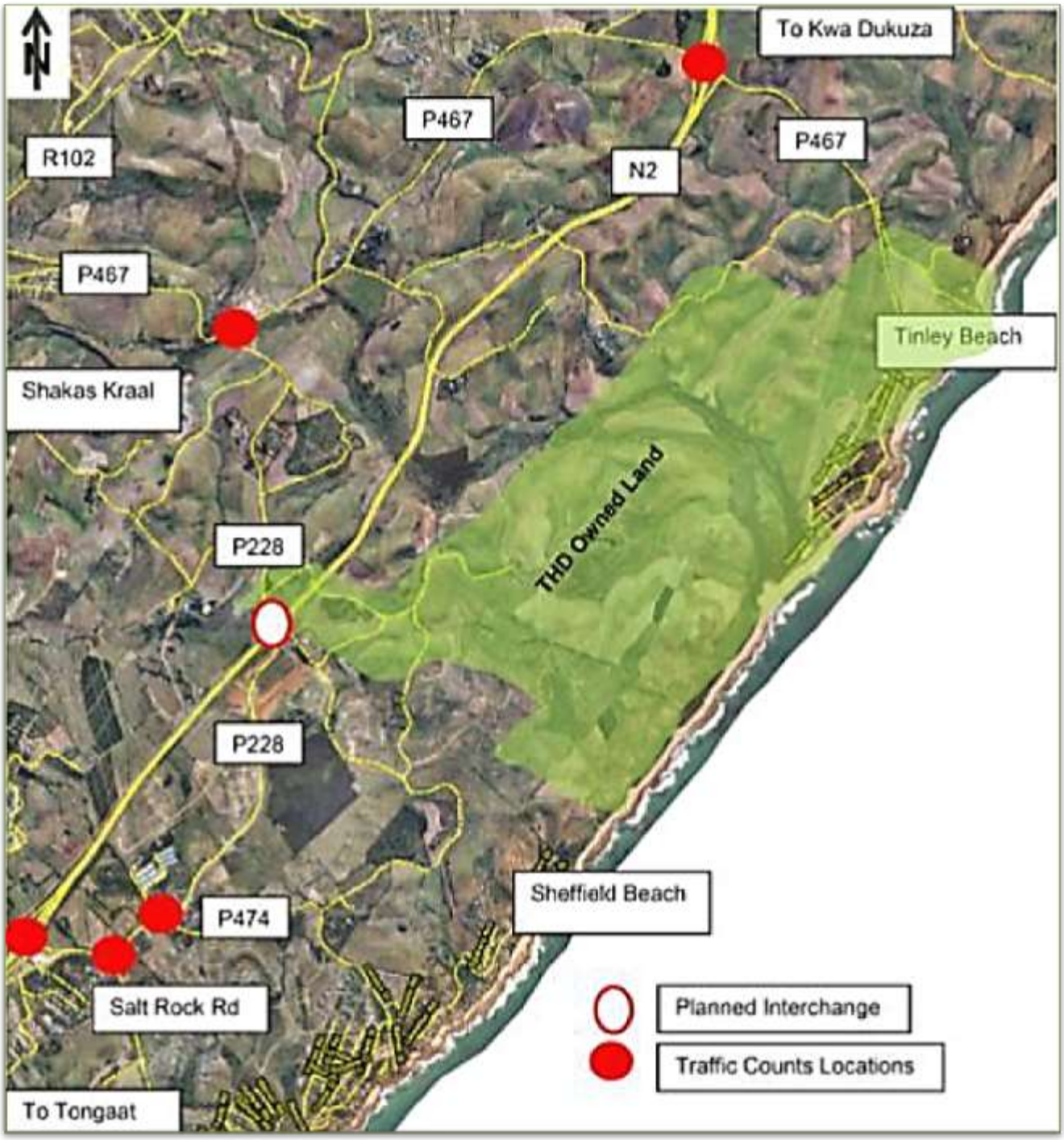


Figure 7-21: Traffic count locations (August 2012)

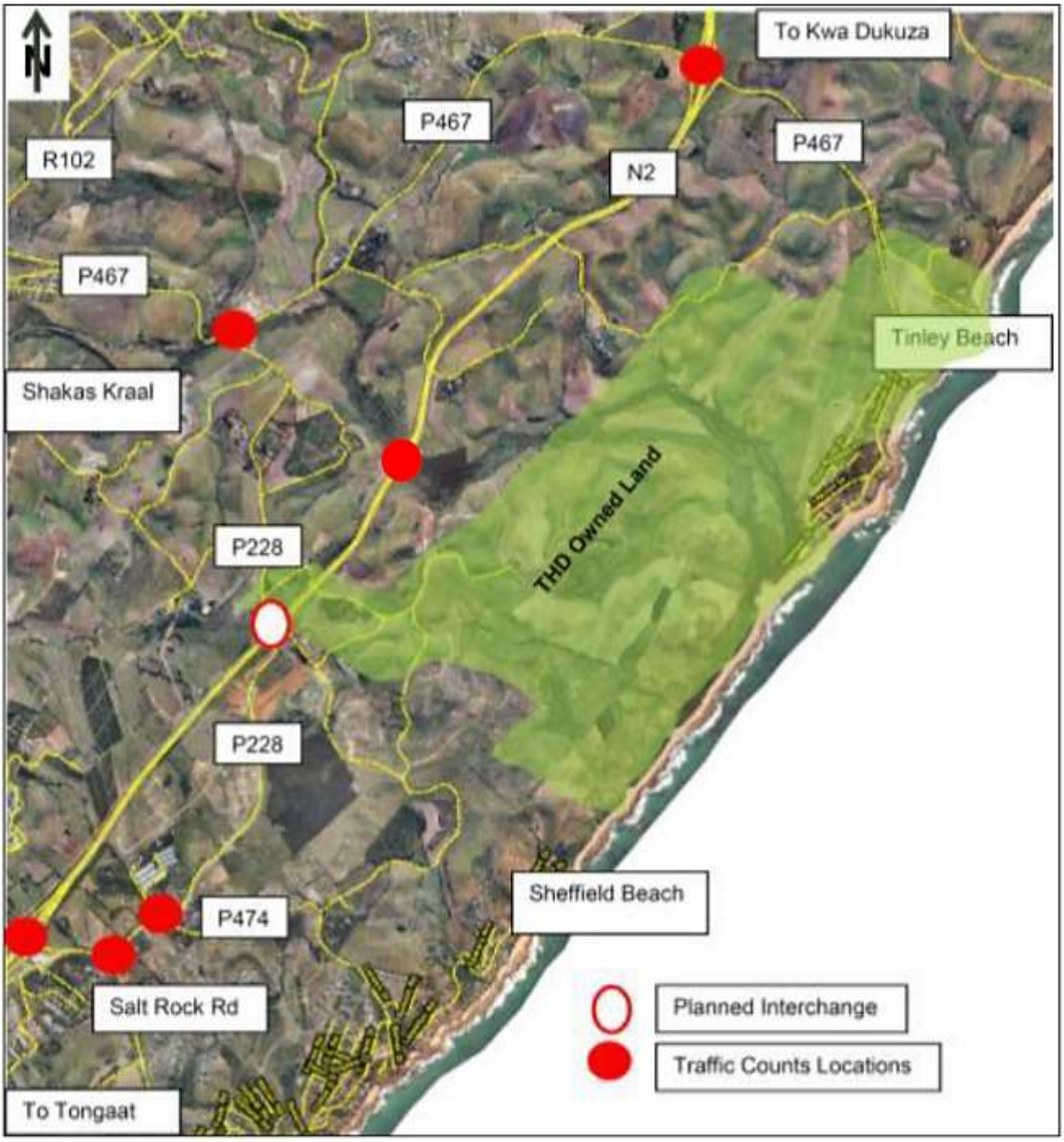


Figure 7-22: Traffic count locations (August 2015)

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 7-23***.

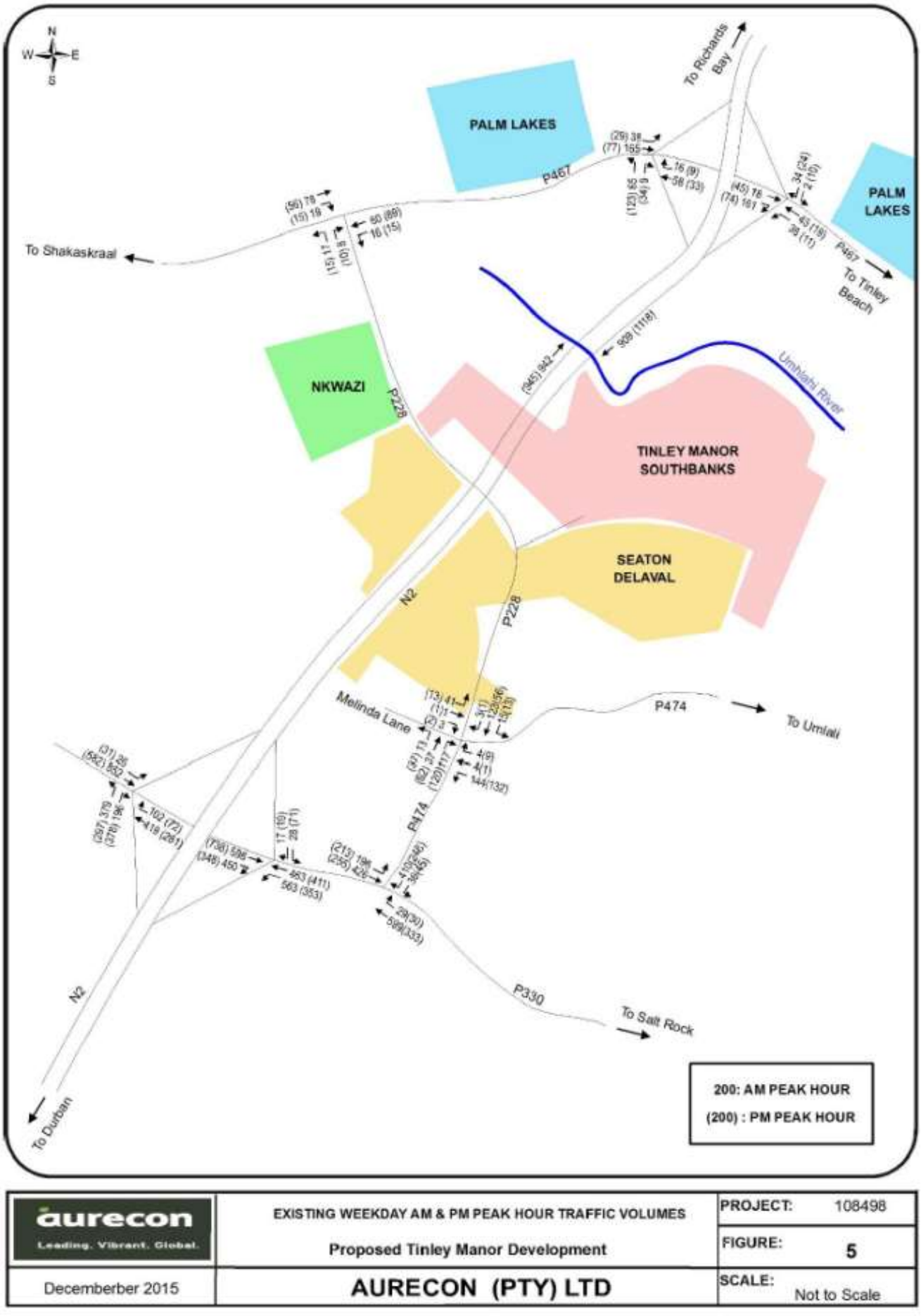


Figure 7-23: Existing peak hour traffic flows (August 2015)

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.

The following observations can be made:

- P330 / N2 Interchange Western Ramp Intersection – It can be seen that, in both peak hours, the level of service on the northbound off ramp is F for both the left and right turn movements while the through movements on P330 are operating at very good levels of service. This is fairly typical of a priority junction where there are high volumes on the through road. The AM LOS F and PM LOS F exhibit long queue lengths.
- P330 / N2 Interchange Eastern Ramp Intersection – It is evident that, in both peak hours, the level of service on the southbound off ramp is unacceptable. The right turn movement onto the south bound onramp is also unacceptable. Due to the severe congestion encountered at this intersection, improvements will be required in the base year.
- P330 / P474 Intersection – It can be seen that the P474 approach is operating at a LOS F in both the AM and PM peak hours due to the heavy and continuous through flows on P330. There is also a high right turn volume from the P474 onto the P330. The indications are that this intersection presently requires upgrading as a result of the existing congestion encountered at this intersection.
- P474 / P228 Intersection – It is evident from the diagrams above, that no congestion is encountered at this intersection. Acceptable delay and queue lengths are encountered at this intersection. As such no upgrades are required for the existing volumes of traffic passing through this intersection.
- P467 / N2 Interchange Western Ramp – This intersection operates at good Levels of Service in both peak hours, primarily due to the low traffic volumes experienced at present. Acceptable delay and queue lengths are encountered at this intersection. As such no upgrades are required in the base year.
- P467 / N2 Interchange Eastern Ramp – It is evident from the diagrams above, that no congestion is encountered at this intersection. Acceptable delay and queue lengths are encountered at this intersection. As such no upgrades are required for the existing volumes of traffic passing through this intersection.
- P228 / P467 Intersection – This intersection operates at good Levels of Service in both peak hours, primarily due to the low traffic volumes experienced at present. Acceptable delays and queue lengths are encountered at this intersection. As such, no upgrades are required in the base year.

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 local intersection analysis shows a number of critical intersections are operating at unacceptable levels of service, experiencing congestion and hence currently require upgrading. These intersections will need to be upgraded due to the existing background traffic and also to accommodate traffic from approved undeveloped land.
- The increase of background traffic in the 10 year horizon along with the traffic generated by the development of Tinley Manor, Seaton Delaval, Palm Lakes, Nkwazi and several other smaller residential developments travelling through these intersections means they will experience severe congestion in the 10 year horizon.
- To alleviate the stress caused by this increase of traffic, a new proposed diamond interchange on the N2 proposed to be called Sheffield interchange will need to be constructed in the 10 year horizon (i.e. 2026).
- The traffic analysis with the introduction of this new interchange shows local intersections will be able to operate at acceptable levels of service with minor intersection upgrades in 2026.
- Upon the introduction of this new interchange, majority of the traffic generated from Tinley Manor Southbanks will use this interchange to access the N2.
- The analysis of the 20 year horizon has revealed the following:
    - The increase of background traffic and all developments generated traffic requires substantial upgrades to the local road network. This includes both intersection upgrades along with link upgrades.
    - The large volume of Friday PM peak hour traffic volumes, a result of commuter trips returning from south on the N2 means a very large right turn volume is encountered at the proposed Sheffield interchange. This warrants the introduction of a south to east directional ramp at this interchange.
    - The large volume of trips generated by Tinley Manor Southbanks in the AM peak hour requires an underpass be constructed under the P228 that commences at Tinley Manor Southbanks and merges with the proposed Sheffield beach eastern terminal southbound onramp.
    - It is recommended that a cost sharing agreement with adjacent landowners, SANRAL, DOT and local municipalities be entered into in funding the proposed Sheffield Interchange.
- 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.

7.9.5 Clarification

Aurecon has reviewed the comments and concerns raised by the KZN EDTEA and provided the following clarification:

- The Sheffield Manor development is complete and operational, the traffic generated by the Sheffield Manor forms part of the background traffic volumes and therefore these traffic volumes were captured in the traffic counts that were carried out. As such, the traffic volumes from the Sheffield Manor were included in the traffic analyses undertaken in the TIA.
- The TIA was based on the manual developed by the National Department of Transport titled *"Manual for Traffic Impact Studies (RR93 / 635)"* which states that the road network must be analysed for the typical AM and PM peak hours only for this particular type of development scheme. In accordance with this manual, the focus of this TIA was the typical peak hours and not the off-peak periods of the day or week when the so called "lifestyle trips" are made to places of leisure, sport, shopping, worship, etc. Since the largest hourly traffic volumes on the road network occur during the peak hours, the worst case scenario on the road network has been assessed and as recommended in the TIA the road network improvements will accommodate the "lifestyle travel patterns" which generally happen outside of the typical peak hours.
- The trip generation rates used in the TIA for the proposed development scheme has been directly extracted from the *Manual for Traffic Impact Studies (RR93 / 635)* mentioned above. The TIA has been approved by the KZN Department of Transport who have raised no objection to the trip generation rates and the methodology used in the TIA since these calculations were undertaken strictly in accordance with the above mentioned manual.
- The phasing of the Tinley Manor Southbanks Development along with the traffic generated by the surrounding major proposed developments has been taken into account to develop a proposed phasing plan to upgrade the external road network in the 5 year development scenario, the 10 year development scenario and the 20 year development scenario. The summary of this phasing plan has been provided in Technical Note 3: Proposed Phasing Plan for the Upgrade of the External Road Network for the Tinley Manor Southbanks Development.
- The detailed upgrade plan for the P228 has been provided in Technical Note 3. Further to this, the TIA makes reference to the upgrading of the P228 in section 12.1 (the 10 year horizon upgrades) & section 12.2 (the 20 year horizon upgrades). The Traffic Road Layout for the upgrade of the P228 has been provided as per drawing 108498/02 (***Appendix C 9***).
- The upgrade of the Salt Rock Road (P330) and P228 intersection has been provided in section 12.1 (the 10 year horizon upgrades) of the TIA. The Traffic Road Layout for the upgrade of this intersection has been provided as per drawing 108498/02. Reference can also be made to Technical Note 3: Proposed Phasing Plan for the Upgrade of the External Road Network for the Tinley Manor Southbanks Development.
- The hard surfacing and upgrading of the identified roads has been identified in section 12.1 (the 10 year horizon upgrades) & 12.2 (the 20 year horizon upgrades). The Traffic Road Layout for the upgrade of these roads has been provided as per drawing 108498/02 (***Appendix C 9***).
- Detailed analysis has been carried out for the proposed Sheffield interchange. The phasing of the Tinley Manor Southbanks Development along with the traffic generated by the surrounding major proposed developments has been taken into account to develop the layout of the proposed Sheffield interchange. The Traffic Road Layout for the upgrade of this interchange has been provided as per drawing 108498/01 attached. An AIMSUN model has also been developed based on this interchange layout for the ultimate development scenario (2036). The proposed interchange is also discussed thoroughly in Chapter 9 and 11 of the TIA. As per the TIA, a simple diamond interchange will be needed in the 10 year horizon while a modified diamond interchange that contains a par-clo ramp will be required in the 20 year horizon.
- It is emphasised that the proposed ultimate interchange over the N2 (in the 20 year horizon) is not required solely for the Tinley Manor Southbanks, but is rather a regional recommendation made in the TIA to support Tinley Manor Southbanks and other neighbouring developments. Due to the phased nature of the development, an interchange will only be required once construction of Phase 5 commences. The interchange is not part of this assessment and will be subject to a separate Application for Environmental Authorisation to be undertaken by SANRAL. SANRAL will be responsible for the implementation of the interchange, whilst securing contributions from relevant affected developments. For Phase 1 of Tinley

Manor Southbanks, access via the P228 will be sufficient. A simple diamond interchange will then be required. The proposed simple diamond interchange will need to be upgraded to the ultimate proposed interchange in order to commence with Phase 10 of the development. Similar to the ultimate development, the Diamond Interchange is the responsibility of SANRAL is outside the scope of this application.

- The TIA recommends that the P228 is upgraded. It is reiterated that the upgrade is a regional recommendation for the implementation of Tinley Manor Southbanks and other neighbouring developments. It is further noted that the P228 is administered by the KwaZulu-Natal Department of Transport (KZN DoT) and any upgrade of this road will need to be applied for and implemented by the KZN DoT. Therefore, the upgrade of the P228 is outside the scope of this application. However, the Applicant (THD) and their Traffic Engineers (Aurecon) have engaged extensively with the KZN DoT who have acknowledged and committed to the need to upgrade the P228 (refer to comment in ***Appendix C 9***). The KZN DoT have indicated that the KDM will commence with determining the relevant financial contributions by all developer's and will commence acquiring contributions for the proposed upgrades. As such, the Applicant (THD) cannot commit to a timeframe for the upgrades to the P228.

7.9.6 *Analysis of Construction Traffic*

It is understood that concerns relating to the use of the P228 during the construction phase have been raised and this has been addressed through the Analysis of Construction Traffic (technical note to the TIA) prepared by Aurecon and presented in Technical Note 1 in ***Appendix C 9***.

The purpose of this report is to assess the impact of the construction traffic, that will be generated by the external roadworks and internal construction works for the development, on the road network. The analysis also included the operational traffic that will be generated by the following developments that will also be present on the road network at the time:

- Seaton Delaval;
- Palm Lakes;
- Nkwazi (now Springvale Estate); and
- Blue Gum Estate.

The volume of traffic generated by the proposed construction of the Tinley Manor Southbanks development is based on the estimated number of workers required for the construction as well as an assumption of the economic profile of these workers. Furthermore, the number of construction delivery trucks was estimated based on the quantities for construction materials that will be required for Tinley Manor Southbanks development and the external road works.

The results of the analyses indicated that the number of construction vehicles that will be generated per hour as result of the internal and external construction works will be very low. The analysis of the road network revealed that the construction traffic will not negatively impact on the operational efficiency of the external road network. As such, no additional road network upgrades will be required to accommodate the construction-related traffic volumes.

A Traffic Management Plan (***Appendix B 5***) has been included as part of the EMPr to manage traffic during the construction phase.

7.9.7 *Amendments to the Concept Plan*

Aurecon were presented an opportunity to update the TIA based on the revised Concept Plan and bulk land use table. A letter was subsequently provided by Aurecon stating that:

- In accordance with the latest Concept Plan, the Tinley Manor Southbanks will generate 4317 two way trips in the AM peak hour and 6335 two way trips in the PM peak hour. The revised development scheme for Tinley Manor Southbanks yields a minor increase in the volume of peak hour trips that will be generated by the proposed development.
- In addition, the KZN DoT has suggested that the traffic volumes that will be generated by the proposed Blue Gum Estate development should be included in the traffic analysis as this development has an

approved TIA. The TIA for the Blue Gum Estate development indicated that this development will generate 204 two way trips in the AM peak hour and 204 two way trips PM peak hour. Furthermore, KZN DOT has advised Aurecon that the development scheme for the Nkwazi development (now known as Springvale Estate) has been considerably reduced, and now generates a total 110 two way trips in the AM peak hour and 110 two way trips in the PM peak hour as compared to a total of 1786 two way trips in the AM peak hour and 1821 two way trips in the PM peak hour previously used in the original TIA for the Tinley Manor Southbanks.

- Given the revised development scheme for TMSB and Nkwazi developments coupled with the inclusion of the Blue Gum Estate, the revised volume of trips that will be generated within the study area was presented and the traffic volumes that will be generated by all developments within the study area is substantially lower than the total trips that were analysed in the original TIA for the Tinley Manor Southbanks. Since Aurecon has analysed much larger traffic volumes in the TIA as opposed to the actual trips that will be generated by the revised development schemes for this area, Aurecon are confident that they have analysed the worst scenario in the original TIA. As such, the recommendations made in the original TIA for the upgrading of the external road network will provide the capacity required as per the revised development schemes as the operating LOS of the road network will in essence improve. In light of the above the discussion there is no need to revise the TIA for Tinley Manor Southbanks as the revised volume of trips is substantially lower than the original TIA.

7.10 Visual Assessment[17]

7.10.1 Visual Baseline Assessment

The physical and land use related characteristics are outlined below as they are important factors contributing to the visibility of a development and visual character of the study area. Defining the visual character is an important part of assessing visual impacts as it establishes the visual baseline or existing visual environment in which the development would be constructed. The visual impact of a development is measured according to this visual baseline by establishing the degree to which the development would contrast to, or, conform with, the visual character of the surrounding area.

7.10.1.1 Topography

The study area or visual assessment zone can be broadly described as highly dissected, undulating coastal plains with relatively steep slopes. Directly north of the proposed development site the terrain slopes sharply down toward the Umhlali River, which dissects the study area and creates a steep lower lying valley that drains towards the Indian Ocean.

Due to the undulating nature of the terrain, the typical visual envelope in this area is determined by the location of the viewer within the landscape. Viewers located on higher ridges are afforded relatively wide vistas over the surrounding landscape, while those located on lower slopes and within more enclosed valleys would have more restricted views. Similarly, the location of the development within the landscape will influence its visibility.

As such, where the development is positioned on high-elevation slopes or ridge tops the structures would be highly visible. In this context the aspect of the slope on which the development is located is also important. For example, where the development is located on slopes with a western aspect it is unlikely to be visible from receptors located to the east of the ridgeline.

The undulating nature of the terrain has also resulted in some steep embankments on either side of the N2 Freeway. As a result, views toward the development site from motorist travelling along this road will be partially restricted (***Figure 7-24***).

[17] *The information in this section has been taken from the Visual Impact Assessment for Tinley Manor Southbanks (2017) prepared by SiVEST and can be found in Appendix C 13.*

Figure 7-24: View toward the development site from the N2 (Google Earth street view photograph)

The visibility of the development would also be largely dependent on the prevailing land use and land cover, which is discussed in more detail below.

7.10.1.2 Land Use and Land Cover

Land use within and surrounding the development site is largely characterised by rolling green hills covered by sugarcane plantations with some limited commercial forestry taking place to the south of the development site and other agricultural activities to the south west. A few mines and quarries are also present within the study area.

The development site is traversed by the N2 Freeway in the western portion and the R102 secondary road runs in the western reaches of the study area.

The small coastal town of Tinley Manor Beach is located directly north of the development site on the opposite side of the Umhlali River valley.

Other dominant urban areas within the study area include Shakaskraal in the western extent of the study area, the small town of Umhlali to the west of the N2, the upmarket resort town of Sheffield beach directly south of the development site and Salt Rock in southernmost part of the study area. Several existing residential security estate developments are also located within Sheffield Beach and Salt Rock.

Other built form in the study area includes scattered low density settlements, power lines, several telecommunication masts and a railway line that runs in a north south alignment in the western part of the study area almost parallel to the R102.

Although the KwaZulu-Natal Coastal Belt vegetation unit prevails throughout most of the study area, much of the natural vegetation within the study area has either been transformed by sugarcane fields, other agriculture and urban development. The vegetation cover within the study area is thus characterised by the remnants of subtropical coastal forest, and areas of grasslands, thickets and coastal thornveld. The Subtropical Coastal Lagoon Vegetation unit prevails within the Umhlali River valley.

The sugarcane plantations would offer limited visual screening with typically wide-open views dominating in these areas. Where the natural dense coastal forest and thicket still prevail, it is likely that the vegetation would screen most views toward the development. Within the urban areas in the southern and western part of the study area the visual character will be altered, thus influencing the degree to which the development would contrast with the surrounding environment.

The influence of the level of human transformation on the visual character of the area is described in more detail below.

7.10.1.3 Visual Character

Visual character can be defined based on the level of change or transformation from a completely natural setting, which would represent a natural baseline in which there is little evidence of human transformation of the landscape. Varying degrees of human transformation of a landscape would engender differing visual characteristics to that landscape, with a highly modified urban or industrial landscape being at the opposite end of the scale to a largely natural undisturbed landscape.

Visual character is also influenced by the presence of built infrastructure such as buildings, roads and other objects such as electrical infrastructure.

As mentioned above, other than isolated patches of natural dense coastal bush and urban transformation which prevails within the southern and western parts of the study area, sugarcane plantations are the dominant land use within the study area. Prominent anthropogenic elements include the N2 Freeway, the R102 secondary road, other secondary roads and a railway line.

The southern and western parts of the study area are more visually degraded, which is mostly attributed to the coastal towns of Sheffield Beach and Salt Rock, as well as the more inland towns of Umhlali and Shakaskraal. The visual character within Salt Rock and Sheffield Beach are typical of a residential coastal town with buildings that are predominantly one to three storeys high. However, some high rise flats are located further south along the coastline.

The small coastal town of Tinley Manor Beach to the north of the development site has a visual character that is typical of a rustic coastal holiday town, with buildings that range from one to three storeys high.

In the western part of the study area near Shakaskraal the visual character becomes more transformed. In addition to the residential urban form; retail buildings, industrial warehouses and mining activities are also visible in this area. The proposed mixed-use development would create less visual contrast when viewed from this part of the study area due to the existing infrastructure already present.

The scenic quality of the landscape is an important factor contributing to the visual character or inherent sense of place. Visual appeal is often associated with unique natural features. As such, the Indian Ocean and the Umhlali River valley are important natural features that would increase the scenic appeal and visual interest within the area. Views toward the ocean and across these river valleys are therefore considered valuable natural resources that are driving forces within the local economy and should be preserved.

As the N2 Freeway is set back by over 2.5 km from the Indian Ocean, the proposed mixed-use development, although positioned between the N2 and the ocean, is unlikely to obstruct views toward the sea from this road. The proposed mixed-use development would however alter scenic views over the Umhlali River valley when viewed from residential dwellings on the western edge of Tinley Manor Beach.

Overall the visual character and ‘sense of place’ differs throughout the study area depending on the degree of transformation. The prevalence of sugarcane plantations in the broader area has changed the natural visual character to reflect a state which has been significantly transformed from its original character, but which still display a distinct pastoral sense of place.

These areas are characterised by distinct light green rolling hills with a patch mosaic of darker areas where coastal bush and plantations are present.

Areas with sea or river views would have a scenic character. The visual character would be more transformed within the urban areas and coastal towns.

7.10.1.4 Cultural, Historical and Scenic Value

Cultural landscapes are becoming increasingly important concepts in terms of the preservation and management of rural and urban settings across the world. The concept of ‘cultural landscape’ is a way of looking at a place that focuses on the relationship between human activity and the biophysical environment (Breedlove, 2002).

The cultural landscape concept is relatively new in the heritage conservation movement across the world. In 1992 the World Heritage Committee adopted the following definition for cultural landscapes:

> *Cultural landscapes represent the combined worlds of nature and of man illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal.*

According to the Committee's Operational Guidelines cultural landscapes can fall into the following three categories;

i. *"a landscape designed and created intentionally by man";*
ii. *an "organically evolved landscape" which may be a "relict (or fossil) landscape" or a "continuing landscape"; and*
iii. *an "associative cultural landscape" which may be valued because of the "religious, artistic or cultural associations of the natural element".*

The study area is situated within the Dolphin Coast in northern KwaZulu-Natal. It is typically known for its warm waters, barrelling waves, pristine beaches, and a collection of tidal pools. In addition, various recreational activities take place within the warm Indian Ocean and along the shark protected beaches. They include swimming, surfing, fishing, dolphin and whale watching, kayaking, canoeing, scuba diving, deep sea fishing and walking or horse riding along the beach.

The area also has a rich history embedded in Indian, Zulu, and Colonial cultures.

Based on the above, the study area can be regarded as a type ‘ii’ organically evolving cultural landscape. It can be considered a continuing landscape as the pristine beaches and warm Indian Ocean continues to attract residents and holiday makers, leisure based tourism facilities and recreational activities into the area.

Although the cultural value of the area is important from a visual perspective, the proposed mixed-use development is unlikely to disrupt the inherent cultural value of the area as it is located in close proximity to the existing urban areas of Sheffield Beach, Salt Rock and Tinley Manor Beach, and confirms with the general development trend and land use along the coast.

7.10.1.5 Sensitive Visual Receptor Locations

A sensitive receptor is defined as a receptor, which would potentially be adversely impacted by a proposed development. This takes into account a subjective factor on behalf of the viewer – i.e. whether the viewer would consider the impact as a negative impact. Adverse impacts are often associated with the alteration of the visual character of the area in terms of the intrusion of the development into a ‘view’, which may affect the ‘sense of place’.

The identification of sensitive receptors has been undertaken based on a number of factors which include:

- The visual character of the area, especially taking into account visually scenic areas and areas of visual sensitivity;
- The presence of leisure-based (especially nature-based) tourism in an area; and
- The presence of sites / routes that are valued for their scenic quality and sense of place.

Experiencing visual impacts is highly subjective and involves ‘value judgements’ on behalf of the receptor. It is largely based on the viewer’s perception and is usually dependent on the age, gender, activity preferences, time spent within the landscape and traditions of the viewer (Barthwal, 2002).

Other factors influencing the degree of visual impact experienced by the viewer include:

- The value placed by the viewer on the natural scenic characteristics of the area.
- The viewer’s sentiments toward the proposed structures. These may be positive (a symbol of progression) or negative (foreign objects degrading the landscape).
- Degree to which the viewer will accept a change in the typical character of the surrounding area.

Sensitivity to visual impacts is typically most pronounced in areas set aside for conservation of the natural environment (such as protected natural areas or conservancies), or in areas in which the natural character or

scenic beauty of the area attracts visitors (tourists) to the area. In these areas the proposed mix-use development may be viewed as an unwelcome intrusion that would degrade the natural character and scenic beauty of the area, and which could potentially compromise tourism activities in the area.

A distinction must be made between a receptor location and a sensitive receptor location.

Receptor locations are sites from where the proposed development may be visible, but the receptor may not necessarily be adversely affected by any visual intrusion associated with the development. Receptor locations include locations of commercial activities and certain movement corridors, such as roads that are not tourism routes.

Sensitive receptor locations typically include sites that are likely to be adversely affected by the visual intrusion of the proposed development. They include; tourism facilities and scenic sites within natural settings.

Table 7-16 below provides details of the visually sensitive receptors that were identified during the field investigation.

Table 7-16: Visually sensitive receptor locations in the study area

Name	Details	Proximity to the Development Site
Christmas Bay	Secluded quiet beach with good snorkelling potential	Approximately 30 m at the closest point
Tinley Manor Beach	Swimming beach which includes a tidal pool and has good snorkelling and scuba diving potential.	Approximately 870 m
Residential Dwellings in Tinley Manor Beach	Residential dwellings on the western edge of Tinley Manor Beach have scenic views over the Umhlali River valley. The development could alter the character of these views by transforming the rural character of the sugarcane plantations which are located on the southern banks of the river valley.	Varies, approximately 140 – 700 m

During the site visit it was confirmed that several accommodation facilities are located within Sheffield Beach. These include Dolphin Rock, Villa Cascada on the Beach and Saffron House.

While accommodation and other tourism facilities are usually regarded as sensitive visual receptors, most views from these accommodation facilities within Sheffield Beach have already been transformed by the presence of existing urban form. As such, the mix-use development would not alter the sense of place, compromise the scenic quality of ocean views from these facilities, or, hinder the ability of these facilities to produce revenue.

As such, although ocean view points and other tourism facilities are located within Sheffield Beach, they are not considered to be sensitive visual receptor locations, as they would not be adversely affected by the visual intrusion of the proposed development.

In addition Cane Cutters Resort is located within the far western part of the development site. This resort has not been considered a sensitive visual receptor location as it is proposed that the resort will be demolished and replaced with high density residential dwellings.

Roads that form tourist routes are also regarded as sensitive receptor locations as they are frequently accessed as a way of appreciating the natural beauty of an area or to access tourism facilities. ***Table 7-17*** below provides details of the visually sensitive receptor road that was identified within the study area.

Table 7-17: Visually sensitive sections of road in the study area

Receptor Road	Visual Sensitivity
N2 Freeway	Important national tourism route which links Durban Central to the North Coast
	Passes through an area with a largely rural character
	Used to access various tourism facilities and water sporting activities on the North Coast

The section of the R102 secondary road that falls within the study area is not regarded as a visually sensitive road for the following reasons:

- The road section is located inland from the coast;
- The road section passes through an area that has been visually transformed by urban and industrial form; and
- The road section does not offer scenic views of the Indian ocean as it is located at least 3.5 km inland.

As mentioned above, various recreational activities take place along the Dolphin Coast. They include swimming, surfing, fishing and scuba diving. Viewers taking part in these recreational activities may be exposed to varying degrees of visual impact depending on whether the development conforms with the typical land use, pattern, form and colour of the elements that make up the landscape.

7.10.2 Visual Sensitivity of the Development Site

A visual sensitivity analysis was undertaken to classify the development site into zones of visual sensitivity. Initially zones of visual exposure were established based on the visibility of the development site from sensitive visual receptor locations within the study area.

The land use and visual transformation within the study area was thereafter investigated to establish zones of visual contrast. Areas in close proximity to highly transformed urban areas were classified into zones of low visual contrast and areas within and in close proximity to natural areas were classified into zones of high visual contrast.

The results the visual exposure and visual contrast assessments were thereafter overlaid according to a set weighting criteria in order to classify the entire study area according to zones of high, moderate and low visual sensitivity.

7.10.2.1 Zones of Visual Exposure

In order to classify the development site into zones of visual exposure, ArcGIS technology with the spatial analyst and 3D analyst extensions were used to undertake a visibility analysis from each receptor location. The zones of visibility indicate the geographical area that would generally be visible from each receptor location. Areas of dense bush, plantations and built-up urban areas were also taken into account when undertaking the analysis.

The visible areas were thereafter overlaid to indicate the zones within the study area that would be visible from all the sensitive receptor locations within the study area. Distance radii from each sensitive receptor location were used to establish zones high, moderate and low visual exposure as viewing distance is a critical factor in the experiencing of visual impacts. The visibility of an object tends to decrease exponentially with increasing distance away from the object. The maximum impact would be exerted on receptors at a distance of 500 m or less, and the impact at 1 000 m would be a quarter of the impact of at 500 m away (***Figure 7-25***).

Given the nature of the receiving environment and the potential height of the development as proposed, the visual impact associated with the proposed development would be significantly diminished from more than 3 000 m away (Hull, R.B., *et al:* 1998).

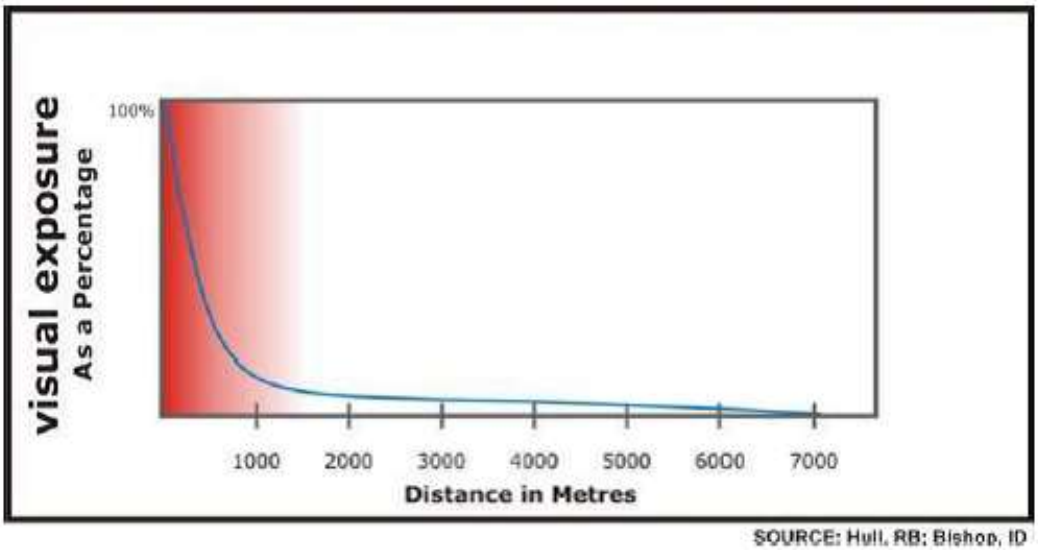


Figure 7-25: Diagram illustrating diminishing visual exposure over distance

As such, the development site was classified according to zones of visual exposure, or areas within which the visual receptors would be exposed to varying degrees of visual impact.

The study area was classified into zones of visual exposure as follows:

- High – 0 ≤ 500 m of a receptor (within the visible zone)
- Moderate – 500 ≤ 1 000 m of a receptor (within the visible zone)
- Low – 1 000 ≤ 3 000 m of a receptor (within the visible zone)
- Negligible / None – 3 000 m </ not within the visible zone

The visual exposure on sensitive receptor locations is provided in ***Figure 7-26*** below.

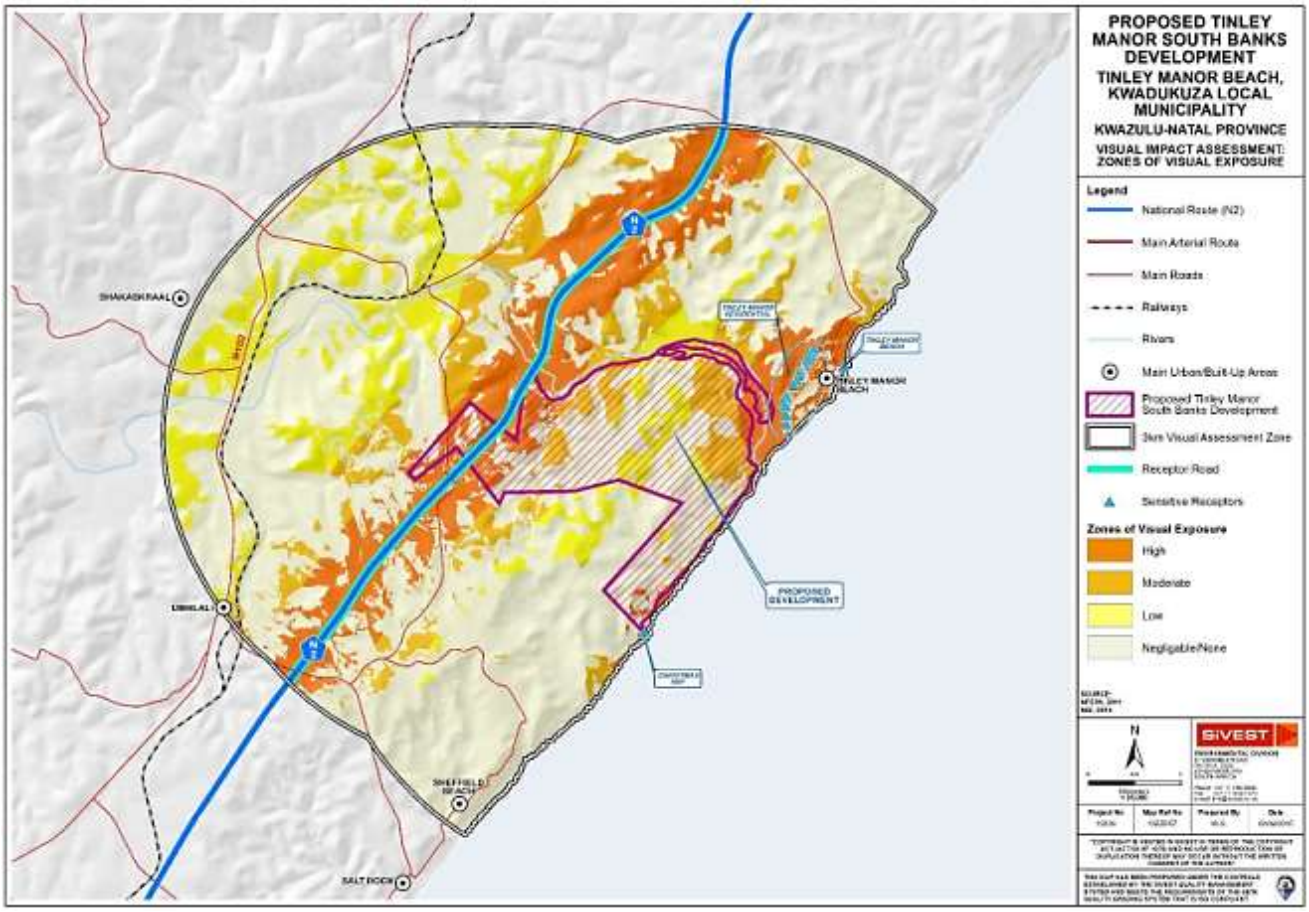


Figure 7-26: Zones of visual exposure

7.10.2.2 Zones of Visual Contrast

The visual contrast refers to the degree to which the development would be congruent with the surrounding environment. It is based on whether or not the development would conform with the land use, settlement density, and the forms and patterns of elements that define the structure of the surrounding landscape.

The visual contrast is an important factor to be considered when assessing the sensitivity of a specific area to a proposed development, as a development that contrasts with the surrounding area may change the visual character of that landscape. This could have a significant visual impact on visually sensitive receptors or important vantage points within the study area.

Based on the land use and visual character in the surrounding landscape, the area was assessed to determine the degree to which the proposed development is visually compatible with the surrounding environment. In the context of this proposed mixed-use development, the presence or absence of existing dense settlement or other urban built-up form is an important factor influencing the level of visual contrast. For example if the development was located adjacent to an existing urban area it would result in significantly less visual contrast.

The development site was therefore classified into the following zones of visual contrast:

- High – Within undeveloped / natural areas (i.e. bare sand / dense bush / grassland / wetlands and waterbodies);
- Moderate – Within intensive agricultural lands / plantations / sugarcane fields / golf courses; and
- Low – Within the low density settlement or within 500 m from built-up/dense settlement and mines / quarries.

The outcome of the visual contrast assessment is provided in ***Figure 7-27***.

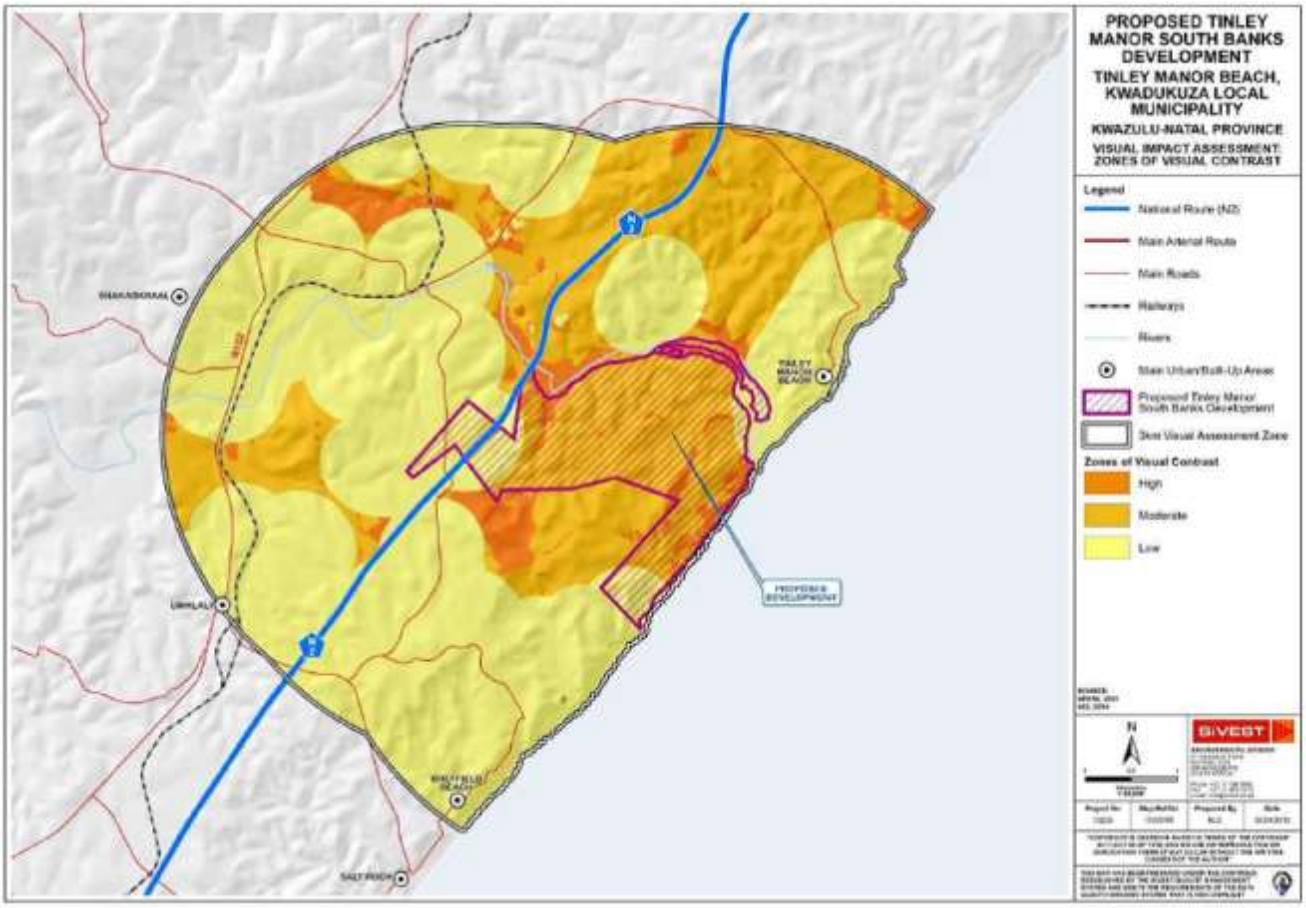


Figure 7-27: Zones of visual contrast

7.10.2.3 Zones of Visual Sensitivity

By combining the results of the visual exposure and visual contrast assessments above, the development site was broken up into the following zones of visual sensitivity:

- ***High*** – Due to the location within natural untransformed areas and the visibility from sensitive visual receptors within close proximity, developing this part of the site would be considered to be a visual intrusion and may elicit opposition from sensitive visual receptors.
- ***Moderate*** – Developing this part of the site would result in moderate negative perception towards the new development as a source of visual impact. These zones of moderate visual sensitivity are either within a short distance from transformed built-up areas but visible from sensitive visual receptor locations within close proximity or within natural untransformed areas but only visible from distant sensitive visual receptor locations.
- ***Low*** – Due to the short distance from transformed built-up areas and the fact that this part of the development site would only be visible from distant sensitive visual receptor locations, developing this part of the site would result in limited negative perception towards the new development.

The overall outcome of the visual sensitivity analysis for the study area is provided in ***Figure 7-28***. In addition the zones of visual sensitivity in relation to the proposed development areas within the development site are indicated in ***Figure 7-29***.

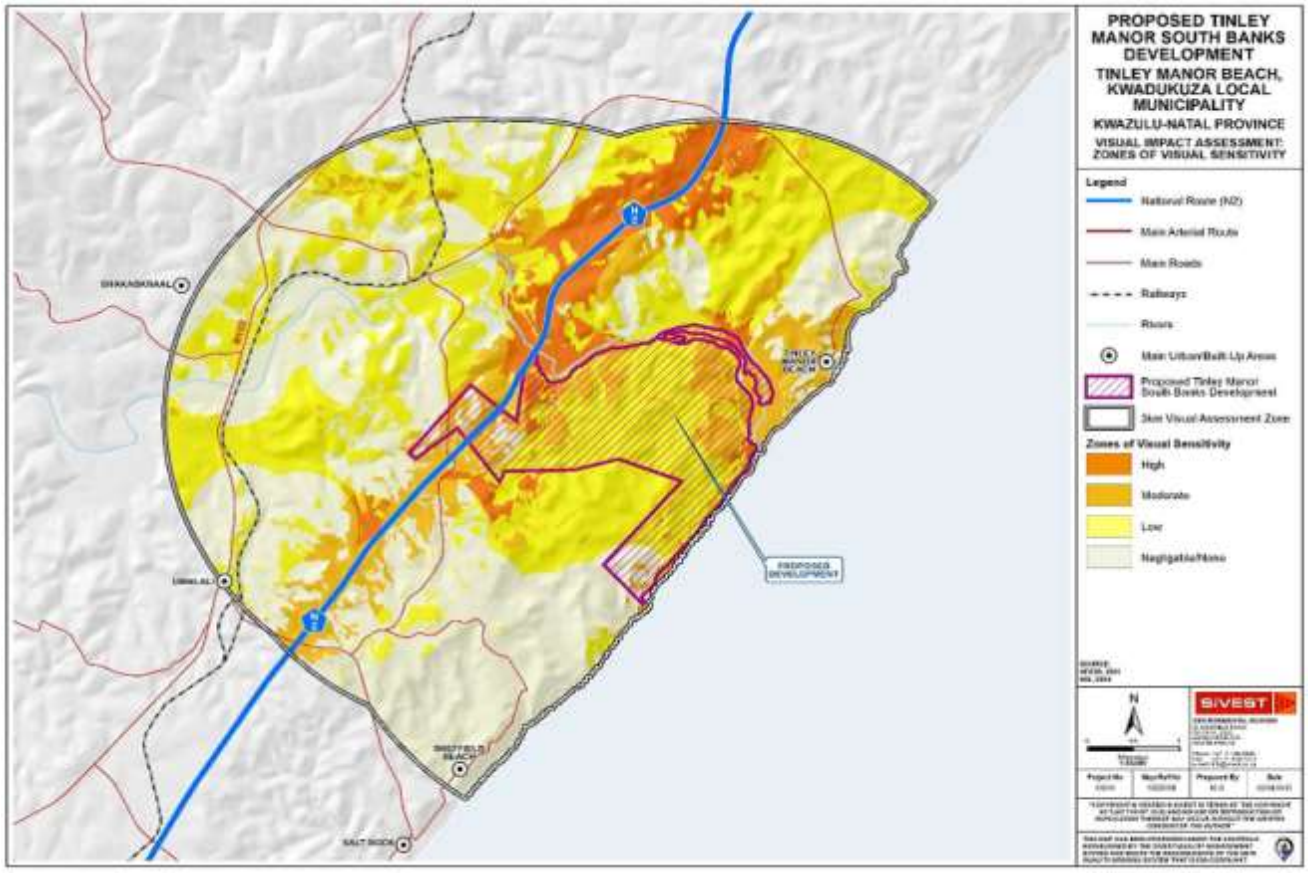


Figure 7-28: Zones of visual sensitivity

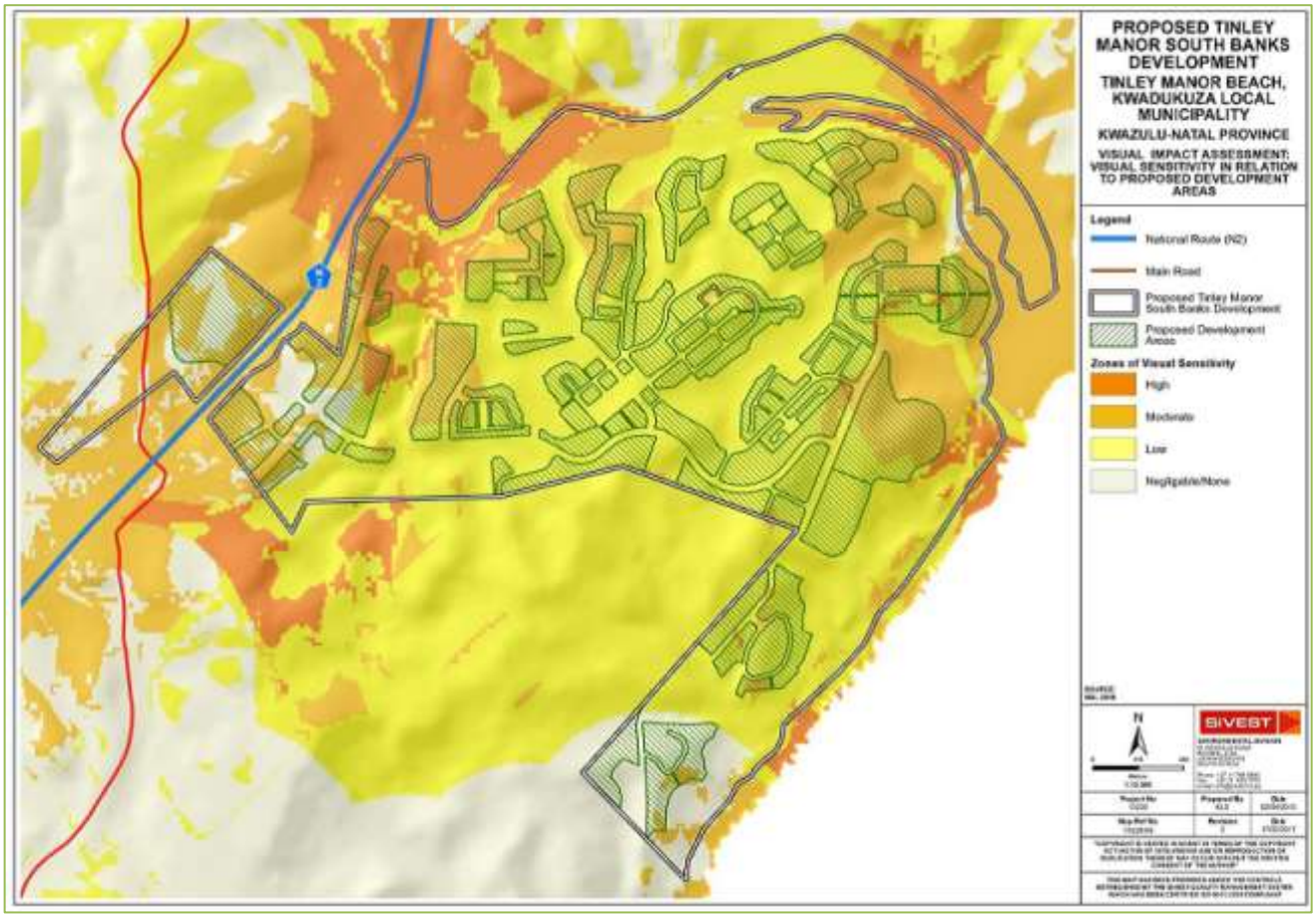


Figure 7-29: Zones of visual sensitivity in relation to the development proposal

Most of the proposed development areas traverse zones of low and moderate visual sensitivity and are considered to be acceptable for the proposed development. However, a small area that is set aside for medium impact mixed use development directly east of the N2 Freeway traverses a zone of high visual sensitivity.

The development within this part of the site would be highly visible to motorists travelling along the N2 and would alter the rural character of the prevailing sugarcane fields. However, the presence of human alteration in the form of exotic trees, telecommunication masts, scattered settlement and built-up urban areas in the far western reaches of the study area, would lessen the visual contrast.

In addition, an area set aside for private resort in the eastern part of the development site directly west of the Umhlali River valley traverses a small area of high visual sensitivity. The proposed private resort development within this area would be highly visible to the residential dwellings on the western edge of Tinley Manor Beach.

As the proposed development would alter the scenic character of views from these dwellings it is recommended that the northern and eastern facing slopes within this zone should be precluded from the development to reduce the impact on these dwellings. This area is indicated in ***Figure 7-29***.

Although the visual impact of the proposed development cannot be reversed, mitigation measures were proposed to lessen the visual impact and should be implemented. These impacts and mitigation measures are presented in ***Section 0***.

7.10.3 Amendments to the Concept Plan

SiVEST have updated their report in light of the amendments to the Concept Plan. The findings of the assessment do not change as a result of the amendments.

7.11 Stormwater Management Plan[18]

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.

7.11.1 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 Stormwater Management Plan (SMP).

Potential impacts and proposed mitigation measures are elaborated on in ***Section 8.3.4***.

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.

[18] *The information in this section has been taken from the Stormwater Management Plan for Tinley Manor Southbanks (2016) prepared by SMEC South Africa and can be found in Appendix B 2.*

7.11.2 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 management 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.

7.11.3 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 stormwater management facilities located outside wetlands but within the 30 m wetland buffer (***Figure 7-30***).

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.
- Stormwater Management 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 stormwater management facilities may be used as storage facilities for the anticipated stormwater run-off. There are a total of forty-two (42) proposed facilities. The facilities for the development are a combination of constructed swales and dry stormwater management facilities. The decision of incorporating both these facilities was greatly affected by the position of the wetland.

The proposed swales will be constructed using Reno mattresses and gabion boxes, to prevent soil erosion. In addition to these stormwater management facilities, on site attenuation will be promoted on all sites. The combined attenuation volume for the proposed facilities is approximately 31,000 m^3. With these measures put in place, the attenuation volumes will meet the required attenuation for the development based on the Rational Method calculation.

The proposed stormwater management facilities were assessed taking into the account the location of wetlands, the topography of the land and the extent of the proposed development. Various alternative solutions were investigated, but the proposed combination of dry attention structures and multiple swales was found to be the most feasible.

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.

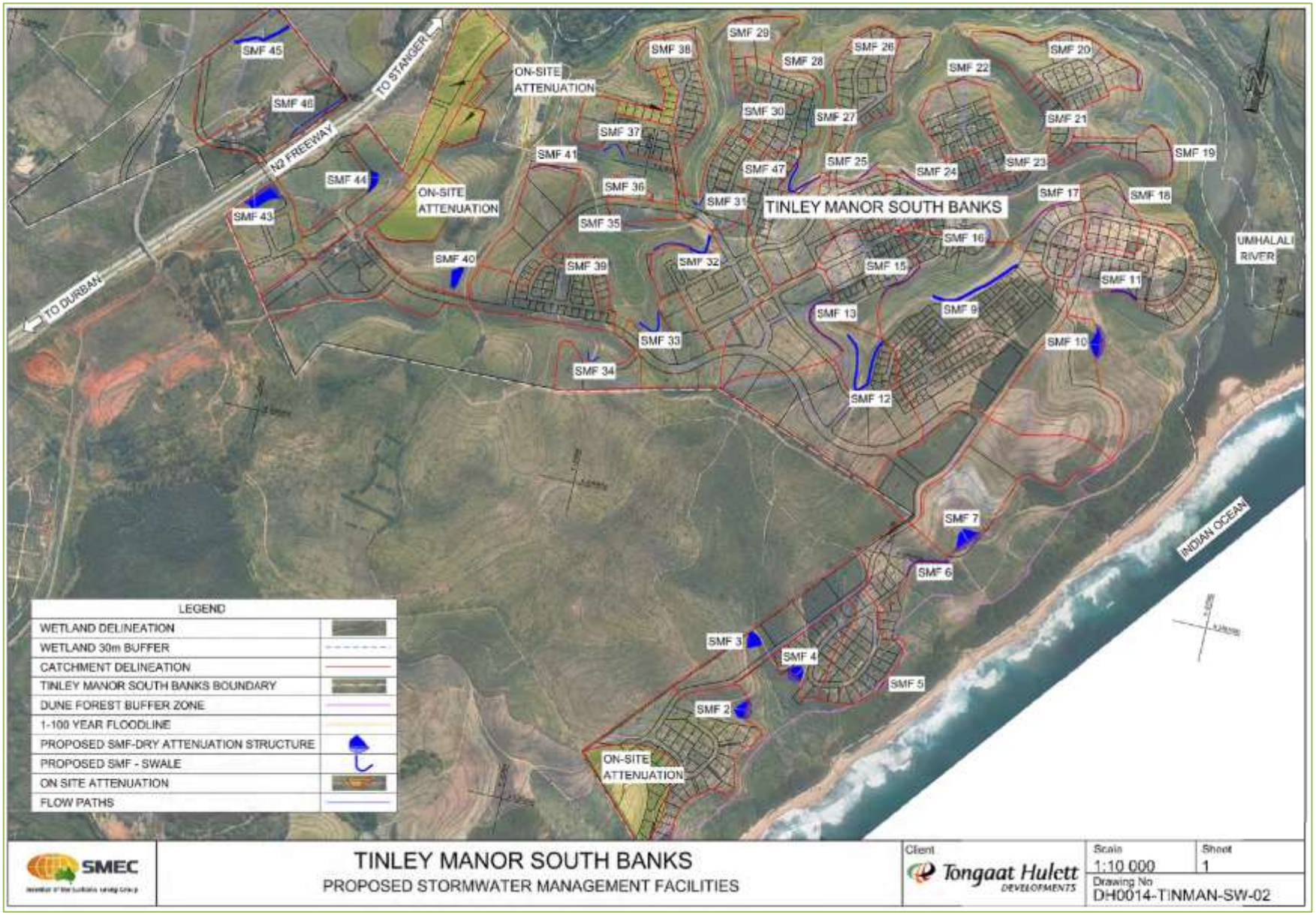


Figure 7-30: Proposed stormwater management facilities

8 ENVIRONMENTAL IMPACT ASSESSMENT

8.1 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.

8.2 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 8-1: 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-transitory	**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			
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
PROBABILITY OF OCCURRENCE	**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 8-2: 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.

8.3 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 8-1*** and ***Table*** 8-2.

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.

8.3.1 Soils and Agricultural Potential

Table 8-3: 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. ▪ Topsoil must be kept separate from overburden, and must not be mixed with other layers of soil and sub-soil. ▪ In the absence of a recognisable topsoil layer, strip the upper most 300 mm of soil. ▪ All stockpile areas must be established on disturbed flat ground within the development footprint. ▪ Erosion / sediment control measures, such as silt fences, concrete blocks, and/or sand bags, must be placed around soil / material stockpiles to limit sediment run-off from stockpiles. ▪ Stockpiled soils must be kept free of weeds and are not to be compacted. ▪ Stockpiled topsoil must be kept moist and this can be achieved through irrigation of topsoil stockpiles on a weekly basis. ▪ If soil stockpiles are to be kept for more than 3 months, they must be hydroseeded with common indigenous grasses. ▪ The slope and height of stockpiles must be limited to 4 m to avoid soil compaction and destruction of soil microbes. ▪ Surplus fill material must be hauled to a designated surplus fill material site, or, to an appropriate licenced landfill facility. ▪ Re-use topsoil as per the options presented in the Soil Management Framework Strategy (***Appendix B 3***).					
	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 re-vegetated and rehabilitated as detailed in the EMPr. ▪ Vegetation / soil clearing activities must only be undertaken during agreed working times and permitted weather conditions. ▪ If heavy rains are expected, clearing activities must be put on hold. In this regard, the contractor must be aware of weather forecasts. ▪ Any vegetation clearing must be done immediately before construction, to avoid prolonged exposure of the soil to weather elements. ▪ Construction activities must be scheduled to minimise the duration of exposure of bare soils on site, especially on moderate to steep slopes.					

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		▪ Run-off generated from cleared and disturbed areas must be controlled using erosion control (e.g. sand bags, earthen berm etc.) and sediment barriers. Sediment barriers (e.g. silt fences, sandbags, hay bales, earthen filter berms or retaining walls) must be established to counter erosion and sedimentation. Sediment barriers must be regularly maintained and cleared so as to ensure effective drainage. ▪ Berms, sandbags, and/or silt fences, must be maintained and monitored for the duration of the construction phase and repaired immediately when damaged. The berms, sandbags, and/or silt fences, must only be removed once vegetation cover has successfully re-colonised the disturbed areas post-rehabilitation. ▪ 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 gully for additional protection until grass has re-colonised the rehabilitated area. ▪ 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.						

8.3.2 Geology and Topography

Table 8-4: 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. ▪ All earth-works must be carried out in a manner to promote stable development of all infrastructure. It is required 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. ▪ The terrace must be shaped to a gradient to prevent water ponding on the surface and must be graded to direct water away from the fill edges and foundations. ▪ Where possible, individual dwelling plots on the steeper slopes must 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 must 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 must 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. - In the event that the above mentioned slope dimensions are 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: - For preliminary design purposes all fill embankment batters must be restricted to 1:2 (26°) and a maximum height of 3 m if not retained. - Within coastal to central areas underlain by sandy material it is considered necessary that proposed fills on moderately steep slopes, greater than 1:6 (10°) are benched into suitably dense material. For deeply weathered areas underlain by Vryheid Formation bedrock or Karoo dolerite and the clayey materials derived therefrom, guideline for the founding requirements for the general subsoil conditions are presented below; ○ In general, where fill embankments are intended on moderately steep slopes where clayey soils					

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
		are < 3 m thick, excavation to bedrock and the construction of a rockfill toe key must be expected. This would involve the excavation of all clays overlying the competent rock along the toe for a predetermined width and subsequent backfilling of the slot to a designated level. Using a coarse pioneer rockfill, preferably of imported, durable rock. ○ Where filling is required on slopes characterised by clayey soils exceeding 3 m thickness, excavation to rock for construction of a rockfill toe key may prove impractical and economically unfeasible. In this case a thin basal rockfill toe would be required in conjunction with geogrids placed at designated spacing within the new fill. - In light of the above at the detailed design stage stability analysis must be carried out for each proposed fill embankment to determine the site specific founding requirements thereof and the required design slope batters. - Fills must be designed and constructed as well compacted engineered fills with the intention of minimising internal settlements to the 1 – 2% of the fill thickness that is expected for well compacted fills. In this regard granular material of G10 or better quality should be favoured and positioned in areas where structures are proposed. The use of more clayey materials (>G10 quality) should ideally be avoided or at least minimised by restricting its use to areas which are not to be developed or for landscaping. In this regard the above may prove difficult given the generally very poor nature of the deeply weathered Vryheid Formation bedrock and overlying material which through laboratory test has been identified are generally unsuitable. As such careful planning of available materials and their suitability will be required and may necessitate the import of suitable off-site material. - A clear record should be kept of where different material types are placed to aid in settlement determinations and structural positioning. Furthermore, it is recommended that upon construction of the platforms, the prick of the cut-to-fill be surveyed if the platforms are to stand for some time before the construction of the proposed structures. Knowing the exact location of this transition across platforms will prove invaluable when designing the structural foundations. - Working benches must be cut into the side-slopes and seated in competent material removing any unsuitable problem materials where necessary. Following which the fill material should be placed and spread in layers not exceeding a loose thickness of 300 mm. While compaction requirements will vary between materials, a general compaction of 93% and 95% of the materials maximum Mod AASHTO density for more clayey and sandy materials respectively should be achieved prior to the placement of the next layer. The maximum particle size within the fill should not exceed two thirds of the layer thickness. Where piling will be the most likely means of founding boulders should not be incorporated into the fill. - More clayey materials (residual and colluvial soils) where included in the fill embankments should be limited to layers of 200 mm loose thickness and where possible sandwiched between more granular material in the lower layers of the fill. As mentioned the clayey layers will exhibit increased consolidation and heave potential in comparison to the less clayey materials, hence should be confined to non-structural portions of the fill. With respect to material workability, moisture control will be critical in achieving compaction control of the more clayey and silty materials. As such both padded and smooth drum rollers may be required for satisfactory compaction of the variable					

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		materials. - Once complete the fill embankment must be vegetated to minimise surface erosion. ▪ 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, structures must 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 concentrated, uncontrolled water-flow.	**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 essential for most development into the loose sands in the south eastern area. ▪ Adequate stormwater surface drainage as per the SMP 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	**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 within the approved development footprint and approved by the ECO in consultation with the construction resident engineer prior to establishment. ▪ Stockpiles created during the construction phase are not to remain during the operational phase. All stockpiles must be shaped to fit the natural topography and re-vegetated. ▪ The potential to mix poor quality material with lime and/or good quality material to obtain an acceptable						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
	topography.	quality material, that can be 'sandwiched' in earth-works between layers of good material (where possible), must be investigated by the engineering team during the detailed design. ▪ 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. These include: - No soil stockpile areas or surplus fill material sites must be located within 50 m of any watercourse (includes the Umhlali Estuary and all wetlands). - All stockpile areas or surplus fill material sites must be established within the approved development footprint. - The stockpiles may only be placed within demarcated stockpile areas, which must fall within the demarcated construction area. - Erosion / sediment control measures, such as silt fences, concrete blocks and/or sand bags must be placed around soil/material stockpiles to limit sediment run-off from stockpiles. - Subsoil and topsoil is to be stockpiled separately. Stockpiled soil must be replaced in the reverse order as to which it was removed (i.e. subsoil first, followed by topsoil). - Stockpiles of construction materials must be clearly separated from soil stockpiles in order to limit any contamination of soils. - Stockpiled soils are to be kept free of weeds and are not to be compacted. - The stockpiled topsoil must be kept moist and this can be achieved through irrigation of topsoil stockpiles on a weekly basis. - If soil stockpiles are to be kept for more than 3 months, they must be hydro-seeded. - The slope and height of stockpiles must be limited to 4 m maximum height, and are not be sloped more than 1:2 so as to avoid collapse.				

8.3.3 Geohydrology

Table 8-5: 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, 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.	**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. Full copies thereof must be included as addenda to the site-specific Emergency Preparedness and Response Plan (EPRP) during construction so as to facilitate suitable response if anyone is exposed inappropriately to such materials. ▪ The integrity of the impervious surface and bunded area must be inspected weekly, and any maintenance work conducted must be recorded in a maintenance report. Proof of rectification / rehabilitation must be reported on weekly thereafter with clear proof of improvement, until the area so affected is deemed to be fully rehabilitated. ▪ Employees must be provided with absorbent spill kits and disposal containers to handle spillages. ▪ The Contractor must train employees and contractors on the correct handling of spillages and precautionary measures that need to be implemented to minimise potential spillages. ▪ Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater. ▪ Cement / concrete batching is to be located in an area of low environmental sensitivity away from watercourses and pre-approved by the ECO. No batching activities shall occur on directly on the ground. ▪ Drip trays should be utilised at all dispensing areas. ▪ No refuelling, servicing nor chemical storage shall occur within 50 m of any watercourse. ▪ 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 practice methods to prevent potential incidents from occurring e.g. Environmental Management System (EMS) reporting and monitoring system. ▪ An Emergency Preparedness and Response Plan (EPRP) must be developed prior to construction commencement, and must be implemented as soon as an incident occurs. All necessary equipment for dealing with spills of fuels / chemicals must be available at the site in suitable quantities. Spills must be cleaned up immediately and contaminated soil / material disposed of appropriately at a registered / licensed site. As indicated, the relevant MSDSs must be included in the EPRP. ▪ Access to storage areas on-site must be restricted to authorised employees only.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		▪ Contractors will be held liable for any environmental damages caused by spillages. Such actions shall be linked to the construction contract and its linked penalty clauses and shall reflect the quantum of the event. The ECO shall be involved in the determination of an appropriate penalty imposition. ▪ If a water pump is required, the water pump must operate inside or on top of a drip tray to prevent any spillage of fuel and limit the risk of soil / water contamination. The drip tray will need to be lined with absorbent pads and checked daily while in use. ▪ The construction workforce must have adequate sanitation facilities. Toilets must not be located within 50 m of a watercourse. ▪ The sanitation facilities must be on-site before the extended workforce is employed to ensure that no unauthorised sanitation practices are implemented on-site. Toilet facilities must be serviced weekly by a registered waste contractor. All waste must be disposed of off-site at a registered facility. ▪ Potential construction practices that might lead to groundwater contamination must be conducted on areas with impervious surfaces to avoid infiltration of contaminated substances into the groundwater aquifer. ▪ Contaminated water containing fuel, oil, or other hazardous substances must never be released into the environment. Such substances must (a) be prevented from being released in the first place, and if released (b) immediately be contained, and (c) all contaminated material must be disposed of at a registered hazardous landfill site. The ECO must be informed of all such spillages, and based on the quantum of the spillage and level of negligence linked to event, appropriate penalties linked to the construction contract will then be considered.						
	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 must have adequate drainage to avoid the damming of water and the hindering of natural sub-surface water flow. ▪ Only approved construction routes through wetlands (i.e. maximum right-of-way (ROW) of 10 m on either side of the approved installation) will be permitted. ▪ All equipment to be used within the sensitive working areas (wetlands) must be checked daily for oil and diesel leaks before gaining access to these working areas. Any vehicles showing leakage shall immediately be banned from working in these areas until the leakage is fixed.						
Operational	**Aspect:** Gravitation of sewage to WWTWs. **Impact:** Leaks of untreated water and sewage from pipelines and/or pump stations 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 an appropriate WWTW. Any leaks must be fixed immediately and areas rehabilitated as needed. ▪ The three (3) sewer pump stations proposed must have an emergency overflow system as designed. ▪ The sewer pump station adjacent to the Coastal Dune Forest must have an extended emergency containment facility as per the design.						

8.3.4 Hydrology

Table 8-6: 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. ▪ No soil stockpile areas or surplus fill material sites must be located within 50 m of any watercourse (includes the Umhlali Estuary and all wetlands). ▪ Erosion / sediment control measures, such as silt fences, concrete blocks, and/or sand bags, must be placed around soil / material stockpiles to limit sediment run-off from stockpiles into drainage lines. ▪ Any such material moving into drainage lines must immediately be: a) reported to the ECO, b) movement of such materials contained and stopped, and, c) rehabilitated / rectified in consultation with the ECO as to appropriate actions to be taken.						
	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 must 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 KwaDukuza 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 must be cleaned out on a regular basis (weekly) 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.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		▪ 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. ▪ Any contravention of the above conditions will be regarded in a serious light and will be considered by the ECO and site manager in terms of penalties imposed in terms of the construction contract. Rectification and rehabilitation must be suitably carried out and will be signed off by the ECO before such activities are deemed to be closed.						
	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: ▪ 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. Copies to be kept with the EPRP. ▪ The integrity of the impervious surface and bunded area must be inspected weekly and any maintenance work conducted must be recorded in a maintenance report. ▪ Employees must be provided with absorbent spill kits and disposal containers to handle spillages. ▪ The Contractor must train employees and contractors on the correct handling of spillages and precautionary measures that need to be implemented to minimise potential spillages. Such training must be reiterated regularly and must be reinforced by information posters and 'tool-box' talks. ▪ Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater. ▪ Cement/concrete batching is to be located in an area of low environmental sensitivity away from watercourses and pre-approved by the ECO. No batching activities shall occur on directly on the ground. ▪ Drip trays must be utilised at all dispensing areas. ▪ No refuelling, servicing nor chemical storage can occur within 50 m of any watercourse. ▪ 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 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 must be developed and implemented should and incident occur. All necessary equipment for dealing with spills of fuels / chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil / material disposed of appropriately at a registered site. ▪ Access to storage areas on-site must be restricted to authorised employees only. ▪ Contractors must be held liable for any environmental damages caused by spillages. ▪ If a water pump is required, the water pump must operate inside or on top of a drip tray, to prevent any						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		spillage of fuel and limit the risk of soil/water contamination. The drip tray will need to be lined with absorbent pads and checked daily while in use. ▪ The construction workforce must have adequate sanitation facilities (minimum ratio of 1:15). Toilets must not be located within 50 m to a watercourse. ▪ The sanitation facilities must be on-site before the extended workforce is employed to ensure that no unauthorised sanitation practices are implemented on-site. Toilet facilities must be serviced weekly by a registered waste contractor. ▪ Potential construction practices that might lead to groundwater contamination must be conducted on areas with impervious surfaces to avoid infiltration of contaminated substances into the groundwater aquifer. ▪ All wastewater must be collected in a sealed container and disposed of by an approved waste contractor. Waybills must be retained for inspection. ▪ Any contravention of the above conditions will be regarded in a serious light and will be considered by the ECO and site manager in terms of penalties imposed in terms of the construction contract. Rectification and rehabilitation must be suitably carried out and will be signed off by the ECO before such activities are deemed to be closed.						
	Aspect: Development of hardened surfaces (platforms etc.). **Impact:** Increased stormwater run-off due to hardened surfaces.	**Without**	2	2	2	1	-7	**Medium**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ Land disturbance (e.g. clearance of land for earth-works or installation of services) must be undertaken in a phased manner (i.e. areas opened, worked on, rehabilitated, and move onto next phase) in order to prevent erosion and run-off – this includes leaving exposed soils open for a prolonged period of time. ▪ The unnecessary removal of groundcover from slopes must be prevented, especially on steep slopes. ▪ Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected, clearing activities must be put on hold. In this regard, the contractor must be aware of the weather forecast. ▪ Construction activities must minimise the duration of exposure to bare soils on site, especially on slopes. ▪ All bare slopes and surfaces to be exposed to the elements of weather during clearing and earth-works must be protected against erosion using rows of silt fences and/or sandbags to break the energy of surface flows. ▪ Sediment barriers (e.g. silt fences, sandbags, etc.) must be established along the entire downslope section of the development footprint to capture sediment before entering the wetland area. Sediment barriers must be regularly maintained and cleaned so as to ensure effective drainage. Breaching of such barriers must be avoided. ▪ The berms, sandbags and/or silt fences must be monitored for the duration of the construction phase and repaired immediately when damaged. Berms, sandbags and silt fences must only be removed once vegetation cover has successfully re-colonised the embankments. ▪ After every rainfall event, the Contractor must check the site for erosion damage and rehabilitate this						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		damage immediately. ▪ Once shaped, all exposed / bare surfaces and fill embankments must be re-vegetated, if it is not to be developed in the future. If re-vegetation of exposed surfaces cannot be established immediately due to phasing issues, rows of silt fences and sandbags of vegetation must be established along contours at regular intervals to capture eroded soil. Rehabilitation of such areas shall not be deemed to be complete until signed off by the ECO. ▪ The SMP must be complied with.						
Operational	**Aspect:** Gravitation of sewage to WWTWs. **Impact:** Leaks of untreated water and/or sewage from pipelines and/or pump stations 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 must be fixed immediately and areas rehabilitated as needed. ▪ The three (3) sewer pump stations proposed must have an emergency overflow system as designed.						
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. ▪ Natural watercourses must be retained and protected as far as possible to prevent pollution, erosion and retain run-off. ▪ Indigenous vegetation along watercourses must be implemented along with the stabilisation of banks. ▪ The site must be well graded to permit water to readily drain away and to prevent ponding of water anywhere on the surface of the ground. ▪ All terraces and earth-works in general must be sloped to a determined gradient that prevents ponding and ingress of water into the subsurface soils. Should ponding that lasts more than a few days occur (i.e. not immediate pond formation after a storm event), the gradient must be re-evaluated and a steeper gradient imposed for that area during construction. ▪ Rainwater harvesting and storage is recommended to take place on-site by installing appropriate systems to collect rainwater in closed-top tanks or landscaped features for irrigation and non-potable purposes. ▪ The use of a combination of open, grass-lined channels / swales, and stone-filled infiltration ditches, rather than simply relying on underground piped systems or concrete V-drains, is encouraged as per the SMP. This will encourage infiltration across the site, provide for the filtration and removal of pollutants and provide for some degree of flow attenuation by reducing the energy and velocity of stormwater flows through increased roughness when compared with pipes and concrete V-drains. The exact method of control is not imposed, but must be best practice and ensure a high level of stormwater control as approved by the Municipality during their planning approval (i.e. approval of the stormwater management plan).						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
		▪ Stormwater outlets into the downstream wetlands / watercourses are in the form of multiple smaller stormwater outlets (i.e. stormwater management facilities and swales) rather than a few large outlets in order to spread out surface flow and avoid flow concentration as far as possible. ▪ Road run-off will be managed through use of grassed swales or grassed drainage trenches running parallel along the road on the downslope side of the access road. Grassed swales / drainage ditches / trenches will be detailed designed so as to intercept run-off and promote stormwater infiltration, thus reducing surface run-off volumes and velocities downslope. ▪ Measures to capture solid waste and debris entrained in stormwater entering the stormwater management system (i.e. inlet protection devices) will be incorporated into the design of the system and could include the use of either curb inlet/inlet drain grates and/or debris baskets / bags.					

8.3.5 *River and Estuary*

Table 8-7: 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 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	3	2	3	-9	**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***). ▪ On-site erosion, as a result of land clearing and construction activities, must be prevented as detailed in the preceding tables and in the EMPr. ▪ Monitoring of *in situ* turbidity and total suspended solids pre-construction, during construction, and for the operational life of development is required. ▪ The development layout must take the natural drainage patterns of the site into account, such that the flow path around buildings and other infrastructure is adequately protected against erosion and is sufficiently roughened to retard stormwater flow (specifically during high rainfall events) – it is noted that this has been done and will be taken forward into the detailed design and building plan approval process. ▪ Sustainable urban drainage methods, such as porous paving techniques and vegetated swales, must be incorporated into the design concept to assist in flow attenuation for the life-span of the development – it is noted that this has been done and will be taken forward into the detailed design and building plan approval process. ▪ Wind-screening and sustainable stormwater control should be implemented to prevent soil loss from the site and reduce erosion channels forming (e.g. 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						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		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, must 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 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. ▪ All sensitive areas must be demarcated as 'no-go' areas and movement must be restricted in these areas. Any persons found in these areas will be fined immediately according to the fine structure in the EMPr, and as informed by the construction contract conditions. ▪ No indigenous vegetation along the estuary margin must be removed. Indigenous vegetation removal along the estuarine riparian zone for the construction of the eco-friendly structures, i.e. boardwalks, is not permissible. However, pruning may be undertaken. ▪ Installation of these structures must not be undertaken in the high rainfall (i.e. late spring summer months), and preferably only when water levels are low following a natural breaching event.						
	Aspect: Earth-works, installation of infrastructure and surplus fill material sites. **Impact:** The increased erosion of soil (detailed above) 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	**Without**	3	3	4	3	-13	**Very high**
		With	4	3	2	3	-12	**High**
		Mitigation measures: ▪ Sedimentation is directly related to increased erosion, thus the above-mentioned mitigation measures will reduce the probability of this impact. ▪ Maximum vegetation cover must 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. However strategic / sensitive pruning will be permitted for creating space for the boardwalks. 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. ▪ The infilling of wetlands (unless where required for the necessary infrastructure and already approved)						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	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.	and estuarine habitat, and any other methods to reduce such environments is not 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 following mitigation for the installation of the boardwalks are required: - Materials must consist of either treated wood or poly-prop or eco-wood to ensure the maintenance of the landscape character as far as possible and to ensure durability; - The optimal width of the boardwalk must be 1.5 m minimum; - Design of access (ramp and/or stairs) onto the beach as well as the decks must take cognisance of the dynamic nature of the beach sand and be able to accommodate variation in heights; - Any protected trees as well as the unnecessary clearing of any coastal vegetation must be avoided; - Rubbish bins must be provided along the route; and - Informative and education signage can be installed to educate users. - The construction methodology must be appropriate to the site and local conditions of the proposed boardwalks and specific method statements must be submitted by the contractor(s) for approval by the ECO, prior to construction. Examples of inclusions in the construction methodology include: o Clearance of vegetation should be kept to a minimum and preferably cleared by hand, if possible. o Follow previously disturbed and transformed existing sugarcane harvesting contour paths; and o Stainless steel screws should be used. ▪ 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 must also be restricted by the estuary boundary. ▪ 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) must 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	**Without**	3	2	2	2	-9	**Medium**
		With	2	1	1	1	-5	**Low**

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	solid waste. **Impact:** Sanitation / sewerage / solid waste disposal into the river influencing water quality, health of biota and the aesthetics of the estuary.	**Mitigation measures:** ▪ A minimum number of site construction camps should be established – the position and extent thereof must be approved by the ECO in consultation with the construction site manager. ▪ 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. ▪ Dumping of vegetation off-cuts in aquatic habitats is not recommended. Regular checks of the estuary must be undertaken and any accumulated waste removed and disposed of at an appropriate disposal facility. ▪ Ablution facilities must be provided for construction personnel and these must be frequently cleared (weekly). ▪ All chemicals must be stored in specifically demarcated and secured areas, which are bunded to avoid any contamination. ▪ An EPRP for accidental spillages of chemical substances must also be developed. ▪ Every effort must be made to prevent the spillage of any pollutants, such as fuels, cements, concrete, lime, and chemicals into any aquatic habitats. In the event of a spill from any Contractor, a penalty should be issued and the 'polluter pays' principle should be applied for clean-up operations and rehabilitation, if necessary.						
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 which combined with the discharge from the Sheffield WWTW could significantly affect the nutrient loads in the river and estuary.	**Without**	4	4	4	4	-16	**Very High**
		With	3	3	3	3	-12	**High**
		Mitigation measures: ▪ Adequate facilities to be provided to the community. ▪ Community to be educated regarding the ecological importance of the river and estuary. ▪ Apart from the existing Sheffield WWTW, the entire sewer network must be located outside of the estuarine boundary (i.e. 5 m topographical contour) and the stormwater system must be kept separate from the sewer system. It is imperative that the sewer reticulation system and the WWTW are properly managed and well maintained to prevent environmental contamination and the associated risks to human health. ▪ Emergency overflow facilities must be considered for each pump station – it is noted that this has been designed for and the design (or better) must be implemented. ▪ With specific reference to the cumulative impacts associated with the discharge from the Sheffield WWTW, the following mitigation is recommended for SSW: - SSW is urgently investigating effluent recycling and reuse from all of its WWTW in light of the current drought and associated water restrictions. To this end, the primary mitigation measure would be to prevent or remove all discharge to the estuary for water reclamation. Consequently a reduction in treated effluent discharge to the estuary will be greatly beneficial in reducing nutrient						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		inputs to the system. Given the current stringent water restrictions, the likelihood of no discharge is very high. Effective means of disposal or reuse of the concentrated sludge need to be investigated, e.g. agricultural applications. Concentrated sludge must not be discharged to the Umhlali Estuary under any circumstances. However, in the event of drought relief and lifting of water restrictions, effluent discharge to the estuary must be controlled and comply with specific standards, in terms of water quality and discharge volumes. In terms of water quality, the Reserve Determination Study for the Umhlali Estuary established that average nutrient levels within the estuary should not exceed 200 ug/l N (nitrates/nitrites), 20 ug/l N (ammonia), and, 10 ug/l P (phosphates). - At a minimum, the discharge standards set for the WWTW (as negotiated between DWS and EDTEA) as a condition of the Environmental Authorisation and discharge permit, 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 treated wastewater discharge that is compliant with the prescribed standards, have illustrated that nutrient loading is still prevalent and detrimental to the estuarine environment. Thus only special water quality standards should be implemented for the discharge of treated wastewater to the system given the system's known sensitivity. - Mechanical and or biochemical processes to remove nutrients to the said standards need to be investigated, for example, the addition of alum for 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. - All the operational conditions of the WWTW must be added to the EMPr for the Tinley Manor Southbanks once these are made available (i.e. via the pending Water Use Licence Application for the Sheffield WWTW).						
	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	4	2	2	-10	**High**
		With	1	2	2	2	-7	**Medium**
		Mitigation measures: ▪ Detailed stormwater design must ensure that stormwater run-off from the new hardened surfaces is cleaned and that flows are attenuated prior to reaching the estuary. Means of 'scrubbing' and removing sediment, litter and debris from the run-off must be implemented, such as silt and trash traps. Such exact means are not prescribed at this point so long as the above objective is ensured. 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 (i.e. 'polishing' of contaminants) and flood control (i.e. slowing flow velocities and promoting percolation) prior to entering the estuary. Direct stormwater discharge into the Umhlali Estuary is not permitted, 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.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	Aspect: Boardwalk maintenance. **Impact:** Impact on the estuary riparian vegetation during the rehabilitation and/or reconstruction of boardwalks.	**Without**	3	3	4	2	-12	**High**
		With	1	3	2	3	-9	**Medium**
		Mitigation measures: ▪ If the boardwalks 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. ▪ No indigenous vegetation along the estuary margin must be removed. However strategic/sensitive pruning will be permitted for maintenance of the boardwalks. 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. ▪ In terms of stabilisation and rehabilitation, the disturbed and damaged areas must be rehabilitated immediately using only local indigenous plant species and any invasive alien vegetation must be removed.						
Cumulative	Disturbance and utilisation (e.g. fishing, recreational activities, etc.) of the estuary, as a result of an increase in the number of people. 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, to be constructed along the edge of the estuary, 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. A new access road and river crossing is proposed in the long-term to provide a link to the northern bank of	**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 from the edge of the estuary 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. ▪ 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 estuarine health. While this is a legislative requirement in terms of the NEM:ICMA, it is the responsibility of the KwaDukuza Municipality as the responsible management authority. ▪ In the interim, following sections and management recommendations for use of the Umhlali Estuary must be included in the operational portion of the EMPr: - A Conservation Management Plan for the management of the open space area (including the estuary) must be compiled prior to the operational phase commencing. - The construction of solid concrete jetties and slipways on the estuary must not be allowed as these reduce estuarine habitat, and impede and alter water flow. - All structures within the Estuarine Functional Zone (i.e. wooden boardwalks, viewing areas, fencing) and up to 100 m of the Estuarine Functional Zone (i.e. roads, stormwater structures, fencing) must be regularly maintained (minimum of annual basis), taking cognisance of the sensitive environment, to prevent any environmental damage or pollution. - The Estuarine Functional Zone must be considered a no-go area for vehicles and earthmoving						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	the Umhlali Estuary.	machinery, as these will result in compaction of soils, damage to estuarine habitats, and disturbance to wildlife. - Maintenance plans must be drawn up for each development sub-complex to ensure that buildings and other infrastructure near the estuary are adequately maintained to prevent any environmental damage or pollution. - Regulations with respect to harvesting of natural resources (i.e. fish and bait) must be enforced. This is within the ambit of DAFF monitoring officials, in accordance with the Marine Living Resources Act (Act No. 18 of 1998). - Access to the estuary must be formalised (e.g. via elevated boardwalks) to prevent the impacts of trampling and habitat disturbance. - The number of access points and wooden structures (i.e. boardwalks) must be limited to a single boardwalk along the southern bank due to its sensitivity. - Although the Umhlali Estuary is naturally shallow, the use of motorised boats during the deeper closed mouth phase should not be permitted, and other low impact / non-motorised recreational activities, such as canoeing, are preferred. - Suitable waste receptacles must be provided at strategic points and serviced, and, regular clean-up operations must be undertaken to ensure that solid waste is contained and removed from conservation / green areas and waterways (including vegetated stormwater channels, wetlands and the estuary). - Maintenance work for structures within and adjacent to the Estuarine Functional Zone must not result in pollution, including solid or liquid contamination, of the surrounding environment. Strict supervision and operating procedures are required. Maintenance shall be in accordance with the approved management plans / programmes. - Through a dedicated and approved Invasive Alien Plant eradication programme, any alien invasive vegetation and weeds that are introduced and become established as a result of habitat disturbance must be removed, and regularly controlled. - 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 to all residents and visitors. This could possibly be achieved through the establishment of an information / visitors centre, the distribution of informative brochures and posters, and, strategic placement of educational signboards throughout the development complex and along the boardwalks. ▪ An assessment of the potential impacts associated with a long-term proposed to link the northern bank of the Umhlali Estuary 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.						
	The eco-centric design concept of proposes to *inter alia*, conserve and enhance the remaining natural elements of the surrounding landscape, as well as rehabilitate	**Without**	2	2	2	2	+8	**Medium**
		With	3	3	3	3	+12	**High**
		Mitigation measures: ▪ Corridor areas designed for movement and linkages between the open space areas and the upper river						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
	(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 is expected to be improved over its current status and this has regional significance.	catchment and the coast must be implemented. ▪ No fences must be erected which will as a barrier to this movement. ▪ Rehabilitation to be done according to the Wetland and Open Space Rehabilitation Plan. ▪ The design of the development perimeter fencing should consider the movement of fauna between the estuary and the conservation areas. ▪ The conservation area must include the entire Umhlali Estuary (i.e. below 5 m amsl contour), as well as the remaining area below the 10 m amsl contour, which constitutes a horizontal buffer area between 16 m (in severe case) and 257 m wide depending on topographical constraints. No further transformation of this land for development or removal of natural vegetation is permitted, apart from invasive alien vegetation removal and sensitive pruning along the boardwalks.					

8.3.6 Wetlands

Table 8-8: 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 erosion and sedimentation impacts.	**Without**	1	2	2	2	-7	**Medium**
		With	1	1	2	2	-6	**Low**
		Mitigation measures: ▪ Construction must ideally be scheduled to take place during winter when flows are lowest (i.e. 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 50 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.					
	Aspect: Construction activities within watercourses. **Impact:** Site clearing, the removal of vegetation, and associated disturbances to soils, leading to increased run-off and erosion with consequent sedimentation of riparian/wetland habitat.	**Without**	2	2	2	3	-9	**Medium**
		With	2	2	2	2	-6	**Medium**
		Mitigation measures: ▪ All construction footprint areas must remain as small as possible, and should not encroach into surrounding more sensitive areas. It must be ensured that the riparian and drainage line systems not proposed to be crossed for the installation of services and/or infilled for the earth-worked platforms, and their associated buffer zones are off-limits to construction vehicles and personnel. ▪ For work in areas close to sensitive areas the allowable construction work footprint must be confirmed and approved by the ECO. ▪ The boundaries of footprint areas are to be clearly defined and must ensure that all activities are limited to defined footprint areas. Appropriate fencing such as shadecloth and signage must be erected advising personal that this is strictly a 'no-go' area. Any infringements on the 'no-go' areas will attract a penalty as per the provisions of the EMPr and as linked to the construction contract conditions. ▪ The working servitude in wetlands must not exceed 10 m on either side of the approved installation. ▪ Any areas where bank failure is observed (due to the construction activities or external impacts) must						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		be immediately repaired. ▪ As far as possible the existing road network must be utilised, minimising the need to develop new access routes resulting in an increased impact on the local environment. Deviations from the existing modified footprint should be motivated, considered in consultation with the ECO, and informed by the approved documentation. ○ Should temporary roads or access routes be necessary and unavoidable, proper planning must take place and the site sensitivity plan must be taken into consideration. The ECO must approve such routes in consultation with the construction site manager. ○ If additional roads are required, then wherever feasible such roads should be constructed a distance from the more sensitive riparian areas and not directly adjacent thereto. The position thereof must be approved by the ECO. ○ If crossings are required, they should cross the systems as close as possible to right angles, to minimise impacts in the receiving environment. ▪ The duration of impacts on the wetlands systems must be minimised by ensuring that the duration of time in which flow alteration and resultant sedimentation will take place is minimised. ▪ Appropriate sanitary facilities in a suitable ratio must be provided for the life of the construction and all waste removed regularly to an appropriate waste facility. ▪ No informal fires are to be permitted in within the study area during construction. ▪ Ensure that an adequate number of rubbish bins are provided so as to prevent litter and ensure the proper disposal of waste generated during construction activities. ▪ Edge effects of activities, particularly erosion and alien / weed control need to be strictly managed. ▪ The EMPr will advise on special (and on-going) monitoring activities that will target areas that have been identified as sensitive areas within the project site.						
	Aspect: Construction activities within watercourses. **Impact:** Movement of construction vehicles within the wetlands.	**Without**	2	1	2	2	-7	**Medium**
		With	1	1	1	1	-4	**Low**
		Mitigation measures: ▪ All areas of increased ecological sensitivity must be marked as 'no-go' areas as defined in the EMPr and kept off limits to all unauthorised construction and maintenance vehicles, as well as personnel. ▪ All vehicles must be regularly inspected for leaks. ▪ Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil. Such fuel tanks must be placed within bunded containment areas of a minimum volume of 110% of that of the tank contained. ▪ Any vehicle showing leaks shall be removed from the site until the leakage is fixed especially if working within areas close to the watercourses or wetlands. ▪ All spills, should they occur, must be immediately cleaned up and treated accordingly. ▪ The EMPr will advise on special (and on-going) monitoring activities that will target areas that have been identified as medium to high sensitivity areas within the project site.						
	Aspect: Construction activities within	**Without**	2	4	3	3	-12	**High**
		With	1	2	2	2	-7	**Medium**

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	watercourses. **Impact:** Proliferation of alien vegetation in disturbed areas.	**Mitigation measures:** ▪ Proliferation of alien and invasive species is expected within any disturbed areas particularly as there is a high degree of alien and invasive species within the study area at present. These species must be eradicated and controlled to prevent further spread beyond the study area. ▪ Alien vegetation along the wetlands to be retained for rehabilitation must be removed and care taken to ensure no more alien plant growth occurs within the newly disturbed areas. ▪ Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled. ▪ Care must be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used. All removal within 50 m of a watercourse, wetland or the estuary must be by mechanical rather than chemical in nature. ▪ Footprint areas must be kept as small as possible when removing alien plant species – alien removal to occur by hand in wetlands. No vehicles are to be allowed to drive through designated sensitive drainage line and riparian areas during the eradication of alien and weed species. ▪ The EMPr will advise on special (and on-going) monitoring activities that will target areas that have been identified as medium to high sensitivity areas within the project site. ▪ Long-term control of such species must be integrated into the approved Conservation Management Plan.						
	Aspect: Construction activities within watercourses. **Impact:** Earth-works within riparian/wetland habitats and in the vicinity of these areas leading to increased run-off and erosion and altered run-off patterns.	**Without**	2	1	2	2	-7	**Medium**
		With	1	1	1	1	-4	**Low**
		Mitigation measures: ▪ To prevent the further erosion of soils, management measures may include berms, soil traps, hessian curtains and stormwater diversion away from areas particularly susceptible to erosion. ▪ Install erosion berms during construction to prevent gully formation. ○ Berms every 50 m should be installed where any disturbed soils have a slope of less than 2%, every 25 m where the track slopes between 2% and 10%, every 20 m where the track slopes between 10% and 15%, and every 10 m where the track slope is greater than 15%. ▪ Sheet run-off from access roads must be slowed down by the strategic placement of berms and sandbags. ▪ As far as possible, all construction activities must occur in the low flow season, during the drier winter months. ▪ All soils compacted as a result of construction activities falling outside of footprint areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas. ▪ Alien and invasive vegetation control must take place throughout all construction and rehabilitation phases to prevent loss of floral habitat. ▪ Monitor all areas for erosion and incision, particularly any riparian / wetland crossings. Any areas where erosion is occurring excessively must be rehabilitated as quickly as possible and any damage rectified. ▪ The EMPr will advise on special (and on-going) monitoring activities that will target areas that have						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		been identified as medium to high sensitivity areas within the project site.						
	Aspect: Construction activities – construction roads and access roads. **Impact:** Loss of wetland area to establish roads, spills, pollution and sedimentation into wetlands.	**Without**	2	4	2	4	-12	**High**
		With	1	1	2	4	-8	**Medium**
		Mitigation measures: ▪ No vehicles are allowed in the demarcated wetlands areas unless authorisation from the DWS and provision has been made in the EA and EMPr. ▪ Existing road alignments are to be used where possible. New roads must be planned to avoid all wetlands unless otherwise approved. ▪ 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. ▪ Road crossings must be routed so that the wetland is crossed at right angles to the direction of flow. ▪ Box culverts must 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 ROW corridor (not to exceed 10 m on either side). The ROW corridor within the wetland should be as narrow as practically possible and must be demarcated and fenced off during the site setup phase to the satisfaction of the ECO. The construction ROW will include 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. Any vehicle showing leakages shall not be allowed to move into the working areas in close proximity to the watercourses, wetlands, or estuary until repaired and cleaned of residue. ▪ 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.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
		No hazardous materials are to be stored or brought within 50 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: Construction activities – installation of pipes, sewer lines, boardwalks, earth-worked platforms and irrigation dam. **Impact:** Compaction and clearing of areas outside of the pipe/boardwalk fill footprint during the construction phase and associated indirect impacts that include erosion and alien plant encroachment into the wetland.	**Without**	2	4	2	4	-12	**High**
		With	1	1	2	2	-6	**Low**
		Mitigation measures: ▪ Construction should ideally be undertaken between the months of April and August. ▪ The wetland boundaries either side of the road and pipe crossings must be demarcated using shade cloth or snow fencing prior to the construction commencing. ▪ Disturbance to the wetland soils along the crossing footprint must be restricted to an established construction ROW corridor. The ROW corridor within the wetland must be no more than 10 m wide, and if necessary, hand excavation should be employed to ensure that the impact does not exceed 10 m in width. The ROW corridor must be demarcated and fenced off during the site setup phase to the satisfaction of the ECO. ▪ The construction ROW must comprise the road and embankment footprint, and the pipe routing only. ▪ All wetland areas outside of the demarcated ROW must be considered no-go areas. ▪ 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, generically as no-go areas and any service crossings should attempt to utilise road ways and existing corridors of disturbance as much as possible. ▪ Sewer manholes should ideally not be located within the wetland and its associated buffer, unless where absolutely necessary i.e. the horizontal and vertical alignments of the pipes must remain constant when passing through these sensitive areas. ▪ Disturbed and bare soils resulting from the construction must be prepared and re-vegetated to the satisfaction of the ECO. ▪ 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. Any vehicle showing leakages shall not be allowed to move into the working areas in close proximity to the watercourses, wetlands, or estuary until repaired and cleaned of residue. ▪ 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 50 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.						
Operational	**Aspect:**	**Without**	2	2	2	2	-8	**Medium**

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
	Stormwater run-off as a result of hardened infrastructure. **Impact:** Siltation of wetland as a result of stormwater management facilities proposed.	**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 is likely that the position of the stormwater management facility will need to be situated in a low lying valley bottom area. However, the position of the stormwater management facility 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 attenuation structures.						
	Aspect: Operational phase activities – maintenance of roads. **Impact:** - The concentration of wetland flow through culverts and the erosion and scouring of the wetland below the culvert(s); and - The fragmentation of the wetland by the road, which represents a serious barrier to faunal movement along the wetland.	**Without**	2	4	2	4	-12	**High**
		With	1	1	2	2	-6	**Low**
		Mitigation measures: ▪ With regards to the wetland crossing 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 any box culverts. ▪ The final design for the wetland crossing must be approved by the wetland specialist prior to construction commencing.						
Cumulative	The layout for the project proposes to encroach into the wetlands and associated buffers of numerous HGM units. This impact has the possibility of reducing the ability of the wetland to perform many of the functions typically associated with such ecosystems. Loss of wetland area has implications for stormwater management and control, sediment trapping and the	**Without**	2	4	2	4	-12	**Very high**
		With	2	3	3	4	+12	**Very high**
		Mitigation measures: ▪ The Wetland and Open Space Rehabilitation Plan must be adhered to. ▪ 75.98 ha of wetland area must be rehabilitated as part of the off-set requirements. ▪ The maximum ROW for wetland crossings is 10 m on either side of the approved wetland crossing co-ordinate impact. ▪ Trench depth and trench widths will vary depending on the type of crossing. The maximum trench depth and trench width in wetlands is expected to be 2.5 m (depth) x 5 m (width). ▪ Regular monitoring of the wetland off-sets as per the Wetland Monitoring Programme contained in the Wetland and Open Space Rehabilitation Plan must be adhered to.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
	treatment or trapping of pollutants and sediments. Loss of wetland area also has the potential to reduce the biodiversity value of a system further. The proposed Tinley Manor Southbanks will result in a permanent loss of some wetland areas (8.29 ha). Improvement in the health of wetlands as a result of rehabilitation of remaining wetlands and buffers as a result of the wetland off-set plan and the no-net loss approach.	▪ A Water Use Licence must be obtained from the DWS prior to construction commencing.					

8.3.7 Biodiversity

Table 8-9: 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 activities (site clearing). **Impact:** Degradation and loss of soil.	**Without**	1	1	2	3	-7	**Medium**
		With	1	1	1	2	-5	**Low**
		Mitigation measures: ▪ Top soil stripping must be restricted to the immediate work area and appropriately stored for later use in back-filling. ▪ Sub-soil and topsoil (the top ± 30–50 cm of the soil) must be stored separately. ▪ Soil stockpiles are to be protected from possible erosion, e.g. through covering of the stockpiles with tarpaulin, and limiting the height and angle of the stockpile. ▪ Soil stockpiles must not exceed 1 m in height. ▪ Soil stockpiling areas must be sufficiently situated away from the drainage areas towards the lower lying non-perennial drainage lines. ▪ Any erosion channels developed during the construction period or during the vegetation establishment period should be backfilled and compacted, and the areas restored to a proper condition. ▪ The Contractor must ensure that cleared areas are effectively stabilised to prevent and control erosion. ▪ Disturbed areas of natural vegetation as well as cut and fills must be rehabilitated immediately to prevent further soil erosion. ▪ Re-seeding shall be done on disturbed areas especially adjacent to any indigenous vegetation pockets. ▪ In accordance with the Conservation of Agricultural Resources Act, Act No. 43 of 1983, slopes in excess of 2% must be contoured and slopes in excess of 12% must be terraced. ▪ Contour banks shall be spaced according to the original or surrounding topography / slope. The type of soil shall also be taken into consideration. ▪ Any erosion channels developed during the construction period or during the vegetation establishment period shall be backfilled and compacted, and the areas restored to a proper condition. ▪ The Contractor shall ensure that cleared areas are effectively stabilised to prevent and control erosion.						
	Aspect:	**Without**	3	4	3	4	-14	**Very high**
		With	1	1	2	3	-7	**Medium**

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	Construction activities (site clearing). **Impact:** Physical degradation due to soil erosion as a result of exposed soil and topsoil.	**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 re-vegetated and rehabilitated as detailed in the EMPr. ▪ Vegetation / soil clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected, clearing activities must be put on hold. In this regard, the contractor must be aware of weather forecasts. ▪ Any vegetation clearing must be done immediately before construction to avoid prolonged exposure of the soil to weather elements. ▪ Construction activities must be scheduled to minimise the duration of exposure of bare soils on site, especially on moderate to steep slopes. ▪ Run-off generated from cleared and disturbed areas must be controlled using erosion control (e.g. sand bags, earthen berm, etc.) and sediment barriers. Sediment barriers (e.g. silt fences, sandbags, hay bales, earthen filter berms or retaining walls) must be established to counter erosion and sedimentation. Sediment barriers must be regularly maintained and cleared so as to ensure effective drainage. ▪ Berms, sandbags and/or silt fences must be maintained and monitored for the duration of the construction phase and repaired immediately when damaged. The berms, sandbags and silt fences must only be removed once vegetation cover has successfully re-colonised the disturbed areas post-rehabilitation. ▪ 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 gully for additional protection until grass has re-colonised the rehabilitated area. ▪ The SMP must be complied with.						
	Aspect: Construction earth-works and installation of services. **Impact:** Loss of indigenous vegetation for the earth-works and installation of services as well as contractor laydown areas resulting in habitat fragmentation and loss of ecological connectivity.		**Without**	1	1	1	3	-6	**Low**
			With	1	1	1	1	-4	**Low**
		Mitigation measures: ▪ The extent of disturbance must be limited to the boundary of the development property. No areas outside the construction footprint may be cleared. Terrestrial areas outside of the development property are considered 'No-Go' areas. Access through and construction activities within the No-Go areas are strictly prohibited in these areas and need to be strictly controlled. Silt fences must be erected and maintained for the entire duration of the construction period to ensure that no sediment is carried into these No-go areas. Regular checks must be conducted to ensure that these silt fences are functioning correctly. Toolbox Talks must be presented with the topic of sensitive environments being highlighted and the staff being educated as to their value. ▪ Many of the trees i.e. *Mimusops caffra* are small and will potentially be easy to relocate. 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						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
		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. ▪ No-Go areas must be clearly defined and protected with signage and shadecloth fencing. No-go areas must not be compromised at any point. Any personal compromising the 'no-go' area must be fined according to the provisions of the EMPr. ▪ The 40 m buffer to the Coastal Dune Forest must be maintained at all times. The Coastal Dune Forest must be considered a 'no-go' area except for the installation of boardwalk, pedestrian footpaths and the two existing emergency vehicular accesses which will be retained. ▪ No wheeled machinery is permitted in the back of beach woody vegetation (Coastal Dune Forest). ▪ No cutting or pruning of indigenous vegetation is permitted without the permission of the ECO, in consultation with the botanist. ▪ Boardwalk areas, within the back of beach vegetation and the estuarine fringing vegetation, must be walked by a botanist to ensure that all trees that are not to be affected by the boardwalk are demarcated. ▪ Prior to commencement of construction, a qualified and skilled botanist must be appointed to survey the construction footprint, identify and mark all conservation importance species and apply for necessary permits and licences to cut, disturb, damage, destroy, remove or translocate them. ▪ The commencement of construction must be preceded by a plant rescue programme which must be conducted only when plant permits and licences have been issued by the relevant authority. ▪ Secondary / Fallow Areas are which are either dominated by alien invasive species and areas which are a mix of indigenous and alien vegetation. These areas must all be inspected prior to construction commencing (with sufficient time to apply for and receive any licences that may be required in terms of protected plants and or trees) by a qualified botanist. ▪ All protected plants identified must be relocated once the required permit is obtained. ▪ Any protected trees that are destroyed must be replaced on a 1 to 3 basis, i.e. for every tree lost, 3 individuals of the same species must be re-planted in the Open Space Network.					
	Aspect: Habitat fragmentation. **Impact:** Habitat fragmentation and loss of ecological connectivity resulting in wildlife displacement as a result of development.	**Without**	2	1	2	1	-6	**Low**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ No wild animal may under any circumstance be hunted, snared, captured, injured, killed, harmed in any way or removed from the site. This includes animals perceived to be vermin (such as snakes, rats, mice, etc.). ▪ Any fauna that are found within the construction zone must be moved to the closest point of natural or semi-natural vegetation outside the construction corridor. ▪ The handling and relocation of any animal perceived to be dangerous / venomous / poisonous must be undertaken by a suitably trained individual.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Operational	**Aspect:** Alien invasive eradication. **Impact:** Improved ecology due to removal of alien invasive vegetation.	**Without**	2	2	4	4	-12	**High**
		With	2	2	2	2	+8	**Medium**
		Mitigation measures: ▪ Invasive Alien Plants that have colonised the construction site must be removed, preferably by uprooting. The contactor must consult the Alien Invasive Eradication Programme in the Wetland and Open Space Rehabilitation Plan regarding the method for removal. ▪ All bare surfaces across the construction and operational site must be checked for alien invasive plants at the end of every month and alien pants removed by hand pulling/uprooting and adequately disposed. ▪ Herbicides must only be utilised where hand pulling / uprooting is not possible. Only herbicides which have been certified safe for use in wetlands / aquatic environments by an independent testing authority may be considered. The ECO must be consulted in this regard.						
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. ▪ Natural watercourses must be retained and protected as far as possible to prevent pollution, erosion and retain run-off. ▪ Indigenous vegetation along watercourses must be implemented along with the stabilisation of banks. ▪ The site should be well graded to permit water to readily drain away and to prevent ponding of water anywhere on the surface of the ground. All terraces and earth-works in general must be sloped to a gradient so as to prevent ponding and ingress of water into the subsurface soils. ▪ Rainwater harvesting and storage is recommended to take place on-site by installing appropriate systems to collect rainwater in closed-top tanks or landscaped features for irrigation and non-potable purposes. ▪ The use of a combination of open, grass-lined channels/swales and stone-filled infiltration ditches rather than simply relying on underground piped systems or concrete V-drains is encouraged as per the SMP. This will encourage infiltration across the site, provide for the filtration and removal of pollutants and provide for some degree of flow attenuation by reducing the energy and velocity of stormwater flows through increased roughness when compared with pipes and concrete V-drains. ▪ Stormwater outlets into the downstream wetlands/watercourses are in the form of multiple smaller stormwater outlets (stormwater management facilities and swales) rather than a few large outlets in order to spread out surface flow and avoid flow concentration as far as possible. ▪ Road run-off will be managed through use of grassed swales or grassed drainage trenches running parallel along the road on the downslope side of the access road. Grassed swales/drainage ditches/trenches will intercept run-off and promote stormwater infiltration thus reducing surface run-off volumes and velocities downslope. ▪ Measures to capture solid waste and debris entrained in stormwater entering the stormwater management system (inlet protection devices) will be incorporated into the design of the system and could include the use of either curb inlet/inlet drain grates and/or debris baskets/bags.						

8.3.8 Coastal

Table 8-10: 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: ▪ The development proposal must adhere 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. ▪ The 40 m buffer to the Coastal Dune Forest must be maintained at all times. ▪ The Coastal Dune Forest must be considered a 'no-go' area except for the installation of boardwalk, pedestrian footpaths and the two existing emergency vehicular accesses which will be retained.						
	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; ▪ Lack of provision of ablutions that may lead to the creation of 'informal ablutions' within or close to the coastal zone; ▪ Overflow from sewer pump	**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. The ECO must approve the location of all site camps prior to establishment. There must be no construction camps within dune forests and coastal zones. All sensitive areas must be buffered and treated as no-go zones. ▪ The construction camps must be located a minimum of 50 m away from the Coastal Dune Forest / Coastal Zone. ▪ 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 (weekly) from each construction point and the broader development site to an appropriate disposal facility. ▪ Dumping of vegetation off-cuts in aquatic habitats is prohibited. ▪ Vegetation off-cuts must be disposed of at a registered landfill site or used as part of the rehabilitation within the development footprint. ▪ No vegetation off-cuts are permitted within the no-go area. ▪ Regular monitoring of the periphery of construction camps must be undertaken and any accumulated waste removed and disposed of at an appropriate disposal facility. ▪ Ablution facilities must be provided for construction personnel at a suitable ratio and these must be frequently cleared (weekly). ▪ All chemicals must be stored in specifically demarcated and secured areas, which are suitably lined to avoid any contamination. ▪ An Emergency Preparedness Response Plan for accidental spillages of chemical substances must be						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	station 3; and/or ▪ Inadequate stormwater management due to hardened surfaces.	developed by the Contractor and submitted to the ECO for approval prior to construction commencing. Copies of relevant MSDSs must be included in the file with the EPRP. ▪ 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. ▪ In the event of a spill, a penalty must be issued as per the provisions of the EMPr. ▪ 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 location of one of the proposed pump stations adjacent the no-development setback line is proposed to be mitigated via the construction of an overflow pond. A stand-by generator must be installed at the pump station and must be maintained in correct working order. It is acknowledged that the infrastructure proposed complies fully with these requirements. ▪ The Stormwater Management Plan proposes 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 water courses. Mitigation proposed in this plan considers stormwater run-off from the new hardened surfaces as well as flow attenuation prior to reaching the estuary and coastal environment. Stormwater design needs to ensure that stormwater run-off from the new hardened surfaces is cleaned and that flows are attenuated prior to reaching the coastal zone. Means of 'scrubbing' and removing sediment, litter and debris from the run-off must be implemented, such as silt and trash traps. 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.						
	Aspect: Clearing of vegetation for platforms and infrastructure. Pruning of vegetation for boardwalks. **Impact:** Increased erosion, sedimentation and scouring. Impacts with regard to the installation of boardwalks include: - Initial impact on vegetation and	**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						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
	surrounds during construction; - Potential source of both pollution and alien vegetation ingress as a result of access as well as initial construction disturbance; - Potential impact on drainage and disruption of soils. - Allows for continued protection of vegetated dune environment (natural defence); - Preserves sense of place and enhances the coastal landscape character; - Reduces trampling of natural flora; - Manages / controls access; and - Reduces the potential of dune 'blow-outs' as a result of inappropriately designed access.	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 must only occur just prior to construction; - Cleared areas must not be left exposed, and should be promptly rehabilitated/vegetated with indigenous plants; - Landscaping and re-vegetation must 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. ▪ 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. Pedestrian 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 must be applied which take account of the sensitive nature of the surrounding environment; ▪ Vehicular beach access must be restricted except for emergency access and boat launching in line with the Public Boat Launch Site Regulations. ▪ No indigenous vegetation along the Coastal Dune Forest must be removed. However strategic /					

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		sensitive pruning will be permitted for creating space for the boardwalks. This will serve to maintain the natural ecological functioning of the forest as well as function as an ecological corridor between terrestrial and marine environments. ▪ Although the boardwalks may be constructed beyond the no-development setback line, 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 sensitive environment. The following mitigation for the installation of the boardwalks are required: - Materials must consist of either treated wood or poly-prop or eco-wood to ensure the maintenance of the landscape character as far as possible and to ensure durability; - The optimal elevation of the boardwalk must be determined by a dune ecologist, specifically in terms of allowing for the continued growth of dune vegetation without blocking sunlight; - The optimal width of the boardwalk must be 1.5 m minimum; - The exact route through the dune environment must be determined on-site in association with a dune ecologist who should identify no-go areas upfront; - Design of access (ramp and/or stairs) onto the beach as well as the decks must take cognisance of the dynamic nature of the beach sand and be able to accommodate variation in heights; - Provision must be made for viewing areas / decks with seating which is cantilevered landwards of the boardwalk and shaded if practical; - Boardwalks must be elevated above the vegetated dune cordon. The height of the boardwalk can vary but must be elevated ~1 m above the substrate; - Any protected trees as well as the unnecessary clearing of any coastal vegetation must be avoided; - Boardwalks located in forested areas must wind around existing trees, rather than removing them so that the forest canopy remains intact; - Rubbish bins must be provided along the route; and - Informative and education signage can be installed to educate users. - The construction methodology must be appropriate to the site and local conditions of the proposed boardwalks and specific method statements must be submitted by the contractor(s) for approval by the ECO, prior to construction. Examples of inclusions in the construction methodology include: ○ Clearance of vegetation should be kept to a minimum and preferably cleared by hand, if possible; ○ Follow previously disturbed and transformed existing sugarcane harvesting contour paths; and ○ Stainless steel screws should be used.						
Operational	**Aspect:** Use of natural resources	**Without**	3	2	3	2	-10	**High**
		With	2	2	2	1	-7	**Medium**

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	Impact: Depletion of natural resources as a result of increased pedestrian traffic.	**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. ▪ On-going monitoring by Department of Agriculture, Forestry and Fisheries (DAFF) compliance officers formalised by estate manager. ▪ Reporting (whistle-blowing) procedures must be communicated to land owners and resort visitors and staff to facilitate stewardship of local resources.						
	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: ▪ Public access to the beach via boardwalks, pedestrian pathways and emergency vehicular access must be provided for. ▪ A private beach is prohibited.						
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. While not part of this specific EIA, the investigation of the provision of a safe swimming beach to accommodate the needs of both the resort and local residents is noted. Should this investigation and subsequent development application be successful, it is noted that the	**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 maintain public beach amenity that would benefit local residents and visitors alike is suggested. An assessment of the potential impacts associated with a long-term proposed to link the Beach Enhancement Project 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.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	nature of usage of this beach will still be constrained and unable to support high intensity usage, predominately as a result of the adjacent topography as well as lack of vehicular access. It is noted that emergency vehicular access to the proposed public beach and accompanying amenity will be required, as a direct result of the potential risks associated with the use of this beach.							
	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.						

8.3.9 Air Quality and Odour

Table 8-11: 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 must 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 must 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 must be controlled at vehicle exit and entry points to prevent the dispersion of dust and mud beyond the site boundary. ▪ The Contractor must employ a 'sweeper' to ensure the P228 at the entrance / exit to the site is cleaned of mud and sand from construction vehicles, preventing nuisance to other road users. ▪ Furthermore, construction vehicles should be covered as far as possible to prevent dust nuisance.						
	Aspect: Construction activities (site clearing; operation of vehicles, equipment etc.). **Impact:** Generation of fumes from vehicle emissions may pollute the air.	**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.						
	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 at a suitable ratio.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
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.						

8.3.10 Noise

Table 8-12: 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.						

8.3.11 Heritage

Table 8-13: 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 suitable buffer (20 m) 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.						

8.3.12 Visual

Table 8-14: 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:** During construction the clearing and grading of the site would create a visual scar in the landscape. Exposed bare soil would contrast with the prominently green sugarcane fields. Large construction vehicles and equipment may also be visible to receptors within the study area.	**Without**	2	3	2	1	-8	**Medium**
		With	2	2	1	1	-6	**Low**
		Mitigation measures: ▪ Limited clearing of vegetation on the development site. This will retain the screening function of natural vegetation. ▪ Carefully plan to reduce the construction period. ▪ Locate the construction camp and storage areas in zones of low visibility i.e. behind dense bush or in lower lying areas (note constraint related to proximity to watercourses). ▪ Construction camps cannot be located within 50 m to watercourses or within areas of sensitive vegetation. ▪ The ECO must approve construction camps positions prior to establishment. ▪ Minimise vegetation clearing and use a phased approach, only clearing vegetation when required. ▪ Areas of dense vegetation on the boundaries of the development site must be left intact to ensure natural screening of the site. ▪ The site must be screened with the use of shade cloth to reduce the visual impact of a construction site. ▪ Rehabilitate cleared areas as soon as possible. ▪ Dust suppression techniques must be made use of. ▪ Maintain a neat construction site by removing rubble and waste materials regularly.						
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 character of the site will be permanently altered, however, the site will be enhanced by the rehabilitation of the wetlands, dune forest, etc., ensuring a sustainable development, while conserving sensitive features like the estuary, coastal forest and other naturally occurring features.						
Cumulative	The proposed mixed-use development would increase the urban footprint in the area, thus altering the visual character and exposing sensitive visual receptors to visual impacts. The development may	**Without**	2	4	2	4	-12	**High**
		With	2	3	2	3	-10	**Medium**
		Mitigation measures: ▪ Layout: - The zones of visual sensitivity must be taken into consideration when undertaking the detailed designs and planning. In particular, the northern and eastern facing slopes that fall within a zone						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
	be perceived as an unwelcome visual intrusion, particularly if located in areas that have a scenic quality or in areas further away from existing urban transformation.	of high and moderate visual sensitivity directly west of the Umhlali River valley in the eastern parts of the development site should be precluded from the development. - Where possible, slopes that are steeper than 33% (1:3) should be excluded from the development areas as positioning the dwellings or buildings on these slopes would result in terracing which would disrupt the characteristic rolling green hills and create distinct horizontal lines within the landscape. In order to access these buildings, roads would have to be 'cut into the slope, creating a prominent linear 'scar' that texturally contrasts with the green hillside. ▪ Boundary: - Careful consideration must be taken when designing the boundary of the estate to avoid creating a sterile edge. - A discontinuous fragmented boundary or invisible fencing system should be utilised as opposed to a solid continuous wall. ▪ Lighting: - Should street lights be required, fittings that focus the light toward the ground and prevent light spill should be utilised. - Commercial buildings should not be illuminated at night. ▪ Architecture: - In order to conform with the scale of existing urban form, it is recommended that the structure heights for all residential land uses should be limited to 6 storeys as far as possible. - Buildings should be painted with natural colours or natural materials should be used such as, face brick and stone cladding. - Non-reflective materials should be utilised where possible.					

8.3.13 Traffic

Table 8-15: 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 travelling on external roads during peak traffic hours, where practically possible. Heavy trucks are not to use external roads during peak traffic hours. ▪ The Traffic Management Plan prepared by Aurecon must be implemented. ▪ All vehicles entering the site are to be roadworthy. ▪ Any incident or damage to a vehicle must be reported immediately.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	Aspect: Construction of access points and/or associated interchanges. **Impact:** Increase in traffic congestion during the construction phase.	**Without**	2	2	4	4	-12	**High**
		With	2	1	2	2	-7	**Medium**
		Mitigation measures: ▪ The Traffic Management Plan prepared by Aurecon must be implemented.						
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.						

8.3.14 Socio-economic and Health

Table 8-16: 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:** Job creation. **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: Human migration. **Impact:** Job creation during the construction	**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.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	phase could result in the influx of people to the area.	▪ No informal settlements will be allowed.						
	Aspect: Community Health. **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.	**Without**	2	2	3	2	-9	**Medium**
		With	2	2	1	1	-6	**Medium**
		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: Community Safety. **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: Labour Safety. **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.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	Aspect: Economic Growth. **Impact:** The development will result in job creation and economic growth.	**Without**	2	2	3	3	+10	**High**
		With	3	2	3	3	+11	**High**
		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	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 community, congestion and noise.	**Without**	2	3	3	2	-10	**High**
		With	2	1	1	2	-6	**Low**
		Mitigation measures: ▪ Police stations to be considered.						
	Improved access to community 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: ▪ KDM to commit finances to the provision of community facilities.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	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: ▪ KDM to commit finances to the provision of community 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.						

8.3.15 *Development and Beach Access*

8.3.15.1 Layout Alternative 1 (a) – Gated Residential Estate

Table 8-17: Tinley Manor Southbanks Gated Residential Estate impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Operational	**Aspect:** Access. **Impact:** Private development with private access to the beach resulting in exclusion of certain parties and loss of sense of place and opportunities for social amenities and recreational potential as well as compliance with beach access regulations.	**Without**	2	3	3	3	-11	**High**
		Mitigation measures: ▪ Not mitigation measures other than to consider the alternative public access development presented.						

8.3.15.2 Layout Alternative 1 (b) – Public Access Mixed-use Development

Table 8-18: Tinley Manor Southbanks Public Access Mixed-use Development impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Operational	**Aspect:** Access. **Impact:** Non-gated estate with commercial, retail and recreational opportunities available to the public as well as public beach access maintain sense of place and social amenity opportunities.	**Without**	2	3	3	2	+10	**High**
		With	2	3	3	2	+10	**High**
		Mitigation measures: ▪ The mixed-use development if not to be gated. Private residential estates within the development are permitted to be gated. ▪ Public beach access must be provided via elevated boardwalks and pedestrian walkways. Emergency vehicular access is required.						

8.3.16 Stormwater Management

8.3.16.1 Layout Alternative 2 (a) – Stormwater Management Facilities within Wetlands

Table 8-19: Tinley Manor Southbanks stormwater management 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 stormwater management facilities within wetlands. **Impact:** 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. Direct loss of wetland area to accommodate attenuation facilities within wetlands.	**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 a rehabilitation 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)	
	Aspect: Clearing of vegetation and topsoil. **Impact:** Cleared vegetation and topsoil placed near drainage areas can divert clean water into dirty water areas, causing waterlogging of adjacent areas or pollute water resources.	**Without**	2	3	3	3	-11	**High**
		With	1	2	2	3	-8	**Medium**
		Mitigation measures: ▪ Place all removed / excavated vegetation and topsoil in demarcated overburden stockpile areas to prevent obstruction of natural drainage paths. ▪ No soil stockpile areas or surplus fill material sites must be located within 50 m of any watercourse (includes the Umhlali Estuary and all wetlands). ▪ Erosion / sediment control measures such as silt fences, concrete blocks and/or sand bags, must be placed around soil / material stockpiles to limit sediment run-off from stockpiles into drainage lines. ▪ Any contravention of the above conditions will be regarded in a serious light and will be considered by the ECO and site manager in terms of penalties imposed in terms of the construction contract. Rectification and rehabilitation must be suitably carried out and will be signed off by the ECO before such activities are deemed to be closed.						
	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	**Very high**
		With	1	2	1	1	-5	**Low**
		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 must 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 KwaDukuza 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 must be cleaned out on a regular basis (weekly) 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. ▪ Any contravention of the above conditions will be regarded in a serious light and will be considered by the ECO and site manager in terms of penalties imposed in terms of the construction contract. Rectification and rehabilitation must be suitably carried out and will be signed off by the ECO before such activities are deemed to be closed.						

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	1	2	1	1	-5	**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. Copies are to be kept with the EPRP. ▪ The integrity of the impervious surface and bunded area must be inspected weekly and any maintenance work conducted must be recorded in a maintenance report. ▪ Employees must be provided with absorbent spill kits and disposal containers to handle spillages. ▪ The Contractor must train employees and contractors on the correct handling of spillages and precautionary measures that need to be implemented to minimise potential spillages. ▪ Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater. ▪ Cement / concrete batching is to be located in an area of low environmental sensitivity away from watercourses and pre-approved by the ECO. No batching activities shall occur on directly on the ground. ▪ Drip trays must be utilised at all dispensing areas. ▪ No refuelling, servicing nor chemical storage can occur within 50 m of any watercourse. ▪ 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 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 must be developed and implemented should and incident occur. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site. ▪ Access to storage areas on-site must be restricted to authorised employees only. ▪ Contractors must be held liable for any environmental damages caused by spillages. ▪ If a water pump is required, the water pump must operate inside or on top of a drip tray to prevent any spillage of fuel and limit the risk of soil/water contamination. The drip tray will need to be lined with absorbent pads and checked daily while in use. ▪ The construction workforce must have adequate sanitation facilities. Toilets must not be located within 50 m to a watercourse. ▪ The sanitation facilities must be on-site before the extended workforce is employed to ensure that no unauthorised sanitation practices are implemented on-site. Toilet facilities must be serviced weekly by a registered waste contractor.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		▪ Potential construction practices that might lead to groundwater contamination must be conducted on areas with impervious surfaces to avoid infiltration of contaminated substances into the groundwater aquifer. ▪ All wastewater must be collected in a sealed container and disposed of by an approved waste contractor. Waybills must be retained for inspection. ▪ Any contravention of the above conditions will be regarded in a serious light and will be considered by the ECO and site manager in terms of penalties imposed in terms of the construction contract. Rectification and rehabilitation must be suitably carried out and will be signed off by the ECO before such activities are deemed to be closed.						
	Aspect: Construction activities within watercourses. **Impact:** Site clearing, the removal of vegetation, and associated disturbances to soils, leading to increased run-off and erosion with consequent sedimentation of riparian/wetland habitat.	**Without**	2	3	3	3	-11	**High**
		With	1	2	2	3	-8	**Medium**

		Mitigation measures:
		▪ All construction footprint areas must remain as small as possible and should as far as possible not encroach into surrounding more sensitive areas. It must be ensured that the riparian and drainage line systems not proposed to be crossed for the installation of services and/or infilled for the earth-worked platforms, and their associated buffer zones are off-limits to construction vehicles and personnel.
		▪ The boundaries of footprint areas are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. Appropriate fencing, such as shadecloth, and signage must be erected advising personal that this is strictly a 'no-go' area. Any infringements on the 'no-go' areas must attract a penalty as per the provisions of the EMPr.
		▪ The working servitude in wetlands must not exceed 10 m on either side of the approved installation.
		▪ Any areas where bank failure is observed must be immediately repaired.
		▪ As far as possible the existing road network must be utilised, minimising the need to develop new access routes resulting in an increased impact on the local environment.
		  ○ Should temporary roads or access routes be necessary and unavoidable, proper planning must take place and the site sensitivity plan must be taken into consideration. The ECO must be consulted for approval.
		  ○ If additional roads are required, then wherever feasible such roads should be constructed a distance from the more sensitive riparian areas and not directly adjacent thereto.
		  ○ If crossings are required they should cross the systems at right angles, as far as possible to minimise impacts in the receiving environment.
		▪ The duration of impacts on the wetlands systems must be minimised as far as possible by ensuring that the duration of time in which flow alteration and sedimentation will take place is minimised.
		▪ Appropriate sanitary facilities must be provided for the life of the construction and all waste removed to an appropriate waste facility.
		▪ No informal fires are to be permitted in within the study area.
		▪ Ensure that an adequate number of rubbish bins are provided so as to prevent litter and ensure the proper disposal of waste generated during construction activities.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		▪ Edge effects of activities, particularly erosion and alien/weed control need to be strictly managed. ▪ The EMPr will advise on special (and on-going) monitoring activities that will target areas that have been identified as sensitive areas within the project site. ▪ Any contravention of the above conditions will be regarded in a serious light and will be considered by the ECO and site manager in terms of penalties imposed in terms of the construction contract. Rectification and rehabilitation must be suitably carried out and will be signed off by the ECO before such activities are deemed to be closed.						
	Aspect: Construction activities within watercourses. **Impact:** Accidental transgression into wetland areas outside the approved ROW.	**Without**	2	3	3	3	-11	**High**
		With	1	2	2	3	-8	**Medium**
		Mitigation measures: ▪ Should any water resource units (wetlands/streams) outside of the construction corridor be disturbed during the construction phase, these areas must be rehabilitated immediately. ▪ All disturbed areas must be prepared and then re-vegetated to the satisfaction of the ECO as per the relevant re-vegetation/re-planting plan. ▪ Where any wetlands or stream channels and riparian habitats have been disturbed, the channels should be re-graded, stabilised using erosion control measures and re-vegetated as per the relevant re-vegetation / re-planting plan. ▪ Any contravention of the above conditions will be regarded in a serious light and will be considered by the ECO and site manager in terms of penalties imposed in terms of the construction contract. Rectification and rehabilitation must be suitably carried out and will be signed off by the ECO before such activities are deemed to be closed.						

8.3.16.2 Layout Alternative 2 (b) – Stormwater Management Facilities Predominantly Outside of Wetlands

Table 8-20: 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 management 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.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	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	2	2	3	-8	**Medium**
		Mitigation measures: ▪ Place all removed / excavated vegetation and topsoil in demarcated overburden stockpile areas to prevent obstruction of natural drainage paths. ▪ No soil stockpile areas or surplus fill material sites must be located within 50 m of any watercourse (includes the Umhlali Estuary and all wetlands). ▪ Erosion / sediment control measures such as silt fences, concrete blocks and/or sand bags must be placed around soil / material stockpiles to limit sediment run-off from stockpiles into drainage lines. ▪ Any contravention of the above conditions will be regarded in a serious light and will be considered by the ECO and site manager in terms of penalties imposed in terms of the construction contract. Rectification and rehabilitation must be suitably carried out and will be signed off by the ECO before such activities are deemed to be closed.						
	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	**Very high**
		With	1	2	1	1	-5	**Low**
		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 must 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 KwaDukuza 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 must be cleaned out on a regular basis (weekly) 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. ▪ Any contravention of the above conditions will be regarded in a serious light and will be considered by the ECO and site manager in terms of penalties imposed in terms of the construction contract. Rectification and rehabilitation must be suitably carried out and will be signed off by the ECO before such activities are deemed to be closed.						

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	1	2	1	1	-5	**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 weekly and any maintenance work conducted must be recorded in a maintenance report. ▪ Employees must be provided with absorbent spill kits and disposal containers to handle spillages. ▪ The Contractor must train employees and contractors on the correct handling of spillages and precautionary measures that need to be implemented to minimise potential spillages. ▪ Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater. ▪ Cement/concrete batching is to be located in an area of low environmental sensitivity away from watercourses and pre-approved by the ECO. No batching activities shall occur on directly on the ground. ▪ Drip trays must be utilised at all dispensing areas. ▪ No refuelling, servicing nor chemical storage can occur within 50 m of any watercourse. ▪ 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 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 must be developed and implemented should and incident occur. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site. ▪ Access to storage areas on-site must be restricted to authorised employees only. ▪ Contractors must be held liable for any environmental damages caused by spillages. ▪ If a water pump is required, the water pump must operate inside or on top of a drip tray to prevent any spillage of fuel and limit the risk of soil/water contamination. The drip tray will need to be lined with absorbent pads and checked daily while in use. ▪ The construction workforce must have adequate sanitation facilities. Toilets must not be located within 50 m to a watercourse. ▪ The sanitation facilities must be on-site before the extended workforce is employed to ensure that no unauthorised sanitation practices are implemented on-site. Toilet facilities must be serviced weekly by a registered waste contractor. ▪ Potential construction practices that might lead to groundwater contamination must be conducted on						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
		areas with impervious surfaces to avoid infiltration of contaminated substances into the groundwater aquifer. ▪ All wastewater must be collected in a sealed container and disposed of by an approved waste contractor. Waybills must be retained for inspection.						
	Aspect: Construction activities within watercourses. **Impact:** Site clearing, the removal of vegetation, and associated disturbances to soils, leading to increased run-off and erosion with consequent sedimentation of riparian/wetland habitat.	**Without**	2	3	3	3	-11	High
		With	1	2	2	3	-8	Medium
		Mitigation measures: ▪ All construction footprint areas must remain as small as possible and should as far as possible not encroach into surrounding more sensitive areas. It must be ensured that the riparian and drainage line systems not proposed to be crossed for the installation of services and/or infilled for the earth-worked platforms, and their associated buffer zones are off-limits to construction vehicles and personnel. ▪ The boundaries of footprint areas are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. Appropriate fencing, such as shadecloth, and signage must be erected advising personal that this is strictly a 'no-go' area. Any infringements on the 'no-go' areas must attract a penalty as per the provisions of the EMPr. ▪ The working servitude in wetlands must not exceed 10 m on either side of the approved installation. ▪ Any areas where bank failure is observed must be immediately repaired. ▪ As far as possible the existing road network must be utilised, minimising the need to develop new access routes resulting in an increased impact on the local environment. ○ Should temporary roads or access routes be necessary and unavoidable, proper planning must take place and the site sensitivity plan must be taken into consideration. The ECO must be consulted for approval. ○ If additional roads are required, then wherever feasible such roads should be constructed a distance from the more sensitive riparian areas and not directly adjacent thereto. ○ If crossings are required they should cross the systems at right angles, as far as possible to minimise impacts in the receiving environment. ▪ The duration of impacts on the wetlands systems must be minimised as far as possible by ensuring that the duration of time in which flow alteration and sedimentation will take place is minimised. ▪ Appropriate sanitary facilities must be provided for the life of the construction and all waste removed to an appropriate waste facility. ▪ No informal fires are to be permitted in within the study area. ▪ Ensure that an adequate number of rubbish bins are provided so as to prevent litter and ensure the proper disposal of waste generated during construction activities. ▪ Edge effects of activities, particularly erosion and alien / weed control need to be strictly managed. ▪ The EMPr will advise on special (and on-going) monitoring activities that will target areas that have been identified as sensitive areas within the project site.						
	Aspect: Construction activities within	**Without**	2	3	3	3	-11	High
		With	1	2	2	3	-8	Medium

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
	watercourses. **Impact:** Accidental transgression into wetland areas outside the approved ROW.	**Mitigation measures:** ▪ Should any water resource units (wetlands/streams) outside of the construction corridor be disturbed during the construction phase, these areas must be rehabilitated immediately. ▪ All disturbed areas must be prepared and then re-vegetated to the satisfaction of the ECO as per the relevant re-vegetation / re-planting plan. ▪ Where any wetlands or stream channels and riparian habitats have been disturbed, the channels should be re-graded, stabilised using erosion control measures and re-vegetated as per the relevant re-vegetation/re-planting plan.					

8.3.17 *Irrigation Dam Location*[19]

Table 8-21: Tinley Manor Southbanks Irrigation Dam alternatives impact assessment

Option	Vegetation Impacts	Wetland Impacts	Storage Capacity	Rating
(a)	Low	Low	Insufficient	No-go
(b)	High	Medium	Insufficient	No-go
(c)	High	High	Sufficient	Go

8.3.18 *Irrigation Source Options*

Initially the abstraction of water from the Umhlali River and Estuary was proposed. The specialist has rated this as a Very High impact in the Estuarine Assessment for the following reasons:

Reduced freshwater inflow (mostly through abstraction) is a major threat facing South African estuaries, including the Umhlali Estuary, where dam construction and known abstraction occurs for irrigation purposes in the catchment area of the Umhlali River. Additional freshwater may be abstracted from the Umhlali River above the head of the estuary to supply construction activities for the Tinley Manor Southbanks, which is also likely to include wetland rehabilitation activities.

The hydrodynamic functioning and ecological state of an estuary are critically dependent on fluvial input. The degree of impact on the downstream estuarine environment will depend on the volume, frequency and timing of water abstraction. In the context of the Umhlali, the cumulative impact of farm dams and direct abstraction of significant volumes of freshwater during the current drought-stressed conditions may result depressed in baseflows and aseasonal and/or prolonged closure of the estuary mouth with knock-on effects for the ecology of the system. Overall reduction in flow will also result in reduction of estuarine habitat. Conversely, over an extended period, the gradual accumulation of water will lead to backflooding and prolonged inundation of littoral habitats, with potential shifts in vegetation community assemblages.

[19] *Impacts associated with the loss of wetland area for the dam and construction activities within the wetland are covered under Section 0.*

While the discharge of treated wastewater from the nearby WWTWs may be thought of as a means to augment the depressed mean annual runoff or off-set freshwater abstraction, the concomitant increase in nutrients related to the discharge will produce a highly negative impact. Furthermore, treated effluent discharged from WWTWs becomes the primary constituent of river flow where natural baseflows have been greatly reduced through abstraction and impoundments, combined with drought conditions. This can have severe consequences in terms of eutrophication of the downstream environment, such as estuaries. This risk must be considered given the severe drought conditions currently being experienced in KZN and in the context of the proposed phased construction approach.

Moreover, the recommended Ecological Flow Requirement (EFR) to achieve the Recommended Ecological Category is the present day flow (51.26 x 106 m^3) but without abstractions or WWTW inputs, and without the current system impacts. Additional abstraction from the system, together with increased nutrient loading, will undoubtedly result in deterioration of the system.

This potential impact is rated at a national scale, as continual abstraction of large volumes of water that erode the ecological reserve will affect estuarine health and functioning, and all biota (both plants and animals), which would decrease the overall importance of the system for conserving estuarine biodiversity.

Proposed Mitigation:

- It is strongly recommended that water abstraction from the Umhlali River and estuary not be permitted in view of: (a) the Category D Present Ecological State, (b) the Recommended Ecological Category of B, (c) the prescribed recommended EFR, and (d) the current impacts threatening the system.
- An alternative water supply must be sought.
- A water conservation strategy should be compiled between SSW as owner of the Sheffield WWTW, and Tongaat Hulett Development to recover water of a suitable standard from the Sheffield WWTW for possible use during construction, rehabilitation and potentially potable use within the Tinley Manor Southbanks complex.
- Failing these points, further investigation into alternative water supply will be required.

Based on the above, the proposal for the use of the existing borehole owned and operated by SSW and/or the re-use of treated wastewater from the Sheffield WWTW is proposed.

Table 8-22: Tinley Manor Southbanks Irrigation Dam alternatives impact assessment

Option	Vegetation Impacts	Wetland / River Impacts	Rating
Potable Water	Low	Low	No-go
Borehole (existing)	Low	Medium	Go
Umhlali Estuary abstraction	High	Very High	No-go
Re-use of treated wastewater	Low	Low	Go

8.3.19 Area '9'

8.3.19.1 Layout Alternative 4 (a) – Development footprint within woody vegetation

Table 8-23: Tinley Manor Southbanks development within woody vegetation impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Loss of woody vegetation. **Impact:** Loss of indigenous vegetation for the sewer line.	**Without**	2	3	3	3	-11	**High**
		With	1	2	2	3	-8	**Medium**
		Mitigation measures: ▪ The extent of disturbance must be limited to the boundary of the development property. No areas outside the construction footprint may be cleared. Terrestrial areas outside of the development property are considered 'No-Go' areas. ▪ Access through and construction activities within the No-Go areas are strictly prohibited in these areas and need to be strictly controlled and only approved by the ECO with due motivation. ▪ Silt fences must be erected and maintained for the entire duration of the construction period to ensure that no sediment is carried into these No-go areas. Regular checks must be conducted to ensure that these silt fences are functioning correctly. ▪ Toolbox Talks must be presented with the topic of sensitive environments being highlighted and the staff being educated as to their value. ▪ No cutting or pruning of indigenous vegetation is permitted without the permission of the ECO, in consultation with the botanist. ▪ Prior to commencement of construction, a qualified and skilled botanist must be appointed to survey the construction footprint, identify and mark all conservation importance species and apply for necessary permits and licences to cut, disturb, damage, destroy, remove or translocate them. ▪ The commencement of construction must be preceded by a plant rescue programme which must be conducted only when plant permits and licences have been issued by the relevant authority. ▪ All protected plants identified must be relocated once the required permit is obtained. ▪ Any protected trees that are destroyed must be replaced on a 1 to 3 basis, i.e. for every tree lost, 3 individuals of the same species must be re-planted in the Open Space Network.						

8.3.19.2 Layout Alternative 4 (b) – Development footprint outside woody vegetation

Table 8-24: Tinley Manor Southbanks development outside woody vegetation impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Bulk land use rations.	**Without**						
		With						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
	Impact: Loss of one residential platform to move up the sewer line to retain the woody vegetation pocket.	**Mitigation measures:** ▪ No mitigation identified.					

8.3.20 Surplus Fill Material Sites

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:

8.3.20.1 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.

8.3.20.2 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.

8.3.20.3 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.

8.3.20.4 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.

8.3.20.5 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 8.3.20.4***, additional materials (as specified above) can potentially be re-used through 'soft-engineering' in the artificial creation of wetland habitats.

8.3.20.6 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 8.3.20.4***, additional materials (as specified above) can potentially be re-used as 'soft-engineering' in the artificial creation of other natural habitats.

8.3.20.7 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.

8.3.20.8 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.

8.3.20.9 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.

8.3.20.10 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.

8.3.20.11 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.

8.3.20.12 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.

8.3.20.13 Placement within Future Servitudes

This option is as per ***Section 8.3.20.12***, 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.

8.3.20.14 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.

8.3.20.15 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 8.3.20.14*** are relevant to this option.

8.3.20.16 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 8.3.20.14*** are relevant to this option.

8.3.20.17 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.

8.3.20.18 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 8.3.20.14*** may be relevant to this option and should be confirmed prior to being initiated.

8.3.20.19 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.

8.3.20.20 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'.

8.3.20.21 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.

Table 8-25: 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 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. ▪ Local flood risk reduction by selection of appropriate design standards for the sites. ▪ 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 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	**Without**	3	2	4	2	-1	**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)	
	sites. **Impact:** Potential impact on the riparian vegetation during the haulage of surplus material.	**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. ▪ 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***).						

9 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 9-1: 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.

9.1 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 9-1*** below.

Table 9-1: 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. • A pre-submission meeting was held with the KZN EDTEA. Minutes of this meeting are included in ***Appendix A***. • On-going consultation subsequent to the pre-submission meeting during the preparation for the final EIAR. • Submission of the final EIAR on 25

Authority	Role	Licence / Approval	Consultation to date
			February 2016. • Submission of an Addendum to the final EIAR on 07 April 2016. • Rejection of the final EIAR on 08 June 2016. • Meeting to discuss the rejection on 12 July 2016. Minutes of this meeting are included in ***Appendix A***. • Request to keep application open submitted on 15 August 2016. • Letter from KZN EDTEA stating application will be kept open until May 2017 received on 15 September 2016. • On-going consultation subsequent to the release of the amended draft EIAR.
Department of Water and Sanitation	Competent Authority for Water Use Licence Application process	Water Use Licence	• Interim comments received on 24 October 2011 (***Appendix H***). • Additional comments received on 08 December 2011 (***Appendix*** H). • No comment received on draft or final EIAR despite numerous attempts to obtain comments (***Appendix H***). • Pre-application meeting held with the DWS on 08 April 2016.
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***). • Final comment received on 19 May 2015 (***Appendix H***). • Revised comment received on 04 July 2016 (***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**). • Final comment received in November 2015 (***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***). • Final comment received on 26 November 2015 (***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***). • Additional comment received on 29 May 2015 (***Appendix H***). • Approval to release the land from Agriculture received on 21 August 2015 (***Appendix H***).
Department of Transport	Transport Authority	Commenting Authority	• Interim comment received on 13 December 2011 (***Appendix*** H). • No comment received on draft EIAR despite numerous attempts to obtain

Authority	Role	Licence / Approval	Consultation to date
			comments (***Appendix*** H). • Comments on the TIA received on 05 December 2016 (***Appendix H***). • Responses submitted by Aurecon (Traffic specialists) on 30 January 2017 (***Appendix H***). • Revised comments received on 24 February 2017 (***Appendix H***).
The South African National Roads Agency Limited (SANRAL)	Transport Authority	Commenting Authority	• Comment received on 18 May 2015 (***Appendix H***).

9.2 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 9-2***.

Table 9-2: 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

9.3 Overview of the Scoping Phase PPP

The PPP undertaken during the Scoping Phase is presented in ***Figure 9-2***.

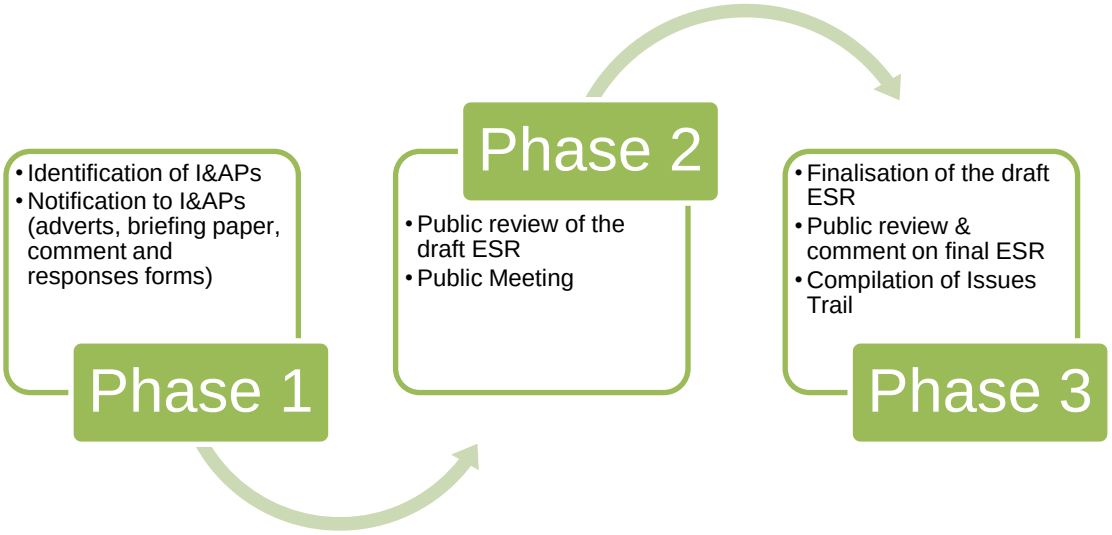


Figure 9-2: Key phases in the PPP undertaken during the Scoping Phase

9.3.1 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***.

9.3.2 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.

9.4 Overview of the EIA Phase PPP

The PPP undertaken / to be undertaken during the Scoping Phase is presented in ***Figure 9-3***.

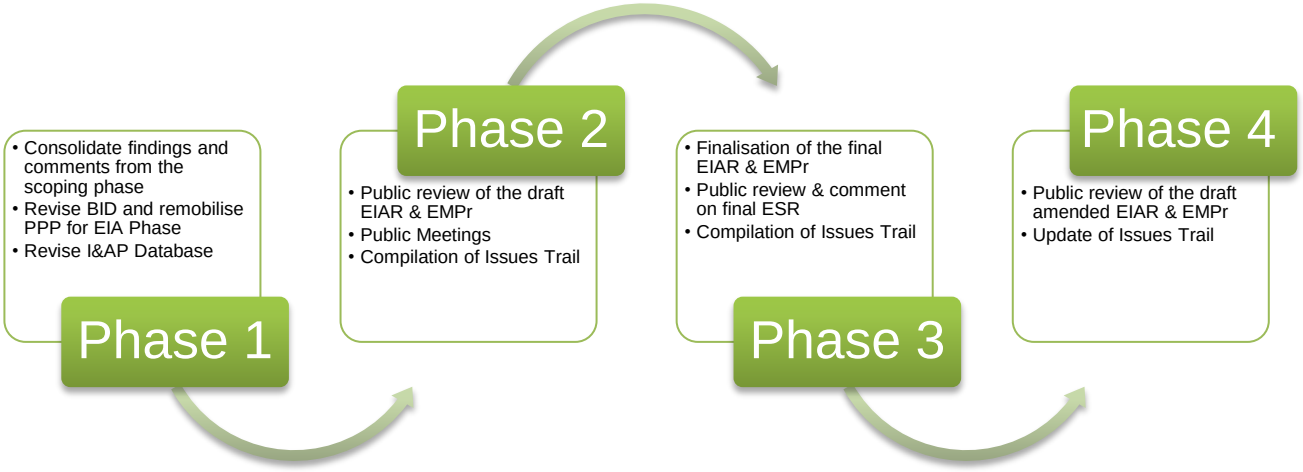


Figure 9-3: Key phases in the PPP undertaken during the EIA Phase

9.4.1 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***.

9.4.2 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***.

9.4.3 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).

9.4.4 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 was held as follows:

- Regal Inn Ballito (23.04.2015 – 17h30).

9.4.5 Public and Authority Review of the Draft Environmental Impact Assessment Report

The draft EIAR was been made available for authority and public review for a total of 40 days from 30 March 2015 to 18 May 2015.

The report was 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

9.4.6 Public and Authority Review of the Final Environmental Impact Assessment Report

The final EIAR was made available for authority and public review for a total of 21 days from 26 February 2016 to 18 March 2016.

The report was 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

Following requests by I&APs, the final EIAR will also be made available at the following library:

- KwaDukuza Library: Corner of Gizenga Street and Balcomb Street

9.4.7 Rejection of the Final Environmental Impact Assessment Report

All registered I&APs were notified about the rejection of the final EIAR as well as reasons for the rejection and the change in contact details of the EAP. I&APs were encouraged to continue to engage with the EAP on the project.

Comments have continued to be received since the rejection of the final EIAR.

9.4.8 Public and Authority Review of the Draft Amended Environmental Impact Assessment Report

The draft amended EIAR will be made available for authority and public review for a total of 40 days from 29 March 2017 to 08 May 2017.

The report will be made available at the following public locations within the study area, which are all readily accessible to I&APs:

- Beach Home Properties offices and address situated below Impulse By The Sea restaurant. The physical address is 167 Sea View Drive, Tinley Manor Beach
- KwaDukuza Library: Corner of Gizenga Street and Balcomb Street
- Salt Rock Library: Ocean Drive, Dolphin Coast, 4391
- Tongaat Hulett Developments: Zimbali Resort Offices, Zimbali (Adjacent to Sales centre just before northern gatehouse)
- Royal HaskoningDHV Website: www.rhdhv.co.za

9.4.9 Issues Trail

Issues and concerns raised during the PPP have been 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.

Comments received will continue to be captured in the Issues Trail until final submission to the KZN EDTEA for decision-making.

9.5 Results of the Public Engagement

On the whole, almost all neighbouring communities likely to be affected, are deemed to be in favour of the Tinley Manor Southbanks, noting the positive socio-economic potential thereof.

During the Public Participation Process however, a number of concerns and questions were posed. The following are the major issues, questions and concerns that have been raised:

- Overall there is significant concern relating to beach and estuary access. Tongaat Hulett Developments have been proactive in ensuring public beach access is provided for, although, given the sensitivities of the coastal dune system, will need to be carefully managed to ensure protection of the coastal zone.
- Traffic Management and congestion was a concern for neighbouring communities as well as accessibility and linkages and a comprehensive TIA has been completed and appropriate linkages made where practical.
- Estuary Management has raised some discussion with the mandate for an Estuary Management Plan falling to the KwaDukuza Municipality as the responsible management authority.
- Increased pressure on existing services was raised as a concern, including sewers, water resources, electricity provision, telecommunications and waste transfer facility sites and detailed services reports have been completed.
- The Department of Agriculture originally raised concern relating to the transformation of agricultural land, however, the Department of Agriculture released the land from agriculture in 2015. It is further confirmed that Tongaat Hulett remains committed to agriculture and agricultural processing in the province and continues to increase the quantum of new agriculture in the rural hinterland where its sustainability is assured.
- Wetland management and loss has been a concern raised by a number of parties. This amended EIA Report seeks to address these concerns.
- The direct neighbour has raised a number of concerns relating to (i) access to the beach and estuary via horseback; (ii) access to his property, and (iii) downstream impacts on his dam to name but a few. Detailed comments and responses are provided in the Issues Trail.

Detailed comments and responses are provided in the Issues Trail presented in ***Appendix H***.

9.6 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.

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 8.3***, 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. ▪ The development will enable Tongaat Hulett to continue it's investment into new agriculture in rural areas	▪ Loss of land with limited agricultural potential. ▪ Tongaat Hulett have been implementing an action plan around increasing the extent of new agricultural land within the region.	▪ 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 lessons learnt from challenges encountered at other	▪ 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 topography and poor soil quality (for	▪ 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**
	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.	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 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 Estuary in the long-term.	▪ 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 be 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 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	▪ The *Status Quo* will remain.	▪ The Umhlali River and Estuary is presently under strain. 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
		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. Including confirmed management of coastal vegetation.	▪ 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.
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.	▪ 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	▪ *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.

	Tinley Manor Southbanks Concept Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
	▪ Protection of Coastal Forest, identified threatened ecosystem and likely to be included as a critical biodiversity area	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.		
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. ▪ Detailed management plans for Tinley Manor Southbanks (e.g. SMP, EMPr, Wetland and Open Space Rehabilitation Plan) which seek to reduce the negative impacts of stormwater run-off and by implication erosion and sedimentation.	▪ 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 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.

	Tinley Manor Southbanks Concept Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
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: o creating a settlement with a unique coastal identity and character; o establishing a functional and visual connection with the sites ecological assets; o incorporating an integrated open space system; and o 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.	▪ As could be expected, the construction phase is characterised by a number of negative social impacts (viz. arrival of construction workers; inflow of job	▪ No foreseen advantages.	▪ The project is situated on land that is ideally situated for Tourism within a number of development corridors or

	Tinley Manor Southbanks Concept Plan		No-Go (Status Quo)	
	Advantages	Disadvantages and Responding Mitigation	Advantages	Disadvantages and Responding Mitigation
	▪ Economic benefits through the injection of R9.8 billion in capital costs include: o Significant jobs created through the value-chain of the development; o Urban renewal; and o Increased rates base of the Municipality.	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.		growth areas identified in provincial and local government plans and strategies in recent years.
Traffic	▪ There will be upgrades of the current road network as well as proposed new roads and interchanges that will provide alternative, additional access / egress to the area	▪ Due to construction activities there is the possibility of disruptions to traffic flow in the area, especially along existing routes when the proposed interchanges are constructed and during the construction phase for Tinley Manor Southbanks. ▪ 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.	▪ The *Status Quo* will remain.	▪ The current haulage sugarcane roads or tracks will remain within Tinley 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	▪ 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	▪ The *Status Quo* will remain.	▪ Currently, access to the coastal area adjacent to the proposed development site is limited to access along the

	Tinley Manor Southbanks Concept Plan		No-Go (Status Quo)	
	Advantages	Disadvantages and Responding Mitigation	Advantages	Disadvantages and Responding Mitigation
	residential and leisure development supported by a range of commercial and social facilities fulfilling the legal obligations of providing public access to the beach. ▪ 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.	limited to pedestrian access via paths and elevated wooden boardwalks, except for emergency vehicular access which has been provided for.		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 rise / storm surge perspective.

10.1.2 Comparative Assessment of Layout Alternatives

Table 10-2: Advantages and disadvantages of the development and access alternatives

	Gated Residential Estate – Initial Option		Public Access Mixed-use Development – Revised Option	
	Advantages	Disadvantages and Responding Mitigation	Advantages	Disadvantages and Responding Mitigation
Type of development layout	-11 after mitigation		+10 after mitigation	
	▪ Security for residents.	▪ Restricted private beach access. ▪ Loss of commercial and retail opportunities. ▪ Limited job opportunities. ▪ Loss of sense of place. ▪ Loss of social amenities.	▪ Public beach access. ▪ Retains sense of place. ▪ Realisation of social amenities and commercial / retail opportunities. ▪ Improved road network. ▪ Protection / management of coastal vegetation.	▪ Increased crime for residents. ▪ Increase in traffic volumes.

Table 10-3: Advantages and disadvantages of the stormwater management facilities alternatives

	Stormwater Management Facilities Within Wetlands – Initial Option		Stormwater Management Facilities Outside Wetlands – Revised Option	
	Advantages	Disadvantages and Responding Mitigation	Advantages	Disadvantages and Responding Mitigation
Location of stormwater management 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 management 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.

Table 10-4: Advantages and disadvantages of the stormwater management facilities alternatives

Option	Vegetation Impacts	Wetland Impacts	Storage Capacity	Rating
(a)	Low	Low	Insufficient	No-go
(b)	High	Medium	Insufficient	No-go
(c)	High	High	Sufficient	Go

Table 10-5: Advantages and disadvantages of the Area '9' alternatives

	Within Woody Vegetation – Initial Option		Outside Woody Vegetation – Revised Option	
	Advantages	Disadvantages and Responding Mitigation	Advantages	Disadvantages and Responding Mitigation
Development footprint in Area 9	**-8 after mitigation**		**+10 after mitigation**	
	▪ Increased development footprint (additional residential unit).	▪ Loss of woody vegetation. ▪ Habitat fragmentation.	▪ Retention of woody vegetation.	▪ Loss of one residential unit.

10.1.3 Comparative Assessment of Activity Alternatives

Table 10-6: Advantages and disadvantages of Irrigation Source alternatives

Option	Vegetation Impacts	Wetland / River Impacts	Rating
Potable Water	Low	Low	No-go
Borehole (existing)	Low	Medium	Go
Umhlali Estuary abstraction	High	Very High	No-go
Re-use of treated wastewater	Low	Low	Go

10.2 Key Findings of the EIA

The Guideline for Biodiversity Impact Assessment was used to guide the assessment of biophysical impacts and to inform the identification of suitable mitigation measures. According to the document, the guiding principle with regards to biodiversity conservation and sustainable development adopted by Ezemvelo KZN Wildlife is one of "*no net loss of biodiversity and ecosystem processes*".

To achieve this principle, a proactive approach to planning and biodiversity conservation must be adopted that ensures:

- The early identification and evaluation of potential biodiversity impacts that may constitute 'fatal flaws', or significant biodiversity related/management issues;
- The early identification and evaluation of conceptual alternatives which could prevent, avoid or reduce significant impacts on biodiversity, or enhance or secure opportunities for biodiversity conservation; and
- The appropriate design of mitigation through the mitigation hierarchy which should strive first avoid disturbance of ecosystems and loss of biodiversity, and where this cannot be avoided altogether, to minimise, rehabilitate, and then finally off-set any remaining residual negative impacts on biodiversity.

The protection of ecosystems and biodiversity generally begins with the avoidance of adverse impacts and where such avoidance is not feasible; to apply appropriate mitigation in the form of reactive practical actions that minimizes or reduces in situ impacts. Management of impacts should aim to prevent the occurrence of large-scale damaging events as well as repeated, chronic, persistent, subtle events which can in the long-term be far more damaging (e.g. as a result of sedimentation and pollution).

Mitigation requires proactive planning that is enabled by following the 'mitigation hierarchy' (***Figure 10-1***). The application of the mitigation hierarchy is intended firstly, to strive to avoid disturbance of ecosystems and loss of biodiversity, and where this cannot be avoided, to minimise, rehabilitate, and then finally off-set any remaining significant residual impacts. The mitigation hierarchy is inherently proactive, requiring the on-going and iterative consideration of alternatives in terms of project location, siting, scale, layout, technology and phasing until the proposed development can best be accommodated without incurring significant negative impacts to the receiving environment.

In cases where the receiving environment cannot support the development or where the project will destroy the natural resources on which local communities are wholly dependent for their livelihoods or eradicate unique biodiversity; the development may not be feasible and the developer knows of these risks, and can plan to avoid them, the better.

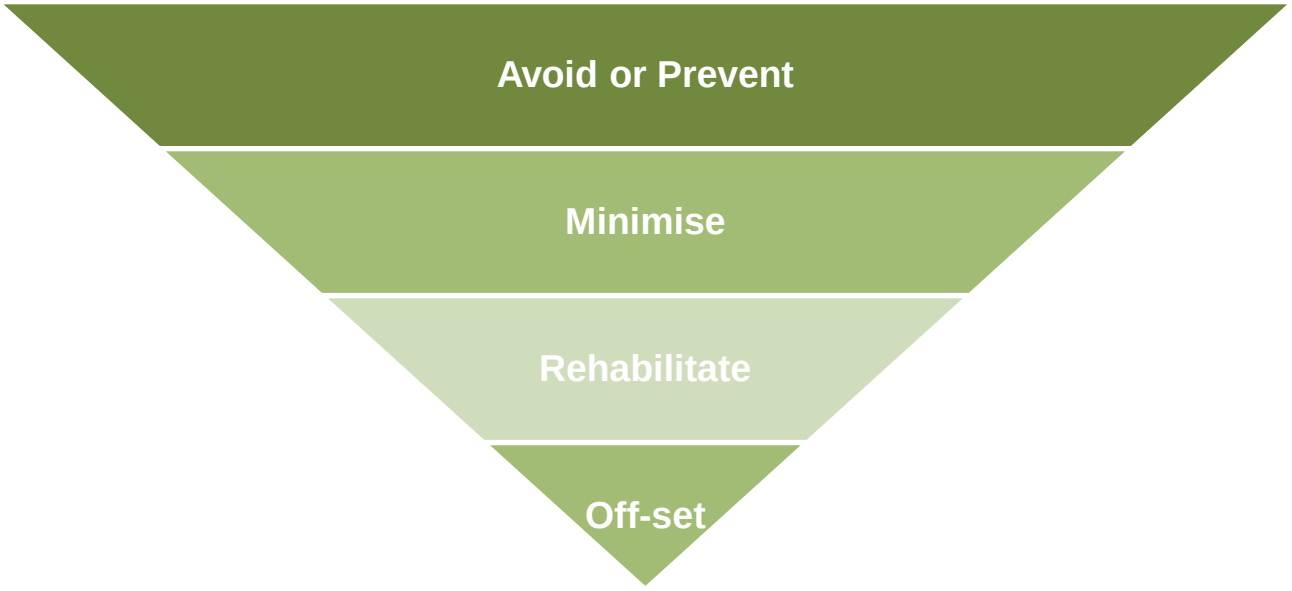


Figure 10-1: The mitigation hierarchy

The mitigation hierarchy as presented in ***Figure 10-1*** has been adhered to. 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 wetlands and indigenous vegetation (***Figure 10-2***).

The Umhlali Estuary and the Coastal Zone (***Figure 10-2***) are sensitive environments which have required careful consideration.

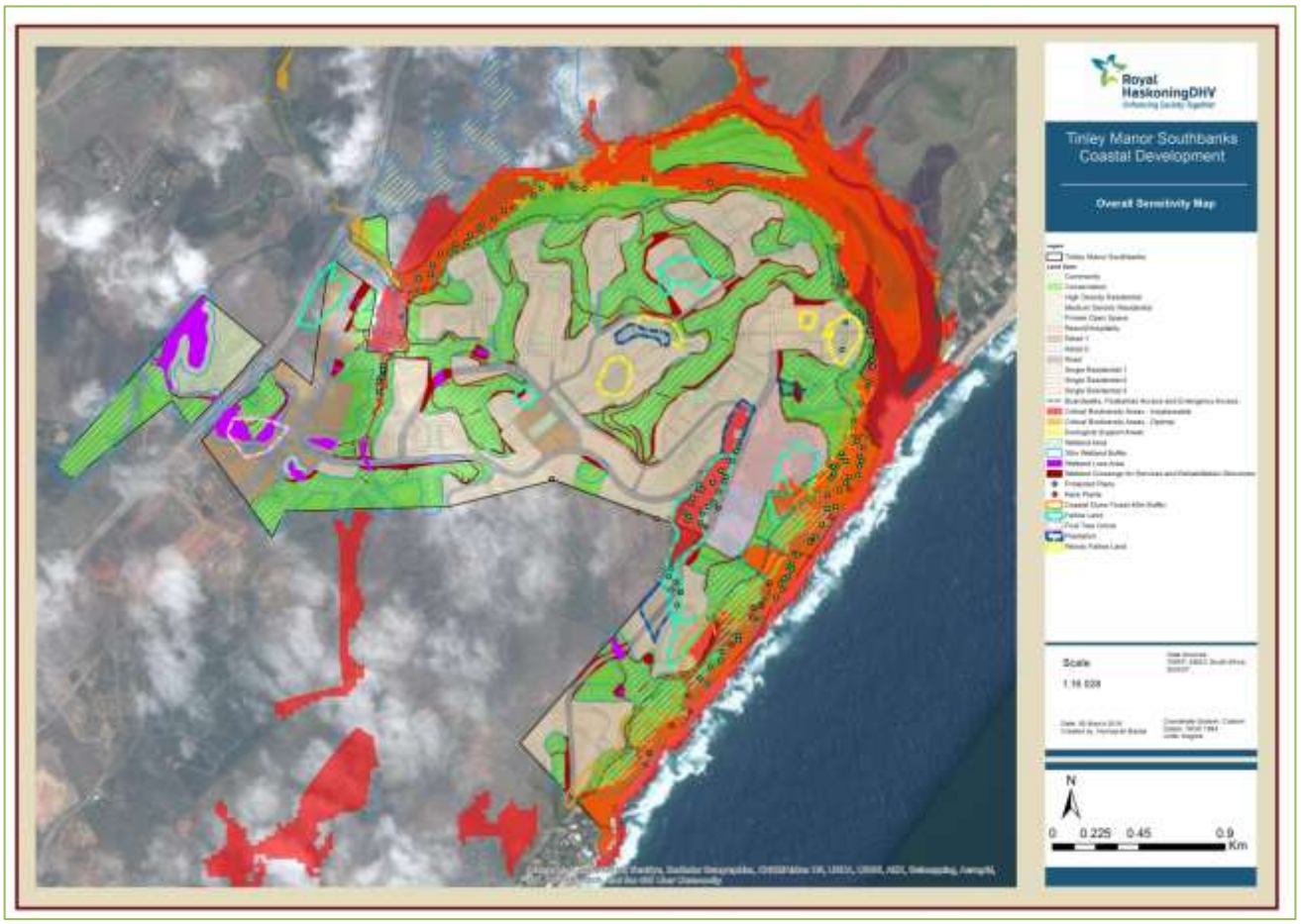


Figure 10-2: Consolidated Sensitivity Map (Amended Concept Plan, 2017)

Key sensitive environments presented in ***Figure 10-2*** include:

- Umhlali River and Estuary (including the floodplain and setback);
- Coastal Dune Zone including setback;
- Coastal Dune Forest;
- Pockets of indigenous vegetation;
- Protected Plant species;
- Indigenous Plant species; and
- Wetlands areas (including 30 m buffer and wetland areas to be 'lost').

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.

Coastal access, which was identified as a potentially significant issue, has been resolved. The Concept Plan which promoted a public access mixed-use development is recommended for authorisation. 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.

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 development's 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.

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.

It is not anticipated that any significant impacts will arise from a vegetation perspective, as the vegetation that will be lost is all secondary in nature and provides limited ecological services and function.

The Open Space Network is well connected and will ensure that ecological processes are able to proceed and develop as the rehabilitation of the Open Space Network progresses. The opportunity exists to establish a heterogeneous Open Space Network that will incorporate, grasslands, wetlands, floodplains and back of

beach areas which will contribute at a significantly higher ecological and functional level than they currently are.

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 wherever possible, 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.

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.

The proposed development layout that has gone to great lengths to conform to the mitigation hierarchy (***Figure 10-1***) in order 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.

Stormwater management 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 management facilities within wetlands or within the wetland buffers have been assessed. Whilst the location of stormwater management 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 management facilities to be located predominantly outside of wetland areas, but within the 30 m wetland buffers, unless where unavoidable to be located within wetlands due to constraints such as topography or catchment hydraulics. The shift to locating stormwater management facilities outside of wetlands has resulted in the introduction of several swales into the stormwater design for the site.

The option of sourcing water for irrigation from various sources was considered. Potable water is not a feasible option considering the water strain and drought conditions presently being experienced. Furthermore, the assessment has found that abstracting water from the Umhlali River and Estuary is not an environmentally sound solution. Therefore, the option of utilising water from the Sheffield WWTW's borehole and/or treated wastewater from the Sheffield WWTW has been assessed.

Water for rehabilitation irrigation would need to be collected, thus the inclusion of a dam to store water for irrigation purposes has been included in this assessment. A number of dam sites were assessed for their ability to provide the appropriate water volumes required for irrigating the rehabilitation works. Layout Alternative 3(a) could not supply the required amount of water for the irrigation demand, and was thus deemed unfeasible, as it would have required additional dams at other sites. While Layout Alternative 3(b) and Layout Alternative 3(c) could store an adequate amount of water for irrigation demands, it was decided that the larger dam (Layout Alternative 3(c)) would be preferable to ensure that enough water was stored to hedge against the drought conditions that have prevailed over the coastal area in the past few years.

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. These sites must be located within the approved development footprint and must be outside sensitive areas.

From a geological perspective, the proposed development of the Tinley Manor Southbanks area is considered feasible as no catastrophic geological flaws exist that would exclude the entire area from development, although some areas should be avoided in terms of slope stability and problem soils. Notwithstanding the above the development of the area should be considered as challenging due to the geological constraints associated with the prevailing subsoil and ground water conditions present on site. As such for planning and construction of the proposed development, the recommendations provided in ***Section 0*** must be strictly adhered to.These amount to no more than sound building practices appropriate for the geotechnical constraints associated with the on-site subsoils conditions. Site specific geotechnical investigation will be required at a later date and should include provisions for regular supervision by a geological engineering professional during development. It is noted that potential slippages have been considered in the development plan.

The Visual Impact Assessment (VIA) conducted for the proposed Tinley Manor South Banks development has demonstrated that the visual character within the study area varies. It includes areas with scenic views of the Indian Ocean and Umhlali River, distinct pastoral areas with rolling green hills and more transformed settings near urban areas and coastal towns. Although the Indian Ocean has attracted several leisure based tourism facilities into the area, very few visually sensitive receptors were identified within the study area as these are mostly located within coastal towns where urban form is already present. As such the proposed development would not alter the sense of place, compromise the scenic quality of views or impact on these facilities in any way.

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 (i.e. Wetland and Open Space Rehabilitation Plan, Stormwater Management Plan, Soil Management Framework Strategy and the Traffic Management Plan), 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. All sensitive areas not earmarked for infilling and/or for the installation of services must be demarcated as 'no-go' areas (***Figure*** 10-3).

These areas must be afforded the highest level of protection during the construction and operational phases to ensure conservation remains an overarching principle of the development throughout the life-cycle of the development.

The following alternatives are preferred to be authorised:

- The Concept Plan (2017) as presented;
- Layout Alternative 1 (b) – Public access mixed-use development - 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 (as presented in the overall Concept Plan (2017);

- Layout Alternative 2 (b) – Stormwater management facilities layout as presented with management facilities to be located predominantly outside of wetlands (as presented in the overall Concept Plan (2017);
- Layout Alternative 3 (c) – Irrigation Dam at location (c) (as presented in the overall Concept Plan (2017);
- Layout Alternative 4 (b) – Development footprint outside of Woody Vegetation (as presented in the overall Concept Plan (2017); and
- The use of water from SSW's existing borehole and/or the use of treated wastewater from the Sheffield WWTW for irrigation purposes.

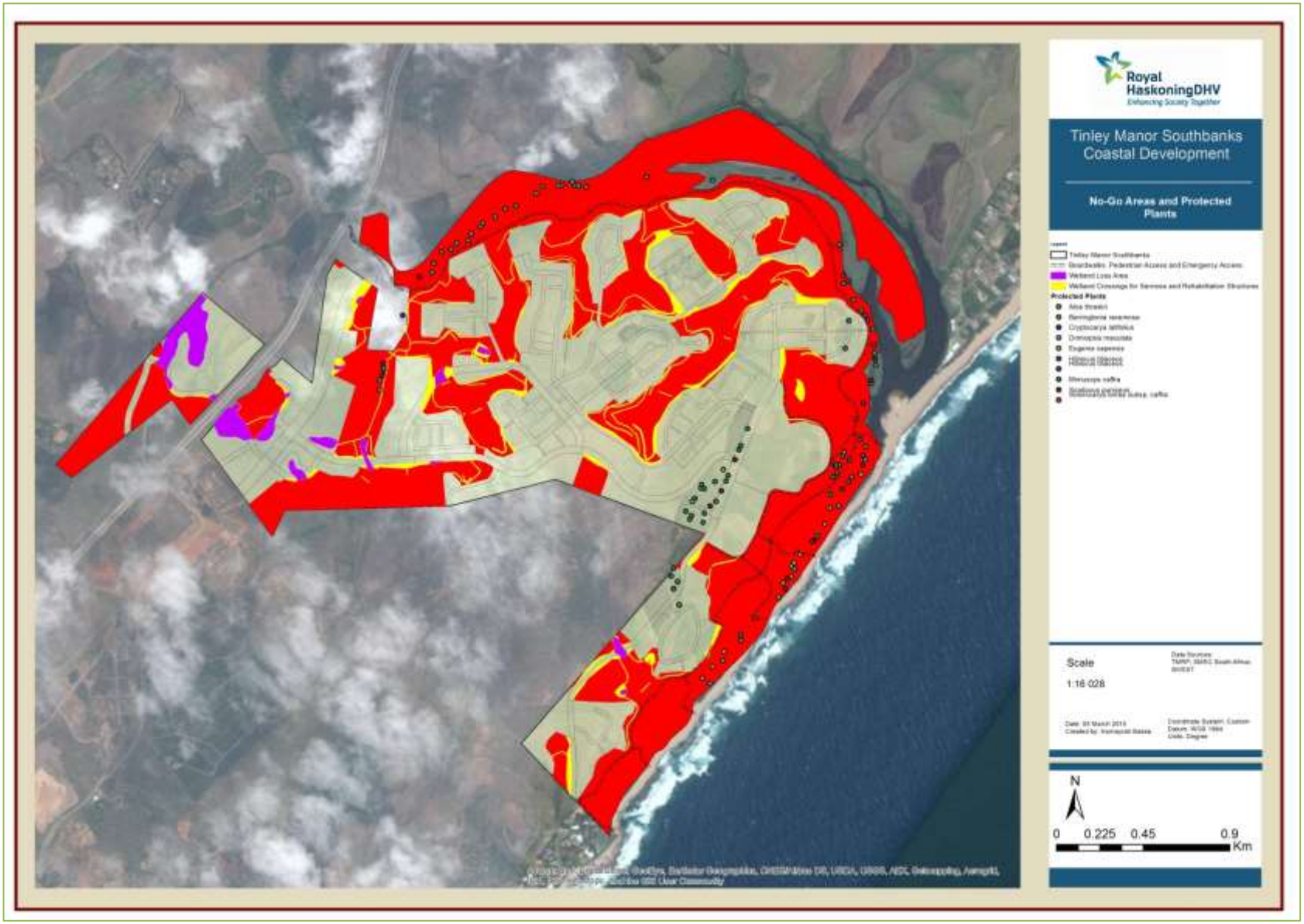


Figure 10-3: Tinley Manor Southbanks 'no-go' areas

11 CONCLUSION AND CONDITIONS OF AUTHORISATION

The EIA process for the Tinley Manor Southbanks Coastal Development and associated infrastructural requirements 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). Furthermore, cognisance of the EIA Regulations (2014) has been taken and similar listing notices provided.

In order to protect the environment and ensure that Tinley Manor Southbanks is constructed and operates 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)(as amended)
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 amended 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 amended 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.
- The P228 is subject to a separate assessment.
- The interchanges over the N2 are subject to separate assessments.
- The 600 mm bulk water main to the Tafeni Reservoir and upgrade of the Tafeni Reservoir are subject to separate assessments.

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[20].
- 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

This study has only focused on the functional, ecological importance and sensitivity, and ecosystem services assessment of wetlands. Aquatic studies of fish, invertebrates, amphibians etc. have not been included in this report. Hydrological or groundwater studies have also not been included.

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 and can be found in Appendix A.

[20] *Note Dr Richard Kinvig has now visited the site in 2017*.

A number of alternative layouts have been considered and these are summarised in Section 8. Throughout the project lifespan the mitigation hierarchy has been employed, and wherever possible, wetlands have not been avoided. However, given the topography of the site, access to portions of the site have required the crossing of some wetlands by roads and other infrastructure, and where this has occurred, the focus has been on minimising the wetland impact. Given the need to lose some wetland habitat in order to gain access to portions of the site, and the need to create specific roads and amenities within the project site, where wetland losses do occur the will be off-set through the rehabilitation of the numerous degraded wetland systems across the site.

11.2.3 Visual Assessment

This visual study has been undertaken based on the shapefiles provided by THD and the Concept Spatial Development Plan (Final Draft) prepared by the Urban Planning Team (dated January 2016).

The Concept Spatial Development Plan indicates the nature, extent and intensity of the development, articulates the spatial structure and form of the development, quantifies the preferred development concept and indicates a concept / block plan which includes a framework for land use, access and circulation and a broad level landscape / township strategy for the site. As no detailed development plans were available, the assessment of visual impact is quite broad and is focused at the scale of the entire development site and not any individual development that would occupy a smaller portion of this area.

As per the information provided to SiVEST by the applicant at the time of undertaking the visual study, it is assumed that no building will exceed a height of six storeys (i.e. 18 m). The worst-case scenario in which most structures would have a height of at least four storeys (12 m) was assumed.

The study area is assumed to encompass a zone of 3 km from the buildable area. This area was assigned as distance is a critical factor when assessing visual impacts. Given the nature of the receiving environment and the potential height of the development as proposed, the visual impact associated with the proposed development would be significantly diminished beyond 3 km and thus the need to assess the impact on potential receptors beyond this distance would not be warranted. It is generally accepted that a mixed use development of this scale would not be visible from more than a 3 km distance (Gibbs D., and Saint Pol M. 2011).

The identification of visual receptors has been based on a combination of desktop assessment as well as field-based observation. Initially Google Earth imagery was used to identify potential receptors within the study area. Thereafter a site visit was undertaken to verify the sensitive visual receptors within the study area and assess the visual impact of the development from these receptor locations. Due to the extensive area covered by the study area, a number of broad assumptions have been made in terms of the sensitivity of the receptors to the proposed development.

It should be noted that not all receptor locations would necessarily perceive the proposed development in a negative way. This is usually dependent on the use of the facility and the economic dependency on the scenic quality of views from the facility.

Sensitive receptor locations typically include sites that are likely to be adversely affected by the visual intrusion of the proposed development. They include; tourism facilities and sites with scenic views or within natural settings. Assessing the visual impact of the proposed development from individual dwellings has not been undertaken due to budget limitations. Should the need for this be proven by stakeholder / I&AP feedback, it will be incorporated into this assessment.

Five meter contours were available for the study area and were used to establish the Digital Terrain Model (DTM). As such, the visibility analysis may have minor inaccuracies, as it indicates the visibility from a specific location relative to topographical screening. Therefore localised undulations in the topography have not been depicted in the DTM which would influence the results of the analysis.

In order to classify the development site into zones of visual exposure, a visibility analysis was undertaken from each sensitive visual receptor location identified within the study area. When undertaking the visibility analysis, an average observer height of 1.65 m was assumed at each receptor location and a vehicle height of

2.5 m (to include buses, etc.) was assumed for observers travelling along the N2 receptor road. Points taken every 200 m were used to determine the visibility from the N2.

In order to factor the potential visual screening provided by the wooded vegetation into the analysis, areas of dense bush as indicated on the data from Ezemvelo KZN Wildlife were factored into the analysis and a height of 9 m was utilised. This height was selected to assume the worst-case scenario i.e. the dense bush would provide the least visual screening. Based on the important taxa found within the KwaZulu-Natal Coastal Belt, the trees and shrubs within this vegetation unit can commonly reach heights of between 15 m and 20 m. Commercial forestry plantations were also factored into the analysis and a height of 25 m was assumed. The fact that the natural vegetation and plantations would offer varying degrees of visual screening at different stages of development was not taken into consideration.

In addition, screening provided by existing infrastructure was also factored into the analysis and a height of 3.5 m was assumed for all urban / built-up areas as indicated on the data from Ezemvelo KZN Wildlife.

As such, the visibility analysis provides an approximate indication of the geographical area that would be visible from each sensitive visual receptor location. Localised vegetation and scattered buildings which may provide at least partial visual screening was taken into consideration during the site visit.

A matrix has been developed to assist in the assessment of the potential visual impact at each receptor location. The limitations of quantitatively assessing a largely subjective or qualitative type of impact should be noted. The matrix is relatively simplistic in considering five main parameters relating to visual impact, but provides a justifiably accurate indicative assessment of the degree of visual impact likely to be exerted on each receptor location by the proposed mixed-use development. The matrix should therefore be seen as a representation of the likely visual impact at a receptor location.

Visualisation modelling or three dimensional simulations were not undertaken for the proposed development due to budget limitations as well as the limited information available at the time of undertaking the visual study. As indicated on the Conceptual Spatial

The Concept Development Plan provided and the development site has been divided into various land uses and a detailed site plan indicating the layout of the buildings within each land use was not available. Should the need for visualisation modelling be proven by stakeholder / I&AP feedback, this will be incorporated into this assessment.

No feedback from the scoping phase public participation process that relates to the visual environment was provided to SiVEST. Any feedback relevant to the visual environment received during the EIA phase public comment period can be incorporated into further drafts of this report. Undertaking a perception survey falls outside of the scope of this VIA.

At the time of undertaking the visual study limited information was available regarding the type and intensity of lighting required and therefore the potential impact of lighting at night has not been assessed. General measures to mitigate the impact of additional light sources on the ambiance of the nightscape have been provided.

At the time of undertaking the visual study no specific information was available regarding the design and layout of services and infrastructure associated with the proposed development. Therefore, the potential visual impact of infrastructure which could include, berms, channels, waste water treatment works and power lines have not been assessed in this VIA.

Although photographs were taken during the site visit these have been supplemented with Google earth street view imagery from locations along the N2 Freeway, due to safety issues associated with taking photographs from locations on this main road.

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 (Act No. 59 of 2008) (as amended);
   - Provisions of the National Environmental Management Integrated Coastal Management Act (Act No. 24 of 2008)(as amended);
   - 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); and
   - 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) The Wetland and Open Space and Rehabilitation Plan must be complied with.

e) Only wetlands authorised to be impacted on and/or infilled (as per ***Figure 7-12***, ***Figure 7-13***, ***Figure 7-14***, ***Figure 7-15*** and ***Figure 7-16***) may be impacted on.

f) A total of 8.29 ha of wetland may be lost. The remaining 75.98 ha of wetland area must be rehabilitated as part of the off-sets.

g) All remaining wetlands are strictly 'No-Go' areas and must be rehabilitated as per the off-set requirements.

h) The Coastal Dune Forest is strictly a no-go area unless work is undertaken for the installation of boardwalks. The installation of boardwalks must be undertaken under the supervision of the ECO and must be undertaken as per the construction method detailed in the EMPr.

i) The Umhlali Estuary is strictly a no-go area unless work is undertaken for the installation of boardwalks and/or other recreational facilities.

j) The installation of boardwalks must be undertaken under the supervision of the ECO and must be undertaken as per the construction method detailed in the EMPr.

k) A Conservation Management Plan for the open space network including the Umhlali Estuary and Coastal Dune Forest must be compiled and approved by Ezemvelo KZN Wildlife prior to the commencement of the operational phase.

l) All necessary permits, licences and approvals must be obtained prior to the commencement of construction.

12 REFERENCES

Admastor Consulting (2017). *Electrical Services Report for Tinley Manor Southbanks*, Unpublished report prepared for Tongaat Hulett Developments.

Aurecon (2017). *Traffic Management Plan for Tinley Manor Southbanks*, Unpublished report prepared for Tongaat Hulett Developments.

Aurecon (2016). *Traffic Impact Assessment for Tinley Manor Southbanks*, Unpublished report prepared for Tongaat Hulett Developments.

Barthwal, R. (2002). *Environmental Impact Assessment*. New Age International Publishes, New Delhi.

Begg, G. (1978). *The Estuaries of Natal. Natal Town and Regional Planning Report 41*, 657.

Begg, G. (1984). *The Estuaries of Natal. Part II*. Supplement to NTRP Report Vol. 41. Natal Town and Regional Planning Report 55, 631.

Breedlove, G., (2002). *A systematic for the South African Cultural Landscapes with a view to implementation.* Thesis – University of Pretoria.

Carmarthenshire Disabled Access Group (no date). *Guide to timber boardwalk maintenance and construction*. Retrieved March 2017, from http:// carmarthenshire-disabled-access-group.org.uk.

Coastwise Consulting (2017). *The Tinley Manor South Banks Coastal Development: Coastal Impact Assessment*, Unpublished Report prepared for Tongaat Hulett Developments.

Demetriades, N. (2007). *An inventory of sandmining operations in KwaZulu-Natal estuaries: Mtamvuna to Thukela*. Investigational Report of CoastWatch, WESSA KZN.

Demetriades, N., & Forbes, A. (2007). *Specialist Report: Assessment of the Seteni and Mvoti estuaries, associated streams and riparian habitats for the Strategic Environmental Assessment of Addington Farm*. Marine and Estuarine Research.

Department of Environmental Affairs. (2014). *A National Strategy for the Facilitation of Coastal Access in South Africa*. Cape Town.

Department of Environmental Affairs and Tourism. (2001). *Environmental Potential Atlas for South Africa*. Source: www.environment.gov.za/enviro-info/enpat.htm.

Department of Environmental Affairs and Tourism. (2006). *South African Environmental Outlook. A report on the state of the environment*. Pretoria, South Africa: DEAT.

Drennan, Maud & Partners (2013). *Report to Tongaat Hulett Development on the Geotechnical Desktop Phase 1 Assessment for the Proposed Development Of Tinley Manor Estate*, 23312.

DWA. (2011). *Resource Directed Measures for protection of water resources: Methods for the Determination of the Ecological Reserve for Estuaries*, Water Resource Protection and Assessment Policy Implementation Process. Version 3. Pretoria: Department of Water Affairs.

DWA. (2014). *Classification of Water Resources and Determination of the Comprehensive Reserve and Resource Quality Objectives in the Mvoti to Umzimkulu WMA: Volume 2c: Umhlali Estuary Ecological Consequences*. Report prepared by CSIR for the Department of Water Affairs. Report Number: RDM/WMA11/00/CON/CLA/0714.

DWAF. (1996). *South African Water Quality Guidelines. Volume 7: Aquatic Ecosystems. Pretoria*: Department of Water Affairs and Forestry.

eThembeni Cultural Heritage (2017). *Heritage Assessment for Tinley Manor Southbanks*, Unpublished report prepared for Tongaat Hulett Developments.

Forbes, A., & Demetriades, N. (2010). *Estuaries of Durban, KwaZulu-Natal, South Africa. Report for the Environmetnal Mangement Department, eThekwini Municipality*. Second Edition. Marine & Estuarine Research.

Forbes, A., & Demetriades, N. (2009). *Ecological Assessment of the Umhlali estuary July - October 2008.* Report for Siza Water. Marine and Estuarine Research.

Forbes, A., & Demetriades, N. (2008). *Estuaries of Durban*. Report for the Environmental Management Department, eThekwini Municipality. Durban.

Gibbs D., and Saint Pol M. 2011. *Visual Impact Assessment for the Vineyards Mixed Use Development of the 'Driehoek' (Driehoek Residential) and 'Vierhoek' (Door de Kraal Plein) – portions of erven 39169 and 39170, adjacent to the existing Vineyards Office Estate*, *Belville*. Gibbs Saintpol. Woodstock.

Harrison, T., Cooper, J., & Ramm, A. (2000). *State of South African Estuaries. Geomorphology, Ichthyofauna, Water Quality and Aesthetics*. State of the Envrionmnet Series Report No. 2:, 184.

Hull, R.B., and Bishop, I.D. 1988. Scenic Impacts of Electricity Transmission Towers: The Influence of Landscape Type and Observer Distance. *Journal Environmental Management*. Vol. 27, pp. 99-108.

iLembe District Municipality (2012). *iLembe District Spatial Economic Development Strategy.*

iLembe District Municipality (2013). *iLembe draft Environmental Management Framework.*

iLembe District Municipality (2016). *iLembe Integrated Development Plan*, 2016/2017 Review.

Kinvig & Associates Environmental Consultants (2016). *Tinley Manor South: Addendum Vegetation Report Comparing 2015 & 2016 Layouts and associated impacts*, Unpublished report prepared for Tongaat Hulett Developments.

Kinvig & Associates Environmental Consultants (2017). *Tinley Manor South: Addendum Report Comparing the Amendments to the Layout Between 2016 & 2017*, Unpublished report prepared for Tongaat Hulett Developments.

KwaDukuza Municipality (2016). *KwaDukuza Integrated Development Plan (2012-2017).*

KwaDukuza Municipality (2015). KwaDukuza Spatial Development Framework Review.

KwaDukuza Municipality (2008a). *Towards a Coastal Management Plan for KwaDukuza.*

KwaDukuza Municipality (2008b). *Policy Approach to Coastal Development.*

KwaDukuza Municipality (2003). *KwaDukuza Coastal Zone Recreational Use Plan.*

KZN Provincial Planning Commission (2013). *KZN Provincial Growth and Development Strategy and Plan (2030).*

Royal HaskoningDHV (2014) *Updated Coastal Access and Beach Assessment*, unpublished report prepared for Tongaat Hulett Developments.

Royal HaskoningDHV (2017a) *The Tinley Manor Southbanks Coastal Development: Updated Estuarine Impact Assessment and Specialist Input for the Mhlali Estuary*, Version 3.

Royal HaskoningDHV (2017b) *Environmental Management Programme for Tinley Manor Southbanks,* Unpublished report for Tongaat Hulett Developments.

Royal HaskoningDHV (2017c) *Soil Management Framework Strategy for Tinley Manor Southbanks,* Unpublished report for Tongaat Hulett Developments.

Markewicz, T. (2017). *Tinley Manor South Banks: Concept Spatial Development Plan (Final Draft).* RHDHV Engineers and Environmental Consultants (Pty) Ltd

Mather, A.A. & Swart, P., (2010). *Report on the Establishment of a Coastal Setback Line for the Tongaat Hulett Properties: Tinley Manor to the Tugela River Mouth*, KwaZulu-Natal. SSI Consortium.

Meyer, C. (2011). *Spatial and temporal variations in macrozoobenthic communities in Kwazulu-Natal temporarily open/closed estuaries*. Unpublished Masters Thesis, University of KwaZulu-Natal.

Mottram and Associates (2012). *Agricultural Potential Assessment of Tinley North and South*, Unpublished report for Tongaat Hulett Developments.

SANRAL, 2006. *Drainage Manual*, The South African Roads Agency Limited (5th Edition).

SiVEST (2015). *Vegetation Assessment for the Tinley Manor Southbanks*, Unpublished report prepared for Tongeet Hulett Developments.

SiVEST (2017a). *Wetland Functional Ecological & Importance Assessment for the Tinley Manor Southbanks*, Unpublished report prepared for Tongeet Hulett Developments.

SiVEST (2017b). *Wetland & Open Space Rehabilitation Plan for the Tinley Manor Southbanks*, Unpublished report prepared for Tongeet Hulett Developments.

SMEC South Africa (2017a). Tinley Manor South: Engineering Services Report, Unpublished Report for Tongaat Hulett Developments.

SMEC South Africa (2017b). Tinley Manor South: Stormwater Management Plan, Unpublished Report for Tongaat Hulett Developments.

SSI (2015). *Assessment of Coastal Landholdings: Tugela and Tinley Manor*. Unpublished report prepared for Tongaat Hulett Developments.

Tourism KZN (2008). *Tourism Strategy (2008-2012).*

Turpie, J., & Clark, B. (2007). *Development of a conservation plan for temperate South African estuaries on the basis of biodiversity importance, ecosystem health and economic costs and benefits*. Final Report. Anchor Environmental Consultants.

Turpie, J., Adams, J., Jouber, A., Harrison, T., Colloty, B., Maree, R., et al. (2002). *Assessment of the conservation priority status of South African estuaries for use for use in management and water allocation*. Water SA 28, 191–206.

UrbanEcon (2013). *Socio-economic Assessment for Tinley Manor Southbanks*, Unpublished report prepared for Tongaat Hulett Developments.

Van Niekerk, L., & Turpie, J. (2012). *National Biodiversity Assessment 2011: Technical Report. Volume 3: Estuaries Component*. CSIR Report Number CSIR/NRE/ECOS/ER/2011/0045/B. Stellenbosch: Council for Sicentific Research.

WESSA. (2011). *In the Mangroves of South Africa*. Wildlife and Environment Societ of South Africa: KZN Region.

Whitfield, A. (2000). *Available scientific information on individual South African estuarine systems*. Water Reserach commision Report 577/3/00, 224.

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

Appendix I

Specialist Declarations

Royal HaskoningDHV

Enhancing Society Together