



DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

THE PROPOSED SUNNY SOUTH HOUSING DEVELOPMENT

BUFFALO CITY METROPOLITAN MUNICIPALITY

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Draft Environmental Impact Assessment Report

The Proposed Sunny South Housing Development

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REVISION AND AMENDMENTS

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SUMMARY DATA

Project:	Sunny South Housing Development
Location:	Sunny South, Buffalo City Metropolitan Municipality, Eastern Cape Province
Client:	Buffalo City Metropolitan Municipality
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EXECUTIVE SUMMARY

The Buffalo City Metropolitan Municipality (BCMM – the Applicant) requested Environmental Impact Management Services (Pty) Ltd (EIMS) to undertake the necessary steps to prepare and submit applications for environmental authorisation (EA) to the competent authority, the Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (ECDEDEAT), for the proposed Sunny South Housing Development in the BCMM in the Eastern Cape Province. A Scoping and Environmental Impact Assessment (EIA) Process is required as per the requirements of the 2010 EIA regulations.

The site is located outside the urban edge of the BCMM, in the Eastern Cape Province of South Africa and the BCMM is currently the landowner of the land to be used. The new infrastructure is proposed to provide formal housing for identified beneficiaries. The project is proposed to take place within an area currently zoned as a residential area, institutional, commercial and public open space. The project is proposed to involve the following components:

- Construction of housing units;
- Installation of electrical, water and sanitation services; and
- Construction of internal roads.

A key feature of the Scoping and EIA Process is the Public Participation Process (PPP) as outlined in the EIA regulations. Subsequent to submission of the application to the Competent Authorities, notifications were sent out to all the pre-identified key interested and affected parties (I&APs), including organs of state, community organisations, the local municipality, and local ward councillors. Advertisements were also placed in a local newspaper and site notices were placed at various locations in and around the development site. Notices were also distributed to occupiers of land within 100m of the properties applicable to the application. A public meeting was held at the Braeside Primary School on 14 February 2013 from 11:30 – 12:30 in order for I&APs to further raise their opinions and/or concerns regarding the project. I&APs were given an opportunity to comment on the Draft and Final Scoping Reports. Comments received from I&APs were included in the Issues and Responses Report (IRR) and submitted to the Competent Authorities for consideration together with the Final Scoping Report.

As part of the Scoping and EIA Process alternatives to the proposal have to be considered in an effort to further minimise the impact of the proposal on the environment and to ensure that the most suitable alternative is carried forward. Development alternatives were considered in the Scoping Phase and one alternative was put forward for further consideration and assessment in the EIA Phase, namely, the layout alternative to avoid certain watercourses on the site.

The following impacts, applicable to the identified alternatives, were identified during the Scoping Phase and assessed during the EIA Phase:

Phase	Impact		
	Bio-Physical	Socio-Economic	
Planning and Design		Job Creation	
	Nuisance due to dust	Job Creation	
Construction	Loss of vegetation	Noise	
	Spread of alien invasive plant species (Biodiversity Loss)	Visual Impacts	
	Loss and degradation of different habitat types (Biodiversity Loss)	Traffic	
	Loss of fauna (Biodiversity Loss)	Impacts on existing property/infrastructure	
	Loss of invertebrates (Biodiversity Loss)	Destruction of colonial period structures	
	Modification of flow dynamics and flow patterns (Hydrological Processes)	Impact on human graves	
	Topsoil loss, soil erosion and sediment deposition (Hydrological Processes)	Discovery of sub-surface paleontological finds	
	Effluent pollution and solid waste pollution (Biodiversity Loss/Hydrological Processes)		
	Disturbance of important ecological process areas (Biodiversity Loss)		
	Soil Pollution		
	Geotechnical stability		
	Fire Hazards		
	Operational	Increased Fire Risk	Visual impacts
		Increased waste generation	Impact on community structure
Loss of Vegetation			
Spread of alien invasive plant species (Biodiversity Loss)			
Loss and degradation of different habitat types (Biodiversity Loss)			
Modification of flow dynamics and flow patterns (Hydrological Processes)			
Effluent pollution and solid waste pollution (Biodiversity Loss/Hydrological Processes)			
Disturbance of important ecological process areas (Biodiversity Loss)			

Subsequent to acceptance of the FSR and consideration of the receiving environment as described in Section 5 of this Environmental Impact Assessment Report (EIAR), the following specialist studies were conducted to quantify and assess the impact that the proposed development is likely to have on the environment:

- Watercourse/wetland and riparian area delineation and assessment;
- Ecological Impact Assessment;
- Geotechnical Investigations; and

- Heritage Impact Assessment.

The key conclusions of this EIAR are as follows:

- During the Planning and Design Phase, only one impact was identified – Job Creation- and it is anticipated that this will have a MEDIUM positive significance. From a socio-economic point of view, Job Creation during the construction phase will have a MEDIUM positive significance.
- The impacts anticipated to occur during the construction phase will either have a LOW or MEDIUM negative significance rating that, in certain cases, can possibly be reduced to a LOW negative rating with the successful implementation of suggested mitigation measures.
- The majority of impacts anticipated to occur during the Operation Phase will either have a LOW or MEDIUM negative significance rating that, in certain cases, can possibly be reduced to a LOW negative rating with the successful implementation of suggested mitigation measures.
- The Ecological and Wetland/Aquatic Impact Assessment found that there were three natural wetlands and three natural drainage areas, including numerous dams, are located within and surrounding the proposed development site. The site assessment confirmed that the proposed development site is highly degraded and, as a result, of relatively low biodiversity value. The Tutura River riparian area and 50 m buffer zone should be implemented, including the other buffers (as indicated in Figure 2d of Appendix C); which should form part of the ecological corridor and Gxulu quaternary catchment's fish support area (as per the mitigation measures summarised below). Legislative requirements triggered by the proposed development, besides the Scoping and Environmental Impact Assessment in terms of the National Environmental Management Act (107 of 1998), include:
 - A water use license application for the proposed development as it is within 500 m of three wetlands (in terms of Section 21(c) and (i) of the National Water Act (36 of 1998). In terms of sewage reticulation, if relevant, the National Water Act will need to be complied with in terms of ensuring that sewage wastewater storage and disposal sites will need to be located above the 1:100 year flood line or at least 100 m from the Tutura River, as well as the drainage areas (non-perennial streams). Further, in terms of section 144, the developer (Municipality) of the proposed settlement will need to determine the 1:100 year flood line of the Tutura River, as well as the drainage areas.
 - Waste Management Conditions (Specifications), as part of the Construction and Operational Environmental Management Plan, will need to be compiled that are aligned with the general measures of the National Environmental Management: Waste Management Act (59 of 2008) Act, where applicable, as part of the EIAR.
 - Waste generated during construction must be disposed of at a licensed waste disposal site, which may still be licensed in terms of the Environmental Conservation

Act (73 of 1989), as per Section 81 of the National Environment: Waste Management Act (NEMWA), or licensed in terms of NEMWA.

- The developer (Buffalo City Metropolitan Municipality) will be responsible for clearing alien invasive plants within the development footprint and immediate surrounds, because all municipalities are responsible for alien clearing and management on municipal owned land (National Environmental Management: Biodiversity Act, 10 of 2004).
- Nine potential construction and operational impacts were identified and assessed, namely:
 - Impact 1 - Loss of vegetation - biodiversity loss
 - Impact 2 - Spread of alien invasive plant species - biodiversity loss
 - Impact 3 - Loss and degradation of different habitat types - biodiversity loss
 - Impact 4 - Loss of fauna - biodiversity loss
 - Impact 5 - Loss of invertebrates - biodiversity loss
 - Impact 6 - Modification of flow dynamics and flow patterns - hydrological processes
 - Impact 7 - Topsoil loss, soil erosion and sediment deposition - hydrological processes
 - Impact 8 - Effluent pollution and solid waste pollution - biodiversity loss & hydrological processes
 - Impact 9 - Disturbance of important ecological process areas - biodiversity loss
- The Ecological and Wetland/Aquatic Impact Assessment concluded that all impacts were rated as LOW post mitigation (includes design, construction and operational phases). As a result, the proposed housing development has a LOW impact on the ecology of the study site and surrounds, if appropriate management measures are implemented, particularly during the design and construction phases. The mitigation measures, especially the revised layout (see Figure 23: The final proposed layout Figure 23), represent the Wetland Alternative.
- The Heritage Impact Assessment found human graves and colonial period structures within the development site. It was found that the impact on human graves will have a LOW negative significance if the recommended mitigation measures are implemented (see Appendix D). The impact on the colonial period structure will have a MEDIUM negative significance.

In considering the assessment of impacts and specialist inputs and recommendations, it was concluded that the Watercourse Alternative, which includes avoidance of all sensitive areas (as reflected in specialists reports), would be the most suitable from an environmental perspective and in terms of overall significance ratings.

It is further recommended that the developer considers the creation of a small cemetery area, as per the suggested layout in Section 9.1 and that the community be consulted with regards to the

relocation/in situ conservation of the grave sites in consultation with the Eastern Cape Provincial Heritage Resources Authority (ECPHRA).

An Environmental Management Programme has been compiled according to the specifications of the above mentioned regulations and has been included in Appendix F.

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APPENDICES

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Appendix B	Site Photos
Appendix C	Ecological and Wetland Impact Assessment
Appendix D	Heritage Impact Assessment
Appendix E	Geotechnical Investigations
Appendix F	Environmental Management Programme

LIST OF ABBREVIATIONS

ACEP	African Coelacanth Ecosystem Programme	GIS	Geographical Information System
BCMM	Buffalo City Metropolitan Municipality	GN	Government Notice
BID	Background Information Document	HIA	Heritage Impact Assessment
CA	Competent Authority	I&AP	Interested and Affected Party
CBD	Central Business District	IAPP	International Association for Public Participation
DEAT	Department of Environmental Affairs and Tourism	IRR	Issues and Responses Report
DSR	Draft Scoping Report	LN	Listing Notice
DWA	Department of Water Affairs	NEMA	National Environmental Management Act (Act No. 107 of 1998)
EA	Environmental Authorisation	NEMBA	National Environmental Management Biodiversity Act (Act No. 10 Of 2004)
EAP	Environmental Assessment Practitioner	NEMWA	National Environment Waste Management Act (Act No. 59 of 2008)
ECBCP	Eastern Cape Biodiversity Conservation Plan	NGL	Natural Ground Level
ECDEDEAT	Eastern Cape Department of Economic Development, Environmental Affairs and Tourism	NHRA	National Heritage Resources Act (Act No. 25 of 1999)
ECPHRA	Eastern Cape Provincial Heritage Resources Authority	NWA	National Water Act (Act No. 36 of 1998)
EIA	Environmental Impact Assessment	PF	Prioritisation Factor
EIAR	Environmental Impact Assessment Report	PoS	Plan of Study
EIMS	Environmental Impact Management Services (Pty) Ltd	PPP	Public participation process
EMPR	Environmental Management Programme Report	SACNSP	South African Council for Natural Scientific Professions
EMF	Environmental Management Framework	SAEON	South African Environmental Observation Network
ER	Environmental Risk	SAIAB	South African Institute for Aquatic Biodiversity
FSR	Final Scoping Report		

SAHRA	South African Heritage Resources Agency	SDF	Spatial Development Framework
SANBI	South African National Biodiversity Institute	SR	Scoping Report
SCCCA	Southern Cape Coastal Condensation Area	VIP	Ventilated Improved Pit (latrine)
		WUL	Water Use Licence

1. INTRODUCTION

The Buffalo City Metropolitan Municipality (BCMM) (the Applicant) requested Environmental Impact Management Services (Pty) Ltd (EIMS) to undertake necessary steps to prepare and submit applications for environmental authorisation (EA) to the competent authority, the Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (ECDEDEAT), for the proposed Sunny South Housing Development which falls within the BCMM in the Eastern Cape Province. The project aims to provide each suitable beneficiary with a formal housing unit from a planned 540 erven grid.

The Final Scoping Report (FSR) and Plan of Study for Environmental Impact Assessment (PoS for EIA) were submitted to the ECDEDEAT during February 2013. The ECDEDEAT has subsequently approved both the FSR and the PoS for EIA and instructed the applicant to proceed with the Environmental Impact Assessment (EIA) Phase and the compilation of the Environmental Impact Assessment Report (EIAR) in accordance with Regulation 31 of Government Notice (GN) R. 543

The aim of the EIAR is to:

- describe the proposed development;
- source specialist input to address the issues raised during scoping and investigate the relevant identified alternatives
- investigate and describe the biophysical, social and economic environment surrounding the proposed development;
- assess identified impacts and their significance;
- recommend mitigation measures;
- present an appropriate Environmental Management Programme (EMPR);
- comparatively assess the potential feasible alternatives for the development;
- communicate the above information to interested and affected parties in an accessible and transparent manner; and;
- describe the public consultation process followed and to record all comments and suggestions received and all issues raised during the scoping process.

The EIA culminates in the compilation of an EIAR that summarises the findings and recommendations of the EIA Phase, as well as an EMPR. The EIAR and the EMPR will be submitted to the ECDEDEAT for decision making and comment during and after public review of the documents.

An important component of an EIA process is the undertaking of a public participation process (PPP). The PPP will be undertaken during the Scoping and Impact Assessment Phases, and is described in detail in Section 6 of this report.

1.1 DETAILS OF THE EAP

In terms of Regulation 17 of the 2010 EIA Regulations (Government Notice R. 543), an independent Environmental Assessment Practitioner (EAP), must be appointed by the applicant to manage the application. EIMS has been appointed by the applicant as the EAP and is compliant with the definition of an EAP as defined in Regulation 17 of the EIA Regulations. This includes, inter alia, the requirement that EIMS is:

- 1) Objective and Independent;
- 2) Has expertise in conducting EIAs;
- 3) Comply with the NEMA, the Regulations and all other applicable legislation;
- 4) Takes into account all relevant factors relating to the application; and
- 5) Provides full disclosure to the applicant and the relevant environmental authority.

EIMS is a private and independent environmental management consulting firm with in excess of 20 years' experience in conducting EIAs. The EAP's responsible for preparing this report are Mr GP Kriel and Ms Caryn Clarke. Brief detail of Mr Kriel and Ms Clarke's expertise and experience are presented in Table 1:

Table 1: Details of the EAP

Full Name:	Gideon Petrus Kriel	Caryn Clarke
Professional registrations	Registered Professional Natural Scientist (SACNSP- #400202/09)	None
Qualifications:	M.Env.Sci (Water Sciences)	M.Sc. (Environmental Sciences)
Key experience:	<p>An environmental scientist with 5 years of experience. Key experience includes:</p> <ul style="list-style-type: none"> • Environmental Impact Assessments • Basic Assessments • Geographic Information Systems (GIS) • Aquatic Ecological Assessments • Water Use Licences • Waste Management Licence Applications • Public and Authority Participations 	<p>An environmental scientist with 1 year of environmental management experience. Key experience includes:</p> <ul style="list-style-type: none"> • Basic Assessments • Environmental Impact Assessments • Geographical Information Systems • Environmental Compliance Monitoring • Water Use Licenses

Mr Kriel holds an M.Env.Sci (Water Sciences) from the North-West University (Potchefstroom Campus). He has delivered presentations locally and internationally concerning the use of bio-indicators for the determination of water quality, and has extensive experience in the identification and taxonomy of freshwater algae, Geographical Information System (GIS) software packages and a wide variety of EIAs.

Miss Clarke is a qualified Environmental Scientist. Caryn holds a Master's degree from Rhodes University. She has experience in Environmental Compliance Monitoring, EIA's, and GIS. She has had work published in the African Journal of Range and Forage Science and has delivered presentations locally concerning the linked effects of multiple stressors (climate change and HIV/AIDS) on vulnerable rural households in the Eastern Cape, South Africa.

2. DESCRIPTION OF THE PROJECT

This section aims to provide an overview of the project, the individual components, the need and desirability and the ultimate objectives.

2.1 NEED FOR THE PROJECT

The project proposes to provide suitable beneficiaries with formal housing units (with basic services infrastructure such as adequate sanitation, water and electricity). The area has been rezoned from agricultural to residential land use due to the BCMM's need for providing formal housing infrastructure to growing communities which currently reside in informal dwellings.

2.2 SITE LOCATION & ACCESS

The Sunny South site is located within the BCMM in the Eastern Cape Province of South Africa (Refer to Figure 1 and Figure 2) and is approximately 32.2 km south west from the East London Central Business District (CBD) via the R346 and Woolwash Road, and 39.0 km via the R72 and R347 on the way to King Williams Town.

The project is proposed to take place on BCMM owned land with an area of approximately 92.8 ha. The property has recently been rezoned from agricultural to residential. The project is proposed to involve the following main components:

- Construction of housing units;
- Installation of electrical, water and sanitation services; and
- Construction of internal roads.

For the purposes of this EIA, one site has been investigated for the proposed housing development. The centre coordinates are provided in Table 2 below.

Table 2: Location and Size of Proposed Housing Development Site

Site	Latitude	Longitude	Size
Preferred	33°04'19.66"S	27°37'38.50"E	92.8397 ha

The site ranges in height from 190 - 230 m above sea level and general slopes at gradients of less than 1:10. The preferred site has several existing direct access points that provide adequate access to the development site, with the R347 providing the main access to the site.

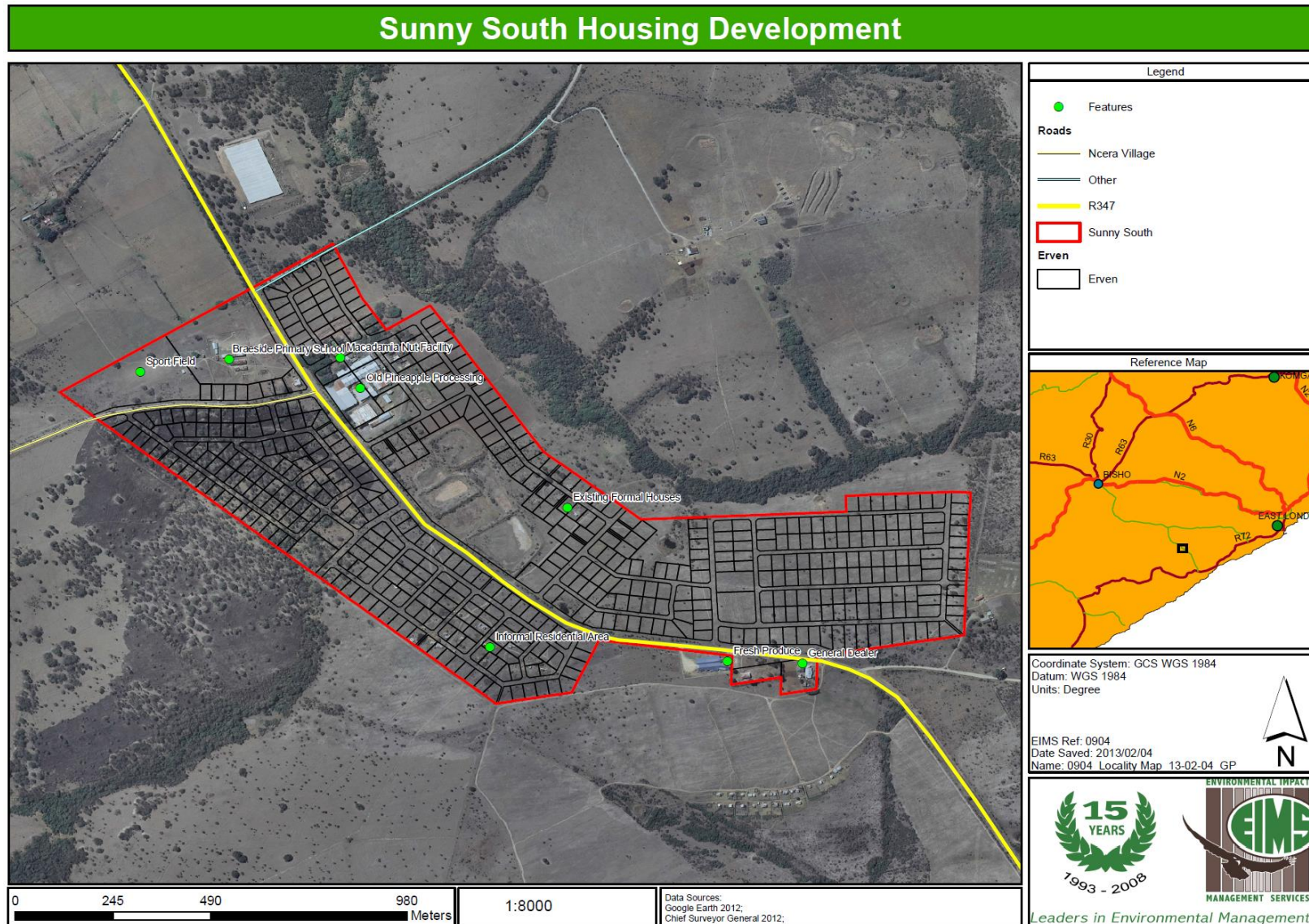


Figure 1: Locality map showing the Sunny South development site

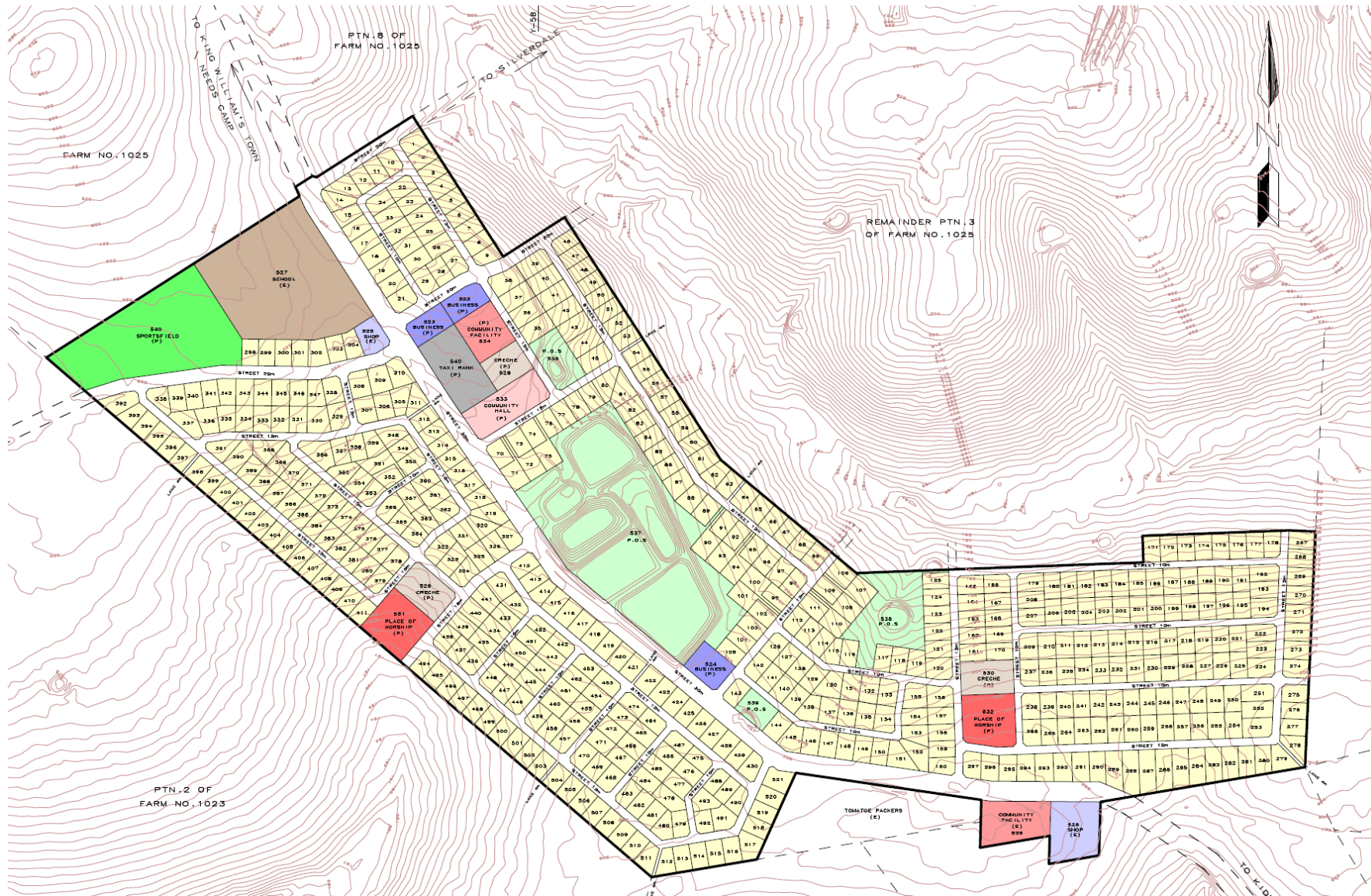


Figure 2: Map showing the proposed layout for the Sunny South housing development (Complan, 2004)

2.3 EXISTING SERVICES & STRUCTURES

This section provides an overview of the existing services and structures within the proposed development site as provided by Kantey and Templer (2012).

2.3.1 Electrical Services

There are existing power lines measuring approximately 4km traversing the Sunny South site (refer to Figure 3 below). These power lines belong to Eskom and reportedly transmit 22kV of electricity. Furthermore, these power lines, stretch across a number of the plots in the proposed Sunny South development scheme and it has been recommended by the BCMM that these power lines be re-routed in order to enable BCMM to build all the proposed residential units as planned.



Figure 3: Eskom power lines

2.3.2 Dams & Wetlands

A number of existing earth dams are present in the centre on the site (refer to Figure 4 below). From inspections on site, it appears that these earthen dams served as some sort of pond system, possibly for (partial) water treatment from the old pineapple processing operations on site.

These dams were incorporated into the original site development plan and their positions coincide with a Public Open Space. These dams will have no impact on the development as the layout has been designed to accommodate the dams.

The site also contained a number of other man made dams that perform wetland functions and wetland areas scattered throughout the site – two small dams immediately east of the earthen dams described above (zoned as Public Open Space – refer to Figure 5 below), as well as two dams towards the west of the earthen dams (zoned as Institutional – refer to Figure 6 and Figure 7 below), which are hidden from aerial view by dense vegetation. Other watercourses were also observed immediately north and south (refer to Figure 8 below) of the Braeside Primary School (wetlands). The wetland immediately south of the Braeside Primary School appears to be partially affected by two of the proposed residential erven. Another wetland area is located on the southern corner of the site, which

would affect four of the erven along the southern boundary of the proposed development (refer to Figure 9 below).



Figure 4: Existing earthen dams near the centre of the site



Figure 5: Dam located east of earthen dams



Figure 6: Westerly dam/wetland area



Figure 7: Westerly dam/wetland area



Figure 8: Wetland south of Braeside Primary School



Figure 9: Wetland along Southern Boundary

2.3.3 Residential Units

Up to 17 existing informal houses (mostly shacks) are present on the southern parts of the site and will have to be moved before project implementation can start. An agreement will have to be reached for the residents to be relocated to developed erven within the project site boundary.



Figure 10: Informal Houses

Six erven in the new township layout are occupied by 6 formal but dilapidated houses of no more than 30m² size in the northern parts of the site. There is one structure per plot. There is no need for these beneficiaries to be relocated as they can be allowed to remain in their respective erven and be provided with new top structures.



Figure 11: Existing formal houses

2.3.4 Commercial and Institutional Facilities

Commercial facilities currently in operation within the site comprise of a fresh produce retailer (refer to Figure 12 below), a general dealer and a macadamia nut facility (refer to Figure 13 below). The macadamia nut facility is located within the old pineapple processing facility (refer to Figure 14 below), which is derelict.



Figure 12: Fresh produce store



Figure 13: Macadamia nut facility



Figure 14: Derelict pineapple processing facility

The Braeside Primary School is located on the north western boundary of the site and consists of two class rooms (refer to Figure 15 below). A sport field is located to the west of the school (refer to Figure 16 below).



Figure 15: Braeside Primary School



Figure 16: Sports field

2.4 PROPOSED STRUCTURES AND INFRASTRUCTURE

An overview of the proposed project is given in this section, as provided by Kantey & Templer (2012).

2.4.1 Potable water

There is currently no formal supply of treated potable water to this area. Potable water supply to this area does form part of a project of the BCMM for the Bulk Water Supply to Coastal Areas which is currently in its implementation phase and of which a number of sub-phases of the overall project are already complete.

Current indications from Goba are that the bulk supply connection for Sunny South will be available no earlier than December 2013. Water standpipes will be provided in Sunny South at a maximum walking distance of 200m from each erf. Each residential unit will be provided with a 2 500 litre tank for roof rain water collection.

Water demands were estimated for three different service levels i.e. standpipes, yard connections or full waterborne sewage. The bulk service connection will have a summer peak flow capacity of 10.5 l/s. The available flow will be sufficient for standpipes or yard connections only.

The average daily demand for potable water for yard connections is expected to be in the order of 184.6 kl/d. This equates to an average flow rate of 2.1 l/s. When applying a peak factor of 1.35 for summer flow, the flow rate increases to 2.835 l/s. With the available bulk peak flow rate of 10.5 l/s an instantaneous peak factor of 5 is available in the system, which will be adequate for this proposed development.

In terms of Fire Protection Guidelines contained in the Red Book, no fire water provision is required in the trunk mains, water storage or reticulation mains for a development of this nature. Nonetheless, fire hydrants will be provided on all reticulation mains of 75 mm diameter and larger. Fire fighting in developments of this nature is generally carried out using trailer mounted water tanks or fire appliances that carry their own water tanks. These tanks can be replenished from the hydrants provided on the reticulation. The pressure in the bulk supply main under instantaneous peak demand will be at least 1.3 bar, which is sufficient for the development.

2.4.2 Sanitation

Dry sanitation in the form of ventilated improved pit (VIP) toilets will be implemented for this project. No waterborne sewage will be installed as there is no existing waterborne sewage system in the surrounding areas. Due to geotechnical concerns pertaining to possible groundwater contamination from the VIP toilets, these toilets will be equipped with lined pits to mitigate this potential impact (see Geotechnical Report in Appendix E).

2.4.3 Stormwater

Storm water generated from the development is not considered to be a substantial increase to what is currently generated, due to the low density of the development (1 000 m² erven with 40 m² houses) and the fact that few surfaces will be hardened with road seals (gravel surfaced roads are provided), as well as the fact that few paved surfaces will be built (entry level houses). Attenuation of stormwater was therefore not deemed to be necessary by the project engineers.

All stormwater run-off will be managed with surface drainage (open channels) in the road reserves and through some erven that are located in the natural path of stormwater drainage through the site. Stormwater servitudes through some erven will be created, where necessary while a limited number of erven will have to be avoided and converted to open spaces in order to accommodate stormwater runoff. No buried pipelines will be required.

Due to the low permeability of the in situ soil, effective stormwater run-off control is recommended to cater for minor flood events (flood events recurring every 1-5 years). Raised barrier kerbs, mountable or semi-mountable kerbs along roads are recommended in order to channel stormwater along roads. The kerbs will also protect the road shoulder from erosion and edge break. Regularly spaced kerb inlets and storm water pipes are recommended to prevent storm water from overtopping kerbs and

flowing into adjacent properties. Alternative stormwater drainage systems could include open lined channels or open grass channels along roads with stone aggregate placed along the roadside to prevent erosion or the shoulder.

2.4.4 Roads

Sunny South is located on either side of the existing R347 trunk road, which is a tarred road. The layout of the internal roads is shown in Figure 2 above. Road widths will be designed to 5.5 m width for the collector and access roads. The different road classes and will be constructed with grades not flatter than 1:130. All internal roads will be provided with a gravel wearing course.

2.4.5 Top Structures

Top structures measuring 40 m² in size with VIP toilets and 2 500 litre water tanks will be built. The top structures will be built on stiffened raft foundations. Since the development falls within the Southern Cape Coastal Condensation Area (SCCCA) and therefore the houses shall be plastered and painted on the exterior and fitted with ceilings. The interior walls will also be plastered and painted, funds permitting, failing which they will be bag-washed.

2.4.6 Commercial & Institutional Facilities

The development will also cater for additional commercial and institutional facilities, including a crèche, taxi ranks, places of worship and a community hall (refer to Figure 2 above). A large sport field is proposed for the north western corner of the site.

2.5 CONSTRUCTION PHASE ACTIVITIES

Kantey and Templer (2012) reports that the project will be constructed and completed in one phase over an estimated construction period of 10 months. It was further proposed that one contractor be appointed for the construction of infrastructure and top structures for the project. The tender document will call for progressive handover of completed houses to identified recipients instead of waiting for the entire project to be completed.

Topstructures measuring 40m² in size with VIP toilets and 2 500 litre water tanks will be built. The topstructures will be built on stiffened raft foundations. The development falls within the Southern Cape Coastal Condensation Area (SCCCA) and therefore the houses shall be plastered and painted on the exterior and shall be fitted with ceilings. Water standpipes will be provided in Sunny South at a maximum walking distance of 200m from each erf.

Dry sanitation in the form of VIP toilets will be implemented for this project. No waterborne sewage will be installed as there is no existing waterborne sewage system in the surrounding areas. Due to geological concerns pertaining to possible groundwater contamination from the VIP toilets, these toilets will be equipped with lined pits to mitigate this potential impact.

2.6 BENEFICIARY ADMINISTRATION

The beneficiary administration process for this project is underway and is handled by the BCMM. According to the BCMM, it was agreed with the community and affected stakeholders that the beneficiaries of the Sunny South project will come from three villages around the development site, namely: Shelford; Paratyana and Sunny South itself.

3. LEGAL REQUIREMENTS

This section of the report briefly describes the enviro-legal aspects of the proposed development according to the relevant legislation. The key enviro-legal aspects that are applicable to the proposed project are highlighted and discussed in this section.

It should be noted that applications for an environmental authorisation would be required under the requirements of the National Environmental Management Act (Act 107 of 1998 as amended- NEMA). Water Use Licences would be required in terms of requirements of the National Water Act (Act No. 36 of 1998 - NWA) for any activities that could be considered as water uses in terms of Section 21 of the NWA.

Other potentially applicable legislation has also been described in this section.

3.1 NATIONAL ENVIRONMENTAL MANAGEMENT ACT

The NEMA, aims to protect the environment, and stipulates that development must be socially, environmentally and economically sustainable, and that disturbances and pollution of the environment must be avoided, minimised and remedied. The Act also provides for the equitable access to environmental resources, to meet basic human needs. Decisions on the environment must be taken in an open and transparent manner, and resources must be held in trust for the public and protected as such. NEMA also makes provision for the cost of remedying pollution, and all such costs shall be paid by the polluter.

Section 24 (2) in NEMA, provides for activities which may have a detrimental effect on the environment and may not commence without environmental authorisation (EA) from the competent authority. In Section 24 (4 & 5) provision is made for the Regulations which stipulate the minimum procedures for the issuing of, and monitoring compliance with, EAs. Section 24 (8), states that authorisations or permits obtained under any other law for an activity listed or specified in terms of this Act does not absolve the applicant from obtaining EA under this Act.

In accordance with Sections 24 (2) and (D) of the NEMA, the Minister has published (in GN R. 544, 545, and 546) a list of activities that require EA prior to commencement of these activities. In this regard Table 3 below provides a list of the specific activities extracted from that list which the proposed project may potentially trigger.

GN R. 543 serves to regulate the procedures and criteria as contemplated in Chapter 5 of the NEMA for the submission, processing, consideration and decision-making with regard to applications for

environmental authorisation of activities and for matters pertaining thereto. As stated in Section Table 3 below. Refer to Figure 17 for a broad outline of the NEMA Scoping and EIA process as stipulated in GN R. 543. The current stage in the process is indicated in the figure as the bold red block.

Table 3: NEMA Listed Activities

Activity #	Listed Activity Description	Reason for Inclusion
NEMA listed activities - Government Notice R544 – Listing Notice 1		
11	<p>The construction of</p> <p>(xi) infrastructure or structures covering 50 square metres or more</p> <p>where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.</p>	<p>This activity will be applicable due to the fact that the site contains several wetland and riparian areas where structures and infrastructure associated with housing development is anticipated to be constructed within 32 meters of the wetland areas.</p>
18	<p>The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil sand shells shell grit, pebbles or rock from</p> <p>(i) a watercourse;</p> <p>(ii) the sea;</p> <p>(iii) the seashore;</p> <p>(iv) the littoral active zone, an estuary or a distance of 100 metres inland of the high water mark of the sea or an estuary, whichever distance is the greater</p> <p>but excluding where such infilling, depositing, dredging, excavation, removal or moving</p> <p>(i) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or</p> <p>(ii) occurs behind the development setback line.</p>	<p>During construction of the housing development, certain features of the housing development may affect the wetland vegetation and soils.</p>
NEMA listed activities - Government Notice R545 – Listing Notice 2		
15	<p>Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes</p>	<p>This activity will be applicable due to the fact that the proposed development area is larger than 20 hectares (92.8397 hectares in total)</p>

Activity #	Listed Activity Description	Reason for Inclusion
	place for: (i) for linear development activities; or (ii) agriculture or afforestation where activity 16 in this Schedule will apply.	
NEMA listed activities - Government Notice R546 – Listing Notice 3		
4(a)ii(ee)	The construction of a road wider than 4 metres with a reserve less than 13.5 metres. (a) In the Eastern Cape province ii Outside urban areas, in: (ee) Critical biodiversity areas as identified in systematic biodiversity plans.	This activity will be applicable due to the fact that a road wider than 4 metres will be constructed within Critical Biodiversity Area, outside of the Urban edge.
13(a)	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal is required for: (2) the undertaking of a linear activity falling below the thresholds mentioned in Listing Notice 1 in terms of GN No. 544 of 2010. (a) Critical biodiversity areas and ecological support areas as identified in systematic biodiversity plans adopted by the competent authority.	This activity will be applicable due to the fact that this activity will take place within a Critical Biodiversity Area (CBA) and more than 1 hectare of indigenous vegetation will be cleared.
16(iv)(a)ii(ff)	The construction of infrastructure covering 10 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line. (a) In the Eastern Cape province ii Outside urban areas, in: (ff) Critical biodiversity areas as identified in systematic biodiversity plans.	This activity will be applicable due to the fact that infrastructure for this project exceeding 10 square metres will be constructed within 32 metres of a watercourse.

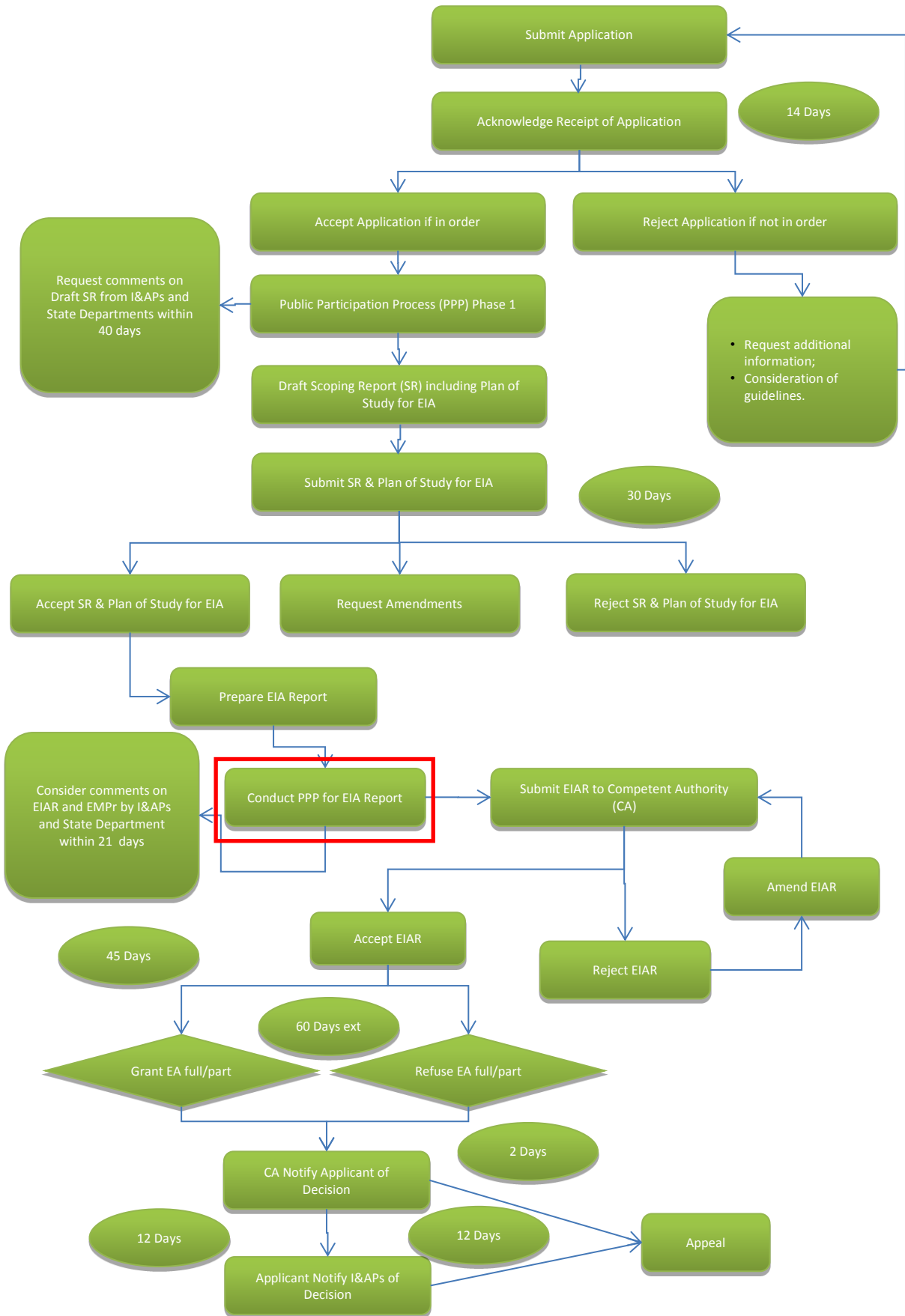


Figure 17: 2010 EIA Process (NEMA)

3.2 NATIONAL WATER ACT

The NWA provides the law relating to the water resources of South Africa. The purpose of the NWA is to manage and control the means by which all water resources are protected, used, developed, conserved and controlled.

Sections 21 of the NWA identify certain water uses which require approval from the Department of Water Affairs (DWA) in the form of a relevant water use licence. Water uses provided for in the Act, which may also be applicable to the proposed activities, and which will be further investigated in the EIA Phase, are listed in Table 4 below.

It is understood that the General Authorisations for the water uses listed in Table 4 below, provide for a legal use of water for these purposes. However, these General Authorisations are specifically excluded for any development which occurs within 500m of a wetland as per GN 1199 of 18 December 2009 Section 6(b).

Table 4: NWA Section 21 activities requiring water use licence

NWA Section 21 Water Use	Proposed Activity
<p>21(c) Impeding or diverting the flow of water in a watercourse.</p>	<p>Wetlands and riparian areas (watercourses) will be crossed by the housing development and associated infrastructure. During construction, there will be a need to temporarily impede and divert the flow of water where these watercourses¹ are crossed.</p>
<p>21(i) Altering the bed, banks, course or characteristics of a watercourse.</p>	<p>Several wetlands and riparian areas will be affected by the proposed development. During construction, there will be a need to alter the bed and banks of the affected watercourses.</p>

3.3 NATIONAL HERITAGE RESOURCES ACT

The National Heritage Resources Act (Act No. 25 of 1999 - NHRA) provides for the protection of heritage resources of South Africa, which are of cultural significance or other special value by introducing an integrated and interactive system for the management of national heritage resources. Section 38 of the NHRA states that:

“38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as-

¹“watercourse” means-

- (a) a river or spring;
 - (b) a natural channel in which water flows regularly or intermittently;
 - (c) a wetland, lake or dam into which, or from which, water flows; and
 - (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse,
- and a reference to a watercourse includes, where relevant, its bed and banks.

- (a) *the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*
- (b) *the construction of a bridge or similar structure exceeding 50m in length;*
- (c) *any development or other activity which will change the character of a site-*
 - (i) *exceeding 5 000 m² in extent; or*
 - (ii) *involving three or more existing erven or subdivisions thereof; or*
 - (iii) *involving three or more erven or divisions thereof which have been consolidated within the past five years; or*
 - (iv) *the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;*
- (d) *the re-zoning of a site exceeding 10 000 m² in extent; or*
- (e) *any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,*

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.”

The Responsible Heritage Resource Authorities, the South African Heritage Resources Agency (SAHRA) and the Eastern Cape Provincial Heritage Resources Authority (ECPHRA) were subsequently notified of the proposed development. The ECPHRA has requested that a heritage and paleontological investigation be done. As such, a Heritage Impact Assessment (including paleontological findings) was commissioned (refer to Appendix D).

3.4 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT

The National Environmental Management: Biodiversity Act (Act No. 10 of 2004 - NEMBA), “provides for: the management and conservation of South Africa’s biodiversity within the framework of the NEMA; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources; the establishment and functions of a South African National Biodiversity Institute; and for matters conducted therewith”.

In terms of the NEMBA, the applicant has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).
- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development

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

- Limit further loss of biodiversity and conserve endangered ecosystems.

Regulations published under the National Environmental Management: Biodiversity Act (Act No 10 of 2004) provides a list of protected species (flora and fauna), according to the Act (GN R. 151 dated 23 February 2007, as amended in GN R. 1187 dated 14 December 2007). With reference to Section 5.4 below, the study area falls within a Critical Biodiversity Area (CBA) and the status of this CBA is listed as Vulnerable. As such, an Ecological and Wetland Impact Assessment was commissioned in order to determine the status of the site and recommend the necessary measures.

4. ALTERNATIVES

As required of the scoping process, feasible alternatives for the aspects of the development have been identified in order to ensure that the proposed activity has the least negative impact on the biophysical and socio-economic receiving environment. The alternatives were identified based on information provided by the client and the status of the receiving environment.

For any alternative to be considered feasible such an alternative must meet the need and purposes of the development proposal without presenting significantly high associated impacts. Alternatives are typically distinguished into discrete or incremental alternatives. Discrete alternatives are overall development options, which are typically identified during the pre-feasibility, feasibility and or scoping phases of the EIA process (DEAT; 2004). Incremental alternatives typically arise during the EIA process and are usually suggested as a means of addressing identified impacts. These alternatives are closely linked to the identification of mitigation measures and therefore are not specifically identified as distinct alternatives. The alternatives that were considered feasible are discussed below.

4.1 LOCATION ALTERNATIVES

Development of the preferred alternative was considered. The preferred site alternative was found to be feasible due to the following reasons:

- The development received a positive Record of Decision in terms of the Environmental Conservation Act (Act No 73 of 1989) by the ECDEDEAT during July 2004. However, the authorisation expired before development commenced;
- The development area was successfully rezoned from agricultural to residential and already has approved layouts in terms of the town planning processes and legislation;
- The preferred site is BCMM owned and there is sufficient space for the proposed layout;
- The topography of the area is conducive enough for the envisaged development;
- There is relatively adequate access to site off the main road.

In general, the criteria below were considered during the feasibility assessment for the development.

- Existing township approval and internal layout;
- Land Ownership;
- Favourable topography and availability of space for the development;
- Access to site; and

It should be noted that no other location alternatives were considered for this development, due to the reasons given above.

4.2 LAYOUT ALTERNATIVE: AVOIDING SENSITIVE AREAS

The proposal calls for the construction of housing units and infrastructure over sensitive areas, including, grave sites, watercourses (including wetland and riparian areas) and potentially ecologically sensitive areas. For this reason, specialist investigations mentioned in Section 7 below were recommended, in order to determine the extent and sensitivity of these areas. The results of the specialist investigations provide a framework for the design team within which alternative development layouts were identified.

It is anticipated that construction activities associated with the proposed layout plan would have a significant impact on the identified areas, as the construction of these units would significantly alter these sensitive areas. Furthermore, the costs and practical implications of construction within sensitive areas would need to be considered.

Consequently, the alternative of not constructing within the areas of concern/sensitive areas was further assessed in the EIA Phase as the main alternative to the proposal. Please refer to Figure 23 in Section 9.1 below.

4.3 NO GO ALTERNATIVE

The “No Go” or “No Action” alternative refers to the alternative of not embarking on the proposed project at all. This alternative would imply that the current status quo without the proposed infrastructure would continue. More importantly, this would mean that there will be no service delivery for the beneficiaries currently residing in informal dwellings.

It is important to note that the No Go alternative is the baseline against which all other alternatives and the development proposal are assessed. When considering the No Go alternative the impacts (both positive and negative) associated with any specific alternative or the development proposal would not occur and in effect the impacts of the No Go alternative are therefore inadvertently assessed by assessing the other alternatives.

5. DESCRIPTION OF THE RECEIVING ENVIRONMENT

This section provides an overview of the physical, biological and socio-economic environment within which the development is proposed to be undertaken.

5.1 TOPOGRAPHY

The topography of the site is characterised by gently undulating terrain which is dissected by some minor natural drainage lines which drain into tributaries of the Tutura and Nunu Rivers. The landscape, within which the proposed housing units and associated infrastructure is proposed to be constructed, ranges in elevation from about 190 to 220 m above mean sea level.



Figure 18: Representative view of the landscape of Sunny South

5.2 CLIMATE

East London is generally located in a humid subtropical region with the typical warm and moderate temperatures of the South African coastline. East London normally experiences increased levels of rainfall during the wet season (during spring and summer), with the summer season reflecting the most rainfall levels on average. The area experiences significantly lower rainfall during the dry season (although perceived not a true dry season) between May and August. Average temperature maximum midday levels to range between 20°C during winter time and 26°C during spring time. The area is the coldest during July with an average of approximately 9.3°C during the night.

Table 5: Climate parameters (TuTiempo, 2012)

Year	T	TM	T _m	PP	V	RA
2000	18.9	24.8	14.3	1060.89	16.0	108
2001	19.2	25.0	14.6	962.38	16.8	112
2003	18.7	24.7	14.2	583.14	15.9	93
2004	18.7	24.9	14.5	853.41	-	107
2006	18.0	24.4	13.9	1229.86	15.0	141

Year	T	TM	T _m	PP	V	RA
2007	18.6	25.0	14.0	647.16	16.7	128
2009	18.6	24.6	14.0	-	17.1	224
2010	18.9	25.3	14.4	-	16.8	227
2011	18.8	24.0	14.1	-	17.6	141

Note: T=Annual average temperature (°C); TM=Annual average maximum temperature (°C); T_m=Annual average minimum temperature (°C); PP=Total annual precipitation of rain and / or snow (mm); V=Annual average wind speed (km/h); RA=Total days with rain during the year; -=no data available.

5.3 HYDROLOGY

According to Vromans (2013), the proposed development site falls within the Mzimvubu to Keiskamma Water Management Area, and the R40A quaternary catchments, in which the major rivers are the Ncera, Mlele, Mcantsi and Gxulu. These rivers surround the proposed development site. The two quaternary catchments that the proposed development site overlaps are R40A (key rivers Ncera and Mlele) and R40A (key river Gxulu), while the quaternary catchment R40A (Mcantsi River) lies just to the south-east. The site is located on a catchment boundary which runs from the north west to the south east. The site drains to the north east to the Tutura River and to the south west to a tributary of the Nunu Rivers. The site is located within the quaternary catchment R40A.

Three small non-perennial streams occur and originate within the boundaries of the proposed development site (see Figure 19 below). The Tutura River, a perennial river, flows adjacent to and some distance from the eastern boundary of the proposed development site, eventually flowing into the Gxulu River.

The National Wetland Classification System (SANBI, 2009) methodology was followed in order to classify the three natural wetlands surveyed. The aquatic features all fall within the Eastern Coastal Belt Ecoregion, and are flats positioned on a plan within an undulating landscape. The three wetlands are natural with seasonally saturated sediments and inundation. All wetlands have been modified to some degree due to rural land use activities, namely livestock grazing and settlements. The dominant geology of the proposed development site is sedimentary and volcanic rocks of the Adelaide subgroup and Balfour formation of the Beaufort Group, which are comprised of grey mudstone and sandstone. Patches of dolerite intrusions (dykes) are also present. Both dolerite dykes and sandstone are usually good aquifers. Vegetation in the wetlands is grassy and herbaceous, with sedges and some rushes and reeds.

A number of wetland indicator species were present in the natural wetlands. Several indigenous grasses that indicate moist saturated sediments were recorded, while the dominant sedges and rush included *Cyperus longus tenuifolius*, *Cyperus sexangularis*, and *Schoenoplectus paludicola*.

It was found that the natural wetlands are considered to be of moderate ecological importance or sensitivity but of low hydrological and anthropogenic importance. It was concluded that a buffer area of 50 m be imposed around the boundary of each natural wetland and around the Tutura River riparian zone. Furthermore, a buffer area of 32 meters will need to be maintained around the natural drainage

areas (non-perennial streams), including dams along these drainage areas. The 1:100 year flood line will also need to be determined for all watercourses. These buffer areas or no-go areas should act as an open space system that ensures connectivity with the surrounding natural environment, from an ecological perspective. Please refer to Figure 19 below for an illustration of the hydrological features found within the proposed development site



Figure 19: Map showing hydrological features for the proposed Sunny South Development

5.4 FLORA AND FAUNA

Muncina and Rutherford (2006) the proposed site is located within the Albany Coastal Belt (Albany Thicket Biome), which has a conservation status of Least Threatened and a protection status of Poorly Protected. According to Vromans (2013), the proposed development site is predominantly grassland, with thicket/forest vegetation occurring along the Tutura River in the valley area to the north-west. Most of these common thicket, grass and herbaceous species recorded on site correspond well with Albany Coastal Belt, while the grass species also correspond well with those of the Berlin Savanna Thicket unit. The statement that Berlin Savanna Thicket is now dominated by woody thicket trees and shrubs is not valid for the grassland areas of the proposed development site as these areas are dominated by grass species, with some *Acacia karoo* trees scattered through the landscape. No Species of Special Concern were recorded in the proposed development site.

In terms of the Eastern Cape Biodiversity Conservation Plan (2007 – ECBCP), the site is classified as Type 2 (R2) protected area – state land. However, Section 2.5.1 (Eastern Cape Protected Areas Coverage of the ECBCP (2007)) states, “*The protected area coverage for the province is current and accurate for Type 1 protected areas; however, for Type 2 and 3 protected areas this data is dated and has not been verified. Also not all of these protected areas are managed as conservation areas (e.g. DWAF forests or state land). Type 2 and 3 protected areas are presented here as context information and cannot be regarded as contributing to achieving national biodiversity targets until their legislative status and management objectives have been verified.*”

As such, it was recommended that an Ecological Impact Assessment be conducted to verify the ecological status of the site. According to Vromans (2013), alien plant cover increased in extent around the drainage area to the south-west of the M25 (R347), in which the dominant species were *Acacia mearnsii* and *Cestrum laevigatum*. Other alien plant species included *Lantana camara*, *Melia azedarach*, *Solanum mauritianum* and *Eucalyptus sp* (Refer to the specialist report in Appendix C for the list of alien species observed).

Because of the highly impacted nature of the proposed development site, Vromans (2013) concluded that the grassland habitat is considered to be degraded.

Important taxa that occur in this vegetation unit are presented in Table 6 below.

Table 6: Important floral taxa within the Albany Coastal Belt sub-biome of the Albany Thicket Biome

Tall Tree	Woody Succulent Climbers	Herbs
<i>Erythrina caffra</i>	<i>Crassula pellucida</i> subsp. <i>marginalis</i>	<i>Chamaecrista mimosoides</i>
Succulent Tree	<i>Sarcostemma viminale</i>	<i>Abutilon sonneratianum</i>
<i>Euphorbia triangularis</i>	Woody Climbers	<i>Acalypha ecklonii</i>
Small Trees	<i>Asparagus aethiopicus</i>	<i>Centella asiatica</i>
<i>Acacia natalitia</i>	<i>A. racemosus</i>	<i>Commelina africana</i>
<i>Brachylaena alliptica</i>	<i>Capparis sepriaria</i> var. <i>citrifolia</i>	<i>C. benghalensis</i>
<i>Canrhium spinosum</i>	<i>Clematis brachiata</i>	<i>Cynoglossum hispidum</i>

<i>Cussonia spicata</i>	<i>Rhoiacarpos capensis</i>	<i>Eriosema squarrosurn</i>
<i>Ficus sur</i>	<i>Rhoicissus digitata</i>	<i>Lactuca inermis</i>
<i>Ochna arborea</i>	<i>R. widentata</i>	<i>Lobelia erinus</i>
<i>Sideroxylon inerme</i>	<i>Secamune alpini</i>	<i>Monsonia emarginata</i>
<i>Zanthoxylum capense</i>	<i>Tecoma capensis.</i>	<i>Phyllopodium cuneifolium</i>
Tall Shrubs	Herbaceous Climbers	<i>Senecio burchelli</i>
<i>Clausena anisara</i>	<i>Rhynchosia caribaea</i>	<i>Sonchus dregeanus</i>
<i>Clerodendrum glabrum</i>	<i>R. totta</i>	Geophytic Herbs
<i>Coddia rudis</i>	<i>Thunbergia capensis</i>	<i>Cheilanthes hirta</i>
<i>Croron rivularis</i>	<i>Zehneria scabra</i>	<i>Moraea pallida</i>
<i>Diospyros villosa</i> var. <i>parvifolia</i>	Graminoids	<i>Oxalis smithiana</i>
<i>Grewia occidentalis</i>	<i>Brachiaria serrata</i>	<i>Sansevieria hyacinthoides</i>
<i>Gymnospcria heterophylla</i>	<i>Cynodon dactylon</i>	<i>Strelitzia reginae</i>
<i>Hippobromus pauciflorus</i>	<i>Dactyloctenium ausrrale</i>	Semiparasitic Epiphytic Shrub
<i>Mystroxyton aerhiopicum</i>	<i>Digitaria natalensis</i>	<i>Viscurn obscurum</i>
<i>Pavetta lanceolata</i>	<i>Ehrharta cabrcina</i>	Succulent Herb
<i>Psydrax obcvata</i>	<i>Eragrosris capensis</i>	<i>Plectranthus verticillatus</i>
<i>Pterccelastrus tricuspoidatus</i>	<i>E. curvula</i>	
<i>Rhus lucida</i>	<i>E. plana</i>	
<i>Scutia mynina</i>	<i>Heteropogon contortus</i>	
<i>Tarchonanthus camphoratus</i>	<i>Panicum deustum</i>	
<i>Turraea obtusifolia</i>	<i>P. maximum</i>	
Low Shrubs	<i>Setaria sphacelata</i>	
<i>Rhynchosia ciliata</i>	<i>Sporobolus africanus</i>	
<i>Carissa bispinosa</i> subsp. <i>bispinosa</i>	<i>Themeda triandra</i>	
<i>Chaetacanthus setiger</i>	<i>Tristachya leuccthris</i>	
<i>Helichrysum asperum</i> var. <i>albidulum</i>	<i>Cymbopogon marginatus</i>	
<i>Pelargonium alchemillcides</i>	<i>Ehrharta erecta</i>	
<i>Phyllanthus maderaspatensis</i>	<i>Elionurus muticus</i>	
<i>Selago corymbosa</i>	<i>Melica racsmusa</i>	
<i>Senecio ptercphorus</i>	<i>Setaria megaphylla</i>	
<i>Tephrosia capansis</i> var. <i>acurifolia</i>	<i>Trachypogon spicatus</i>	

Mucina and Rutherford (2006) further mention that the region that contains this vegetation unit is a mosaic of a wide variety of structural vegetation types, ranging from grassland to forest. This variation reflects post-disturbance succession gradients as well as natural variation in geology, soil patterns and distribution of water in the landscape. The current vegetation mosaic so typical of the Albany Coastal Belt is a creation of man and the original (pre-settlement) vegetation was dominated by non-seasonal, dense thicket. The area of this unit was prime agricultural land which attracted early settlers who, presumably, cleared the dense thicket cloak for pastures.

Vromans (2013) found that numerous faunal and bird Species of Special Concern may potentially utilize the study site. Two important butterfly species are most likely inhabitants of the wetlands, dams and riverine environment, namely the Green-marbled Sandman (*Gomalia elma*) and the Olive-haired Swift (*Borbo borbonica*), both widespread but uncommon, and not red listed.

5.5 GEOLOGY AND SOILS

The geological map indicates that the site is underlain by Permian Balfour Formation mudstone and sandstone and localised Jurassic Karoo dolerite. The soil types are highly variable and range from clays to gravel. The underlying bedrock occurs at a shallow depth over most of the site with exception of the area underlain by deeply weathered dolerite. There is a geological fault traversing the site but this believed to be inactive and will not affect the stability of the site.

The geotechnical investigation (see Appendix E) concluded that the in situ soils will not meet the SABS 1200 LB specification for selected granular material for pipe bedding or blanket and these materials should be imported. Foundations for single and double storey structures should be founded on dense or well compacted in situ soil cover. Due to the potentially problematic soil conditions, the recommended foundation type throughout the entire development is stiffened rafts (H1-2 conditions) at a depth of approximately 350mm below NGL (underside of down-stand beams of raft). This method is widely employed for low-cost housing and is ideal for sites where there are potentially problematic soils or significant variability in the ground conditions.

5.6 AREAS OF HISTORICAL/CULTURAL SIGNIFICANCE

Van Ryneveld (2013) identified three main cultural resource types (see Appendix D), namely Contemporary structures; Colonial Period structures (older than 60 years); and Graves and Cemeteries (not older than 60 years).

The Colonial Period Residence and the Colonial period Factory, which is located on the Ncera Macadamia Farming facility development, are formally protected by the NHRA 1999, which states that any alterations to the structure should be done under an EC PHRA Built Environment permit.

With respect to the grave sites situated within the footprint of the study site, both conservation *in situ* and relocation options should be consulted with the community before implementation. In addition it came to the fore that the community would appreciate a cemetery in the area. It was recommended that a minimum approximate 80x45m area be set aside to ensure conservation of the cemetery. Should development be able to accommodate an approximate 80x80m area, it will be possible to provide for a small cemetery within the development layout and consider re-internment of selected graves located on the study site footprint (see Figure 20 below).

It was concluded that the Colonial Period structures be conserved *in situ* and that the graves found within the development area be conserved *in situ* or relocated with consultation with the relevant affected parties.

The findings of the HIA are provided in Section 7.2 below. Please refer to Appendix D for details.

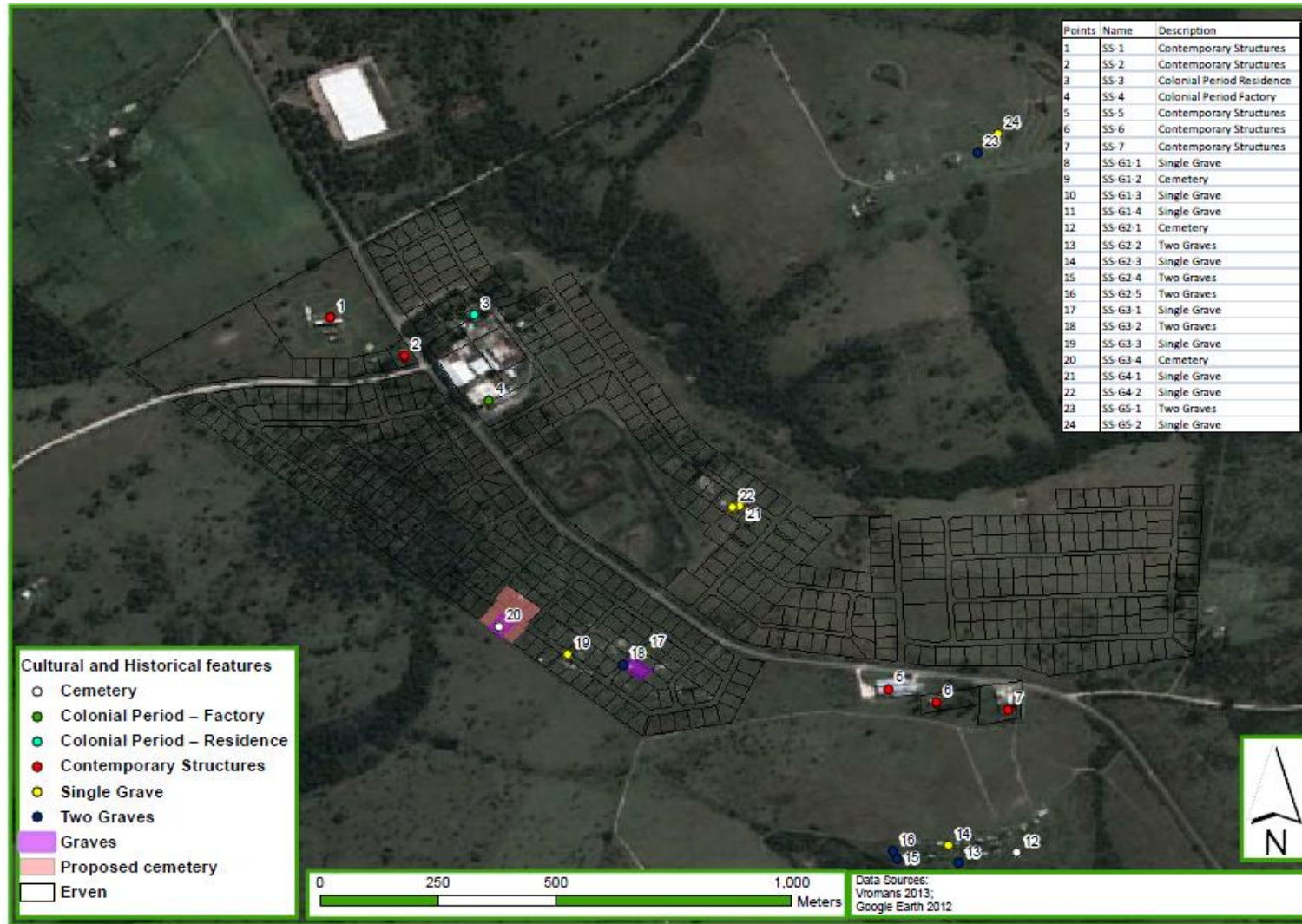


Figure 20: Map illustrating the cultural and historical features within and around the proposed development site

5.7 LAND COVER

With reference to Figure 1 above, it can be observed that the majority of the area consists mainly of rural areas with patches of natural areas (transformed) in between. The majority of the study area is located outside the urban edge and is characterised by a transformed landscape consisting of, amongst other things, disturbed vegetation, old farm lands and man-made dams near and within the proposed development area. The old farm lands are characterised by large open landscapes, mainly transformed grassland.

Current land use within the catchment is predominantly rural housing, with limited light industry (e.g. fruit canning) and extensive agriculture (livestock grazing). Land cover within the study site is largely degraded grassland, which has been impacted by past agricultural activities, namely cultivation, and current extensive livestock grazing (cattle and goats). Impacts associated with past cultivation were in the form of shallow furrows and terraces, as a result of past cultivation and degraded natural cover due to grazing by livestock. There degraded state of the grassland is also a result of current human activities, such as the erection of power lines, waste dumping, etc. The M25, which dissects the study site, footpaths, access tracks, rural housing and rural industry (buildings) are other land use impacts on the landscape. In addition, numerous dams have been established along natural drainage areas and proximate to the Tutura River, as well as a series of six large dams adjacent to the M25/R347 (Vromans, 2013).



Figure 21: Trench with old waste cans

5.8 SOCIO-ECONOMIC ENVIRONMENT

The study area is located within the BCMM. The following social and economic information for the ward was obtained from the BCMM (2011). It is possible that the social structure of the area may have changed since this data was made available.

5.8.1 Population and Age Structure

Table 7 indicates general population distribution for BCMM based on the results from a survey conducted by Statistics South Africa in October 2007. In the 2007 survey, the BCMM had an estimated population 724 306, of which the Black African community forms the majority of the population followed by the White community.

Table 7: General population distribution for the BCMM

Population Group	Distribution
Black African	626 833
Coloured	52 212
Indian or Asian	1 950
White	53 311

The female gender contributed approximately 51% of the population in the BCMM. The age distribution for the BCMM shows that the age group with the largest population was 15 to 64 years of age.

Table 8: Population age structure

Population Group	Distribution
Females	370 200
Males	354 106
0 – 14 years	196 085
15 – 64 years	488 103
≥ 65 years	40 118

5.8.2 Employment Profile

In 2007, there were at least 84 000 people unemployed in the BCMM area compared to the 82 000 that were employed. These figures came from a total of 208 389 households including the East London, King Williams Town and Surroundings, Mdantsane, Rural South and the Rural North areas. Table 8 indicates the annual household income in the BCMM during the 2007 survey. From the table it can be observed that a significant portion of the population in the BCMM survives with just under R6 500.

Table 9: Annual household income distribution for the BCMM during 2007

Household Income	Population
R1 – R400	18 677
R401 - R800	26 181
R801 – R1 600	62 514
R1 601 – R3 200	29 461
R3 201 - R 6 400	25 179
R6 401 – R12 800	20 605
R12 801 – R25 600	7 520
R25 601 – R51 200	2 613

R51 201 – R102 400	1 054
R102 401 - R204 800	609
R2 457 601 +	283

6. PUBLIC PARTICIPATION

The public participation process as required by the NEMA was carried out according to Chapter 6 of GN R. 543 promulgated under Section 24 (5) the above mentioned Act. The detail of the public participation process is described in this section.

6.1 INTRODUCTION

South Africa, being one of the countries with the most progressive constitutions, enshrined the public's right to be involved in decisions that may affect them in the constitution. Section 57(1) of the new Constitution states the following:

"The National Assembly may (b) make rules and orders concerning its business, with due regard to representative and participatory democracy, accountability, transparency and public involvement."

This provision, along with several others, gave rise to many new trends in South African legislation. In environmental legislation, the idea of public participation (or stakeholder engagement) features strongly and especially the NEMA and the recent regulations passed under the auspices of this Act, makes very strict provisions for public participation in environmental decision-making.

One of the questions that may arise at this point is what the definition of public participation is. One of the most comprehensive definitions of public participation was given by Greyling – it has also been adopted by the International Association for Public Participation (IAPP). Greyling defines public participation as... *"a process leading to a joint effort by stakeholders, technical specialists, the authorities and the proponent who work together to produce better decisions than if they had acted independently"* (Greyling, 1999, p. 20). From this definition, it can be seen that the input of the public is regarded as very important indeed.

An Issues and Responses Report (IRR) (Appendix A) lists all verbal and written issues raised by Interested and Affected Parties (I&APs) and stakeholders during the Scoping and EIA process thus far. These issues/queries/concerns/comments were submitted to EIMS in the following manner:

- Issues raised after the placing of the notification advertisements in the newspaper and as a response to the posters, site notices and flyer notifications; and
- Written queries submitted to EIMS via e-mail, post, telephone calls and fax.

Comments received have been processed by EIMS and responses will be compiled by EIMS. As such, comments contained in the IRR will include:

- Issues raised during the public meeting;

- Comments received by fax, email or post; and
- Transcribed telephonic conversations.

6.2 LANDOWNER NOTIFICATION

Regulation 15 the 2010 EIA Regulations (GN R. 543) requires that in cases where the applicant is not the owner or person in control of the land on which the activity is to be undertaken, that the applicant must give notice to the owner or person in control of the land on which the activity is to be undertaken.

Since this applicant is the owner of the development site there was no need for landowner notification.

6.3 OPPORTUNITIES FOR PUBLIC PARTICIPATION

This section provides an overview of the opportunities provided to I&APs for participation in the Scoping Process.

6.3.1 Placement of Site Notices

In line with the current legislation, site notices were placed prominently at several locations within and around the Sunny South housing development site. These included the following (please refer to Appendix A for the exact locations of these notices):

- 3 x A1 size notices, each containing an A2 size Xhosa notice and an A2 size English notice placed at key points in and around the development area;
- Distribution of A4 pamphlets to all local landowners and occupiers of land; and
- An advertisement placed on one local newspaper.

6.3.2 Formal Opportunities for Public Participation

Notification advertisements were placed in the local newspaper, the Daily Dispatch (5 February 2013). The following documentation was also made available on the EIMS website (www.eims.co.za):

- Xhosa and English version of the site notice; and
- Map showing the proposed development;

The IRR records the formal opportunities provided for public participation during the Scoping and EIA process thus far, which commenced with the advertising of the process during February 2013.

Table 10: Opportunities provided for Public Participation

Public Participation Phase			
Action	Description	Publication/Place	Date
Announcement of Project	Landowner Notification	Via email, post and physical delivery.	04 February 2013
Announcement of Project	Newspaper Advertisements.	Daily Dispatch	05 February 2013

Public Notification	Distribution of fliers and placement of site notices.	Refer to section 6.3.1 above.	04 February 2013
Public Information	Public Meeting	Braeside Primary School	14 February 2013
Public Notification	Availability of the DSR and Plan of Study (PoS) for EIA for Public review.	Site Notices and advertisements	08 February 2013 20 February 2013
Public Notification	Availability of the Final Scoping Report and Plan of Study (PoS) for EIA for Public review and Authority Decision.	Notification of availability will be sent to all registered I&APs via e-mail, fax and post	14 March 2013
Public Notification	Availability of the Draft EIAR for Public review.	Notification of availability will be sent to all registered I&APs via e-mail, fax and post	30 May 2013
Public Notification	Availability of the Final Environmental Impact Assessment Report (EIAR).	Notification of availability will be sent to all registered I&APs via e-mail, fax and post	To be confirmed
Public Notification	Notification of Authority decision on EIAR.	Notification of availability will be sent to all registered I&APs via e-mail, fax and post	To be confirmed

In addition to the newspaper advertisements, many key I&APs were pre-identified and received invitations to participate at the inception of the project. I&APs in this category include organs of state (e.g. the DWA, ECPHRA, ECDEDEAT), officials at the BCMM, service providers, ward councillor of Ward 31 of the BCMM, as well as other relevant community representative associations.

A public meeting was also held on 14 February 2013 at the Braeside Primary School from 11:30 to 12:30. During this meeting, an overview of the Scoping and EIA processes was provided, as well as a detailed description of what the project entails. I&APs were given an opportunity to ask questions and to provide comment. The issues raised during this meeting were included in the IRR to be submitted with the Scoping Report.

The DSR was also made available for review by the public at the Braeside Primary School. Copies of the DSR were also made available to the ward committee members situated in Shelford and Paratyana farms. The DSR was also placed on the EIMS website (www.eims.co.za) and made available for download. The registered I&APs were advised of the availability of the Draft Scoping Report and requested to submit comments to EIMS. The Final Scoping Report was also made available on the EIMS website once available.

The Draft EIAR has been made available for review by the public at the Braeside Primary School. Copies were also made available to the ward committee members situated in Shelford and Paratyana farms. The Draft EIAR was also placed on the EIMS website (www.eims.co.za) and made available for download. The registered I&AP's were advised of the availability of the Draft EIAR and requested to submit comments to EIMS within a specified comment period. The Final EIAR will also be made available on the EIMS website.

6.4 ISSUES RAISED

The issues raised pertained mainly to the request for additional information and the consultation of certain key I&APs regarding the project.

6.5 I&AP DATABASE

All I&AP contact details were recorded, as was their relationship to the project. An I&AP database was created to capture all relevant information (See Appendix A).

7. SPECIALIST INVESTIGATION FINDINGS

This section provides a brief summary of the findings, conclusions and recommendations of the specialist investigations. For more detailed discussions and presentations of the findings please refer to Appendices C – D for each of the specialist studies.

7.1 ECOLOGICAL AND WETLAND/AQUATIC IMPACT ASSESSMENT

The Ecological and Wetland Impact Assessment is included in Appendix C.

An ecological assessment and watercourse (streams and wetlands) classification, delineation and assessment were conducted to provide input to the Scoping and Environmental Impact Assessment, as well as a Water Use Licensing Application in terms of the National Water Act (36 of 1998).

In order to delineate the drainage areas and wetlands, a field survey was conducted on 1 May 2013. The methodology described by 'A practical field procedure for identification and delineation of wetlands and riparian areas' (DWAF, 2005) was followed, in part, as the presence of riparian and wetland species, as well as inundated areas, were the key criterion for determining stream and wetland presence. GPS coordinates of the boundary of the wetlands were recorded at regular intervals in the field and were used in GIS software (Quantum GIS version 1.8) to map the wetlands. Aerial (2009) and Google imagery (2012) were used to delineate the natural drainage areas (non-perennial). The Tutura River riparian areas was digitized by following the band of thicket and forest vegetation with the use of aerial (2009) and Google imagery (2012) as well (in order to provide a visual of the recommended buffer area). Consequently, some error with regards to the accuracy of the drainage areas, riparian and wetland boundaries should be expected.

Three natural wetlands and three natural drainage areas, including numerous dams, are located within and surrounding the proposed development site. These dams have modified the hydrology of the site, although the three wetlands are sited upslope of these dams and are therefore not significantly, if at all, impacted by this change in hydrology (flow volume and pattern). The Tutura River is some distance from the north-eastern border of the proposed development site. Two of these natural drainage areas drain into the Tutura River, which then flows into the Gxulu River.

Numerous faunal and bird Species of Special Concern may potentially utilize the study site. Two important butterfly species are most likely inhabitants of the wetlands, dams and riverine environment, namely the Green-marbled Sandman (*Gomalia elma*) and the Olive-haired Swift (*Borbo borbonica*), both widespread but uncommon, and not red listed.

Three systematic conservation plans have been generated for the region in which the study site is situated, namely the Maputoland-Pondoland-Albany Hotspot study, the Eastern Cape Biodiversity Conservation Plan's Critical Biodiversity Areas Map and the National Freshwater Ecosystem Priority Areas Map. The study site is approximately 5 km from a mapped point for Threatened species, meaning there is a potential for certain Threatened species to occur in and around the study site. The study site also falls partly within a Critical Biodiversity Area (Ecological Corridor), with degraded areas, and is a non-statutory protected area Critical Biodiversity Area according the Eastern Cape Biodiversity Conservation Plan's Critical Biodiversity Areas Map. The recommended permissible land uses are Conservation, Game Farming and Communal Livestock. The National Freshwater Ecosystem Priority Areas Map indicates that part of the site falls within Fish Support Area, with the Gxulu River indicated as the Fish Support Area. This means that the catchment needs to be maintained in a good condition to prevent the loss of threatened or near threatened fish species that occur in rivers indicated as Fish Support Areas.

The site assessment confirmed that the proposed development site is highly degraded and, as a result, of relatively low biodiversity value. However, because the Eastern Cape Biodiversity Conservation Plan's Critical Biodiversity Areas Map and the National Freshwater Ecosystem Priority Areas Map indicate that part of the proposed development site is a Critical Biodiversity Area (Ecological Corridor and important sub-quaternary catchment) and a Fish Support Area the value of the site as an important ecological / hydrological process area cannot be discounted. It was concluded by Vromans (2013) that a buffer area of 50 m be imposed around the boundary of each natural wetland, as well as for the Tutura River riparian zone (which should form part of the ecological corridor and Gxulu quaternary catchment's fish support area). Furthermore, a buffer area of 32 meters will need to be maintained around the natural drainage areas (non-perennial streams), including dams along these drainage areas. The 1:100 year flood line will also need to be determined for all watercourses.

Legislative requirements triggered by the proposed development, besides the Scoping and Environmental Impact Assessment in terms of the National Environmental Management Act (107 of 1998), include:

(1) A water use license application for the proposed development as it is within 500 m of three wetlands (in terms of Section 21(c) and (i) of the National Water Act (36 of 1998). In terms of sewage reticulation, if relevant, the National Water Act will need to be complied with in terms of ensuring that sewage wastewater storage and disposal sites will need to be located above the 1:100 year flood line or at least 100 m from the Tutura River, as well as the drainage areas (non-perennial streams). Further, in terms of section 144, the developer (Municipality) of the proposed settlement will need to determine the 1:100 year flood line of the Tutura River, as well as the drainage areas.

(2) Waste Management Conditions (Specifications), as part of the Construction and Operational Environmental Management Plan, will need to be compiled that are aligned with the general measures of the National Environmental Management: Waste Management Act (59 of 2008) Act, where applicable, as part of the EIAR.

(3) Waste generated during construction must be disposed of at a licensed waste disposal site, which may still be licensed in terms of the Environmental Conservation Act (73 of 1989), as per Section 81 of the National Environment: Waste Management Act (NEMWA), or licensed in terms of NEMWA.

(4) The developer (Buffalo City Metropolitan Municipality) will be responsible for clearing alien invasive plants within the development footprint and immediate surrounds, because all municipalities are responsible for alien clearing and management on municipal owned land (National Environmental Management: Biodiversity Act, 10 of 2004).

Nine potential construction and operational impacts were identified and assessed, as included in Section 8 below.

It was concluded that the proposed housing development has a low impact on the ecology of the study site and surrounds, if appropriate management measures are implemented, particularly during the design and construction phases. Mitigation measures are largely through a revised layout plan that avoids the wetlands and natural drainage areas, as well as the dams along these lines, including minimizing the extent of the construction and development footprints, rehabilitation, alien plant control and effluent management. The mitigation measures, especially the revised layout (see Figure 23), represent the alternative.

7.2 HERITAGE IMPACT ASSESSMENT

The Heritage Impact Assessment is included in Appendix D.

The archival study showed that the study area is mainly underlain by Permian aged sedimentary rocks of the Karoo Supergroup, which belong to the Balfour Formation of the Adelaide Subgroup. The Permian Adelaide Subgroup is interpreted as a meandering river deposit grading upwards into a lacustrine environment and is well known for containing fossils.

It was recommended that a paleontological site inspection be done by a qualified paleontologist once the vegetation has been cleared during the early stages of construction in areas with a Moderate sensitivity rating for the occurrence of fossils (see Figure 3 in Appendix D). The EAP of the project team should be made aware of the possible occurrence of fossils. If any fossils are recorded during initial field visits, a trained paleontologist must be notified to assess the finds.

During the survey, three main cultural resource types were identified, namely Contemporary structures, Colonial Period structures, and Graves and Cemeteries.

It was concluded that the Colonial Period structures be conserved and that the graves found within the development area be conserved *in situ* or relocated with consultation with the relevant affected parties and the ECPHRA. Changes to the buildings older than 60 years on the site (points 3 and 4 in Figure 20), would require authorization from the ECPHRA prior to alteration or destruction.

7.3 GEOTECHNICAL INVESTIGATION

Outeniqua Geotechnical Services was appointed by Kantey & Templer Consulting Engineers to undertake a combined Preliminary and Phase 1 geotechnical site investigation for the proposed Sunny South subsidy housing project near East London in the Eastern Cape.

An initial desk-top study was undertaken followed by a subsurface investigation which included a series of test pits, *in situ* tests and laboratory tests. It was concluded that all earthworks should be conducted as per SABS 1200D or COLTO 3300. The construction of foundations and superstructures should be carried out with reference to the guidelines set out in the NHBRC Home Builders Manual.

The recommended foundation method for single and double-storey structures is a stiffened raft foundation on *in situ* soils at a depth of approximately 350mm below NGL (underside of down-stand beams of raft). This method is widely employed for low-cost housing and is ideal for sites where there are potentially problematic soils or significant variability in the ground conditions.

An estimated allowable safe bearing pressure of 75kPa can be assumed for design purposes on stiff/dense *in situ* soils. If the *in situ* soils at the founding level are not adequately stiff/dense, compaction should be attempted with a trench rammer and the final founding conditions should be assessed by a competent person. The expected settlement of single or double storey structures constructed in such a manner should not exceed 5mm. However, significant potential heave is anticipated and articulation joints above openings and doors are recommended as a precaution. An alternative method of dealing with expansive soil would be partial or complete removal of the potentially expansive horizon and casting of modified normal strip foundations (lightly reinforced). However, this method is often problematic from a supervision/quality control perspective and it is not recommended.

The *in situ* soils are typically fine-grained and cohesive and are not deemed to be suitable for use as filling material for platforms or under foundations/raft slabs, unless otherwise directed by the engineer. For this reason, it is recommended that all structures located on terraced sites should be founded on the *in situ* (i.e. *in cut*) and not span onto any fill.

Additional recommendations were provided:

- Clear and grub all organic material (approximately 100mm of surficial soil).
- No structures should be placed on uncontrolled fill (a competent contractor should be able to recognise uncontrolled fill and be aware of the problems associated with founding structures on uncontrolled fill). Uncontrolled fill should be cut to spoil or as directed by the engineer.
- Localised depressions in the topography requiring filling should be filled with suitable local or imported material and compacted to the same degree as the surrounding soil.
- Do not try to compact saturated soil. Rather remove and replace.
- The finished floor level of all houses should be a minimum of 150mm above final ground level to prevent flooding.

- Foundations should be inspected by the engineer's representative to assess founding conditions, such as soil types, consistency in density and moisture levels.
- The ponding of storm water around the exterior of houses can be avoided by constructing a 1m wide a concrete apron with a 10% fall away from the house.
- Road construction should be carried out according to SABS 1200 or COLTO 3000 specifications.
- Design and construction of stormwater drainage should be carried out according to SABS 1200LE or COLTO 2000 specifications.

8. IMPACT IDENTIFICATION DESCRIPTION AND ASSESSMENT

During the Scoping phase, possible impacts were identified through various site visits, consultation of published information and specialist knowledge of the site and surrounds. During the EIA phase, these and other impacts identified as a result of the specialist studies were assessed in greater detail. Section 8.1 describes the methodology that was used to rate the impacts identified.

8.1 IMPACT ASSESSMENT METHODOLOGY

The impact assessment methodology is guided by the requirements of the NEMA 2010 EIA Regulations. The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, and Magnitude) and relate this to the probability/ likelihood (P) of the impact occurring. This determines the environmental risk. In addition other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S).

During the EIA phase, the impacts were assessed according to the criteria outlined in the following paragraphs. Each impact was ranked according to extent, duration, magnitude and probability. From these criteria, a significance rating was obtained, of which the method and formula is described below in Section 8.1.1. Where possible, mitigatory measures were recommended for impacts identified.

8.1.1 Determination of Environmental Risk

The Significance (S) of an impact is determined by applying a Prioritisation Factor (PF) to an Environmental Risk (ER). The environmental risk is dependent on the Consequence (C) of the particular impact and the Probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology the Consequence of the impact is represented by:

$$C = \frac{(E + D + M + R) \times N}{4}$$

Each individual aspect in the determination of the Consequence is represented by a rating scale as defined in Table 11:

Table 11: Criteria for determination of impact consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site)
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).

Aspect	Score	Definition
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the Consequence has been determined, the Environmental Risk is determined in accordance with the standard risk assessment relationship by multiplying the Consequence and the Probability (refer to Figure 22). Probability is rated/scored as per Table 12

Table 12: Probability Scoring

Aspect	Score	Definition
Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

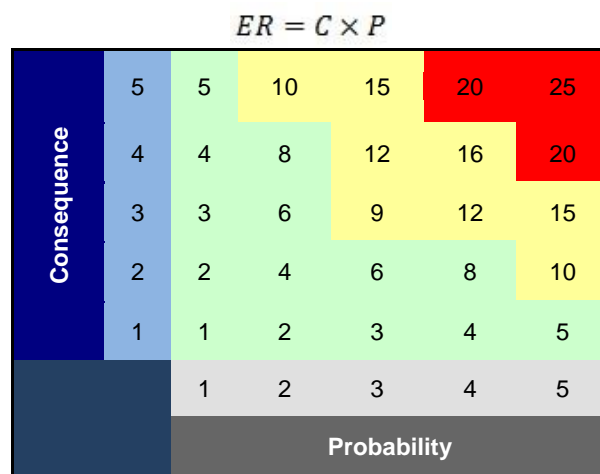


Figure 22: Determination of environmental risk.

The outcome of the environmental risk assessment results in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table 13.

Table 13: Significance classes

Value	Description
< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk),
≥9; <17	Medium (i.e. where the impact could have a significant environmental risk),
≥ 17	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/ mitigated.

8.1.2 Impact Prioritisation

In accordance with the requirements of Regulation 31 (2)(l) of the EIA Regulations (GN R. 543), it is necessary to assess each potentially significant impact in terms of:

- Cumulative impacts; and
- The degree to which the impact may cause irreplaceable loss of resources.

In addition it is important that the public opinion and sentiment regarding a prospective development and consequent potential impacts is considered in the decision making process.

In an effort to ensure that these factors are considered, an impact Prioritisation Factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings, but rather to focus the attention of the decision-making authority on the higher priority / significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/ mitigation impacts are implemented.

Table 14: Criteria for the determination of prioritisation

Aspect	Score	Description
Public Response (PR)	Low (1)	Issue not raised in public responses.
	Medium (2)	Issue has received a meaningful and justifiable public response.
	High (3)	Issue has received an intense meaningful and justifiable public response.
Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and

Aspect	Score	Description
		temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable Loss of Resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 14. The impact priority is therefore determined as follows:

$$Priority = PR + CI + LR$$

The result is a priority score which ranges from 3 to 9 and a consequent Prioritisation Factor ranging from 1 to 2 (refer to Table 15).

Table 15: Determination of prioritisation factor

Priority	Ranking	Prioritisation Factor
3	Low	1
4	Medium	1.17
5	Medium	1.33
6	Medium	1.50
7	Medium	1.67
8	Medium	1.83
9	High	2

In order to determine the final impact Significance the Prioritisation Factor is multiplied by the Environmental Risk of the post mitigation scoring.

$$S = ER \times PF$$

The ultimate aim of the Prioritisation Factor is to be able to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential, significant public response, and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

Table 16: Environmental Significance Rating

Value	Description
< 9	Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
≥9; <17	Medium (i.e. where the impact could influence the decision to develop in the area),
≥ 17	High (i.e. where the impact must have an influence on the decision process to develop in the area).

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

8.1.3 Specialist Investigations

It is important to note that in identifying, describing and assessing the impacts specialist sub-consultants were consulted and appointed to undertake individual specialist studies. These studies informed the findings of this EIAR and are appended as follows:

- Appendix C: Ecological and Wetland Impact Assessment
- Appendix D: Heritage Impact Assessment
- Appendix E: Geotechnical Investigations.

8.2 IMPACT IDENTIFICATION

Impacts that are likely to occur as a result of the proposed project have been listed in **Error! eference source not found. Error! Reference source not found.. Error! Reference source not found.** provides a summary of impacts identified for each phase of the proposed project.

Table 17: Impacts identified for the different phases of the development

Phase	Impact	
	Bio-Physical	Socio-Economic
Planning and Design		Job Creation
	Nuisance due to dust	Job Creation
Construction	Loss of vegetation	Noise

Phase	Impact	
	Bio-Physical	Socio-Economic
Operational	Spread of alien invasive plant species (Biodiversity Loss)	Visual Impacts
	Loss and degradation of different habitat types (Biodiversity Loss)	Traffic
	Loss of fauna (Biodiversity Loss)	Impacts on existing property/infrastructure
	Loss of invertebrates (Biodiversity Loss)	Destruction of colonial period structures
	Modification of flow dynamics and flow patterns (Hydrological Processes)	Impact on human graves
	Topsoil loss, soil erosion and sediment deposition (Hydrological Processes)	Discovery of sub-surface paleontological finds
	Effluent pollution and solid waste pollution (Biodiversity Loss/Hydrological Processes)	
	Disturbance of important ecological process areas (Biodiversity Loss)	
	Soil Pollution	
	Geotechnical stability	
	Fire Hazards	
	Increased Fire Risk	Visual impacts
	Increased waste generation	Impact on community structure
	Loss of Vegetation	
	Spread of alien invasive plant species (Biodiversity Loss)	
	Loss and degradation of different habitat types (Biodiversity Loss)	
	Modification of flow dynamics and flow patterns (Hydrological Processes)	
	Effluent pollution and solid waste pollution (Biodiversity Loss/Hydrological Processes)	
	Disturbance of important ecological process areas (Biodiversity Loss)	

8.2.1 Planning and Design Phase Impacts

8.2.1.1 Job Creation

During the Planning and Design Phase, employment opportunities will arise for the design and assessment of the proposed project. Input will be required from a variety of professionals, such as engineers, environmental consultants, and the regional and national authorities responsible for reviewing the applications made in terms of the relevant legislation.

Impact Name	Job creation				
Alternative	All Alternatives				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	1	1	Magnitude of Impact	2	2
Extent of Impact	4	4	Reversibility of Impact	1	1

Duration of Impact	1	1	Probability	5	5
Environmental Risk (Pre-mitigation)				10	
Mitigation Measures					
Environmental Risk (Post-mitigation)				10	
Degree of confidence in impact prediction:				High	
Impact Prioritisation					
Public Response				1	
No public responses have been received relating to this impact.					
Cumulative Impacts				1	
No cumulative impacts are associated with this impact.					
Degree of potential irreplaceable loss of resources				1	
This impact will not lead to irreplaceable loss of resources.					
Prioritisation Factor				1	
Final Significance				10	

8.2.2 Construction Phase Impacts

8.2.2.1 Job creation

During the construction phase, employment opportunities will arise as a result of the actual construction that will take place within Sunny South. The construction activities will also result in a demand for equipment, building material and labour. The use of local labour would have a positive impact on the local economy and promote skills transfer.

Impact Name	Job creation				
Alternative	All Alternatives				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	1	1	Magnitude of Impact	1	2
Extent of Impact	4	3	Reversibility of Impact	3	3
Duration of Impact	1	1	Probability	5	5
Environmental Risk (Pre-mitigation)				11.25	
Mitigation Measures					
<ul style="list-style-type: none"> It is recommended that the beneficiary areas benefit from the job creation as much as possible. 					
Environmental Risk (Post-mitigation)				11.25	
Degree of confidence in impact prediction:				High	
Impact Prioritisation					
Public Response				1	
No public responses have been received relating to this impact.					
Cumulative Impacts				2	
It is anticipated that job creation could lead to an improvement in the livelihoods of the local people resulting from the temporary income and the transfer of skills to the local people enabling them to provide for themselves as opportunities arise in future.					
Degree of potential irreplaceable loss of resources				1	

The potential for irreplaceable loss of resources is low.	
Prioritisation Factor	1.17
Final Significance	13.13

8.2.2.2 Nuisance due to dust

Construction activities on site will lead to land clearing and disturbance of the soil resulting in dust creation. The impact is expected to be of limited extent. It is anticipated that the impact will be of LOW negative significance. The implementation of the recommended mitigation measures will further reduce the anticipated significance of this impact during construction.

Impact Name	Nuisance due to dust				
Alternative	All Alternatives				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	1	Reversibility of Impact	1	1
Duration of Impact	1	1	Probability	3	2
Environmental Risk (Pre-mitigation)					-5.25
Mitigation Measures					
<ul style="list-style-type: none"> Ensure stockpiles are adequately protected from wind and that regular spraying of exposed soils occurs to minimise dust generation 					
Environmental Risk (Post-mitigation)					-2.5
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					1
No cumulative impacts are associated with this impact.					
Degree of potential irreplaceable loss of resources					1
This impact will not lead to irreplaceable loss of resources.					
Prioritisation Factor					1
Final Significance					-2.5

8.2.2.3 Loss of vegetation

The proposed housing development will require the removal of extensive areas of grassland vegetation during the construction phase as the development covers an extensive area. The vegetation type is known as Albany Coastal Belt or Berlin Savanna Thicket. Both are Least Threatened vegetation types, meaning extensive areas of this vegetation type still occur within the country or region, although part of the site falls within a Critical Biodiversity Area or an Ecological Corridor in terms of the Eastern Cape Biodiversity Conservation Plan. Much of the grassland habitat is however degraded and transformed, and therefore of low biodiversity value.

The Proposed Layout (see Figure 2) will remove approximately 76.9 ha of vegetation from the 92.8 ha development site i.e. 82.8 % vegetation loss will be incurred. The Alternative Layout (see Figure 23) will remove approximately 66.7 ha of vegetation i.e. 71.8 % vegetation loss will be incurred, which constitutes a difference of 10.2 ha or 10.9 %. In other words, both layout options will have a high impact on vegetation loss, removing a substantial amount of vegetation from the development site. Even if vegetation is not removed from the 32 m buffer areas (Figure 2d of Appendix C), as per the Alternative Layout, vegetation loss will be greater than 70 %. The loss of vegetation can therefore not be considered low for the alternative layout option; however, it is 10.9 % lower.

The removal of protected species is regulated through the Provincial Nature Conservation Ordinance (Bill), the National Forest Act and the National Environmental Management: Biodiversity Act. However, no protected species were recorded within the proposed development footprint.

Impact Name	<i>Loss of vegetation</i>				
Alternative	<i>Proposed Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	2	Reversibility of Impact	4	4
Duration of Impact	4	4	Probability	5	5
Environmental Risk (Pre-mitigation)					-16.25
Mitigation Measures					
<ul style="list-style-type: none"> • Removal of vegetation within the construction and development footprint only. • Rehabilitation of disturbed areas with indigenous plants. • Compilation and implementation of an Environmental Management Programme (EMP), with rehabilitation plan, that indicates method statements and specifications in this regard. An EMP is required by the NEMA Environmental Impact Assessment regulations. • Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. • During the operational phase, the Municipality should encourage homeowners to practice indigenous gardening, where appropriate i.e. where food crop gardens or livestock activities are not being practised by a landowner. 					
Environmental Risk (Post-mitigation)					-15
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider the existing extent of transformation and degradation within the study site and surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera) and the potential of the proposed development resulting in significant cumulative impacts in this region. Transformed areas are represented by rural housing (communal areas), industry (buildings), agriculture, urban areas, roads, and alien plant cover, while degraded areas are representative of land under grazing and impacted by past intensive agriculture. On consultation of available land use data (Eastern Cape Biodiversity conservation Plan), the present cumulative impacts are considered moderate-high as the percentage cover of transformed and degraded terrestrial areas is relatively extensive when compared to the percentage natural plant cover.</p> <p>Potential future cumulative impacts must also be considered which are based on potential future development scenarios. These development scenarios should be based on available municipal Spatial Development Frameworks (SDF) as the SDF guides development within the municipal domain. Municipal Spatial Development Frameworks are supposed to integrate biodiversity into the SDF planning process, as has been done for the Buffalo City Metropolitan Municipality SDF (2009). Consequently, if future spatial planning takes into consideration the municipal Spatial Development Framework, as well as the Eastern Cape Biodiversity Conservation Plan Critical Biodiversity Areas Map</p>					

(which requires further fine-scale mapping, which has been done via this study), Strategic Environmental Assessments, State of Environment Reports and Environmental Management Frameworks (e.g. the Coastal EMF from Cannon Rocks to Kei Mouth) etc., long term cumulative impacts of potential future developments should not cause significant environmental damage with regards to biodiversity loss.	
Degree of potential irreplaceable loss of resources	1
The potential for irreplaceable loss of resources is low. The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.	
Prioritisation Factor	1.17
Final Significance	-17.50

Impact Name	Loss of vegetation				
Alternative	Watercourse Alternative				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	1	Reversibility of Impact	3	3
Duration of Impact	4	4	Probability	5	5
Environmental Risk (Pre-mitigation)					-15
Mitigation Measures					
<ul style="list-style-type: none"> Removal of vegetation within the construction and development footprint only. Rehabilitation of disturbed areas with indigenous plants Compilation and implementation of an Environmental Management Programme (EMP), with rehabilitation plan, that indicates method statements and specifications in this regard. An EMP is required by the NEMA Environmental Impact Assessment regulations. Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. During the operational phase, the Municipality should encourage homeowners to practice indigenous gardening, where appropriate i.e. where food crop gardens or livestock activities are not being practised by a landowner. 					
Environmental Risk (Post-mitigation)					-12.5
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider the existing extent of transformation and degradation within the study site and surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera) and the potential of the proposed development resulting in significant cumulative impacts in this region. Transformed areas are represented by rural housing (communal areas), industry (buildings), agriculture, urban areas, roads, and alien plant cover, while degraded areas are representative of land under grazing and impacted by past intensive agriculture. On consultation of available land use data (Eastern Cape Biodiversity conservation Plan), the present cumulative impacts are considered moderate-high as the percentage cover of transformed and degraded terrestrial areas is relatively extensive when compared to the percentage natural plant cover.</p> <p>Potential future cumulative impacts must also be considered which are based on potential future development scenarios. These development scenarios should be based on available municipal Spatial Development Frameworks (SDF) as the SDF guides development within the municipal domain. Municipal Spatial Development Frameworks are supposed to integrate biodiversity into the SDF planning process, as has been done for the Buffalo City Metropolitan Municipality SDF (2009). Consequently, if future spatial planning takes into consideration the municipal Spatial Development Framework, as well as the Eastern Cape Biodiversity Conservation Plan Critical Biodiversity Areas Map (which requires further fine-scale mapping, which has been done via this study), Strategic Environmental Assessments, State of Environment Reports and Environmental Management Frameworks (e.g. the Coastal EMF from Cannon Rocks to Kei Mouth) etc., long term cumulative impacts of potential future developments should not cause significant environmental damage with regards to biodiversity loss.</p>					

Degree of potential irreplaceable loss of resources	1
The potential for irreplaceable loss of resources is low. The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.	
Prioritisation Factor	1.17
Final Significance	-14.58

8.2.2.4 Spread of alien invasive plant species (Biodiversity Loss)

During the construction of the proposed housing development, disturbed areas and exposed soils will be created. This will potentially promote the encroachment of alien invasive plants (during both the construction and operational phases) that already occur within the study site. The majority of the proposed development site is degraded grassland, interspersed with some herbaceous alien species. Dense alien plant cover occurs in the south-western portion of the development site, around drainage area 3. The majority of these are woody alien species, namely *Acacia mearnsii*, *Cestrum laevigatum*, *Lantana camara* and *Solanum mauritianum*.

Implementing the proposed layout or alternative layout will not make a considerable difference in this impact. If any difference, the proposed layout will probably provide less available land for alien invasive species to establish and encroach from (because 10.9 % more land will be developed), while the alternative layout will provide a good opportunity for alien species to encroach wetter drainage areas.

This impact is considered LOW post-mitigation for both layouts during the construction and operational phases. This is because it is a management protocol that can be implemented for both layout options.

The control of alien invasive species is regulated through the Conservation of Agricultural and Resources Act and the National Environmental Management: Biodiversity Act.

Impact Name	Spread of alien invasive plant species (biodiversity loss)				
Alternative	All Alternatives				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	1
Extent of Impact	3	1	Reversibility of Impact	3	3
Duration of Impact	4	2	Probability	5	3
Environmental Risk (Pre-mitigation)					-16.25
Mitigation Measures					
<ul style="list-style-type: none"> • Compilation and implementation of an Environmental Management Programme (EMP), with rehabilitation plan, that provides specifications with regards to alien clearing and management. (NOTE: Any municipal owned land must have an alien management control plan in place in terms of the NEMBA). An EMP is required by the NEMA Environmental Impact Assessment regulations. • Rehabilitation will be required within the construction footprint. • Alien plants growing within the construction area must be removed during the construction period by the Contractor, and alien clearing must be implemented by the municipality during the operational phase. • Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. 					
Environmental Risk (Post-mitigation)					-5.25

Degree of confidence in impact prediction:	High
Impact Prioritisation	
Public Response	1
No public responses have been received relating to this impact.	
Cumulative Impacts	2
<p>The potential cumulative impacts consider the existing extent of alien invasive plants within the study site and the surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera), and the potential of the proposed development resulting in significant cumulative impacts in these catchments. Within the proposed development site, alien plant cover is relatively low compared with the natural plant cover. Percentage alien plant cover in the catchment areas is unknown and therefore a rating for this cannot be provided. It is highly likely, however, that <i>Acacia mearnsii</i> and <i>Cestrum laevigatum</i> are among the key alien invasive species along streams and rivers in the catchment, as is the case for many rivers in the region e.g. Buffalo River and East London. Refer to Impact 6 and 7 with regards to alien vegetation and how this may potentially impact on hydrology (i.e. erosion of stream banks, sedimentation of streams etc.).</p> <p>Potential future cumulative impacts due to potential future developments in the catchments, such as housing and agriculture, could increase this impact due to an increase in exposed soil, if alien management procedures are not implemented. However, it is considered unlikely that future rural agricultural activities will expand based on the fact that cultivation in the area has ceased, while rural housing demands may escalate considering that there are several rural communities in the catchments. If alien management plans are implemented this impact is considered manageable and reversible, but without such management plans alien invasion can become a serious problem. The Buffalo City Metropolitan Municipality Spatial Development Framework (2003) highlighted alien invasion in areas of endemism as an area of concern.</p>	
Degree of potential irreplaceable loss of resources	1
If alien management plans are implemented this impact is considered manageable and reversible, but without such management plans alien invasion can become a serious problem.	
Prioritisation Factor	1.17
Final Significance	-6.13

8.2.2.5 Loss and degradation of different habitat types (Biodiversity Loss)

The proposed housing development will require the removal of large expanses of vegetation within the proposed development site during the construction phase. Consequently, terrestrial habitat known as Albany Coastal Belt or Berlin Savanna Thicket will be significantly reduced on site, and will further result in the loss of biodiversity in the region. These habitats however have been reduced to a degraded grassland habitat and are of low biodiversity value in the current condition, but should improve over time if left undeveloped. Wetland habitats and drainage areas occur on the site, and if planning and design does not avoid these habitats, further habitat loss and therefore biodiversity loss, will take place on site. The current layout proposal does not adequately avoid the natural wetlands and drainage areas on site. The proposed development site is proximate to the Tutura River, a non-perennial river. An adequate buffer area should be delineated from the housing development otherwise indirect impacts, such as erosion, sedimentation and pollution (storm water run-off, sewage etc.), could potentially result in degradation of this riverine habitat, as well as dams along the drainage areas, which will indirectly impact the riverine habitat. Although sewage related pollution impacts should be lower during the construction phase (i.e. less ablution facilities), the other impacts, coupled with possible sewage pollution impacts, may potentially be felt outside of the development footprint (Extent = Local = 3). Note that pollution and degradation impacts are related to Impact 8.2.2.10 (Refer Impact 8.2.2.10).

The Proposed Layout will destroy the natural wetlands and drainage areas (with dams), although not all these dams will be destroyed. Conversely, the Alternative Layout will not; and therefore diversity of habitat loss will be negated. Further, the implementation of the 32 m buffer zone will reduce the potential impacts of pollution as the vegetation buffer will assist with ameliorating such impacts. However, it is important to be aware that other mitigation measures are important for adequately controlling potential pollution impacts e.g. maintenance of sewage/ablutions. Albany Coastal Belt or Berlin Savanna Thicket loss will be very similar for both layout options and therefore the habitat impact in this regard is roughly equivalent i.e. insignificant difference.

Disturbance of wetlands is regulated through the National Water Act, in that a water use license application must be processed through the Department of Water Affairs to disturb any wetland within 500m of a proposed development/disturbance. Rivers are also regulated if development occurs within the river. National and provincial policy does however require appropriate buffer zones to be delineated to protect rivers, such as the Eastern Cape Biodiversity Conservation Plan, which guides environmental authorities. The removal of protected species is regulated through the Provincial Nature Conservation Ordinance (Bill), the National Forest Act and the National Environmental Management: Biodiversity Act. No protected species were recorded within the proposed development site.

Habitat loss is considered HIGH and MEDIUM negative, with a slight lowering of the Environmental Risk scores from the pre-mitigation phase, for both layout options respectively. This is because, although extensive areas of vegetation habitat will be removed from the development site, the degree of impact will be somewhat lowered by confining impacts to the construction and development footprints, which reduces the magnitude of the impacts. For the Alternative Layout, the buffer recommendations should lower habitat loss even further (extent), permitting a lower score compared with the Proposed Layout score. Implementing a storm water and erosion management plan (design phase), including operational pollution management, should negate the degradation of habitats relating to this specific impact for both layout options, although degradation of habitats already destroyed (e.g. the natural wetlands and some of the dams) by the Proposed Layout will not apply. Potential degradation of the Tutura River will however apply. Because the Proposed Layout positions some erfs within the 50 m buffer from the riparian zone, this layout option will have a slightly higher impact. The Alternative Layout (avoiding aquatic features/watercourses), should serve to reduce pollution impacts further due to biodegradation by vegetation and movement through the sediment therefore allowing for the lower Environmental Risk score.

Impact Name	<i>Loss and degradation of different habitat types (biodiversity loss)</i>				
Alternative	<i>Proposed Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	2	Reversibility of Impact	4	4
Duration of Impact	4	4	Probability	5	
Environmental Risk (Pre-mitigation)					-16.25
Mitigation Measures					

<ul style="list-style-type: none"> Removal of vegetation habitat within the construction and development footprint only Rehabilitation of construction footprints or disturbed areas. Compilation and implementation of an Environmental Management Programme (EMP) that indicates method statements and specifications with regards to the above. An EMP is required by the NEMA Environmental Impact Assessment regulations. Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. Waste Management Conditions to designate an area for the construction camp (which includes ablution facilities, storage of hazardous wastes, maintenance stations etc.) at least 100 m away from the Tutura River, streams, drainage areas, dams and wetlands. Waste Management Conditions to identify procedures for solid waste disposal (e.g. bins, no littering or burning policy) and the maintenance of ablution facilities, including the disposal of liquid and hazardous waste at a licensed waste disposal site. Waste Management Conditions (Specifications) to ensure that no re-fuelling of construction vehicles or maintenance activities occur within 100 m of the Tutura River, streams, drainage areas, dams and wetlands. Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. 	
Environmental Risk (Post-mitigation)	-15
Degree of confidence in impact prediction:	High
Impact Prioritisation	
Public Response	1
No public responses have been received relating to this impact.	
Cumulative Impacts	2
<p>The potential cumulative impacts consider the existing extent of transformation and degradation within the study site and surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera) and the potential of the proposed development resulting in significant cumulative impacts in this region. Transformed areas are represented by rural housing (communal areas), industry (buildings), agriculture, urban areas, roads, and alien plant cover, while degraded areas are representative of land under grazing and impacted by past intensive agriculture. On consultation of available land use data (Eastern Cape Biodiversity conservation Plan), the present cumulative impacts are considered moderate-high as the percentage cover of transformed and degraded terrestrial areas is relatively extensive when compared to the percentage natural plant cover.</p> <p>Potential future cumulative impacts must also be considered which are based on potential future development scenarios. These development scenarios should be based on available municipal Spatial Development Frameworks (SDF) as the SDF guides development within the municipal domain. Municipal Spatial Development Frameworks are supposed to integrate biodiversity into the SDF planning process, as has been done for the Buffalo City Metropolitan Municipality SDF (2009). Consequently, if future spatial planning takes into consideration the municipal Spatial Development Framework, as well as the Eastern Cape Biodiversity Conservation Plan Critical Biodiversity Areas Map (which requires further fine-scale mapping, which has been done via this study), Strategic Environmental Assessments, State of Environment Reports and Environmental Management Frameworks (e.g. the Coastal EMF from Cannon Rocks to Kei Mouth) etc., long term cumulative impacts of potential future developments should not cause significant environmental damage with regards to biodiversity loss.</p>	
Degree of potential irreplaceable loss of resources	1
<p>The potential for irreplaceable loss of resources is low.</p> <p>The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.</p>	
Prioritisation Factor	1.17
Final Significance	-17

Impact Name	<i>Loss and degradation of different habitat types (biodiversity loss)</i>				
Alternative	<i>Watercourse Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	1	Reversibility of Impact	4	4
Duration of Impact	4	4	Probability	5	5

Environmental Risk (Pre-mitigation)	-16.25
Mitigation Measures	
<ul style="list-style-type: none"> • Removal of vegetation habitat within the construction and development footprint only. • Rehabilitation of construction footprints or disturbed areas. • Compilation and implementation of an Environmental Management Programme (EMP) that indicates method statements and specifications with regards to the above. An EMP is required by the NEMA Environmental Impact Assessment regulations. • Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. • Waste Management Conditions to designate an area for the construction camp (which includes ablution facilities, storage of hazardous wastes, maintenance stations etc.) at least 100 m away from the Tutura River, streams, drainage areas, dams and wetlands. • Waste Management Conditions to identify procedures for solid waste disposal (e.g. bins, no littering or burning policy) and the maintenance of ablution facilities, including the disposal of liquid and hazardous waste at a licensed waste disposal site. • Waste Management Conditions (Specifications) to ensure that no re-fuelling of construction vehicles or maintenance activities occur within 100 m of the Tutura River, streams, drainage areas, dams and wetlands. • Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. 	
Environmental Risk (Post-mitigation)	-13.75
Degree of confidence in impact prediction:	High
Impact Prioritisation	
Public Response	1
No public responses have been received relating to this impact.	
Cumulative Impacts	2
<p>The potential cumulative impacts consider the existing extent of transformation and degradation within the study site and surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera - Figure 3) and the potential of the proposed development resulting in significant cumulative impacts in this region. Transformed areas are represented by rural housing (communal areas), industry (buildings), agriculture, urban areas, roads, and alien plant cover, while degraded areas are representative of land under grazing and impacted by past intensive agriculture. On consultation of available land use data (Eastern Cape Biodiversity conservation Plan, Figure 3), the present cumulative impacts are considered moderate-high as the percentage cover of transformed and degraded terrestrial areas is relatively extensive when compared to the percentage natural plant cover.</p> <p>Potential future cumulative impacts must also be considered which are based on potential future development scenarios. These development scenarios should be based on available municipal Spatial Development Frameworks (SDF) as the SDF guides development within the municipal domain. Municipal Spatial Development Frameworks are supposed to integrate biodiversity into the SDF planning process, as has been done for the Buffalo City Metropolitan Municipality SDF (2009) (Figure 8 below). Consequently, if future spatial planning takes into consideration the municipal Spatial Development Framework, as well as the Eastern Cape Biodiversity Conservation Plan Critical Biodiversity Areas Map (which requires further fine-scale mapping, which has been done via this study), Strategic Environmental Assessments, State of Environment Reports and Environmental Management Frameworks (e.g. the Coastal EMF from Cannon Rocks to Kei Mouth) etc., long term cumulative impacts of potential future developments should not cause significant environmental damage with regards to biodiversity loss.</p>	
Degree of potential irreplaceable loss of resources	1
<p>The potential for irreplaceable loss of resources is low.</p> <p>The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.</p>	
Prioritisation Factor	1.17
Final Significance	-16.04

8.2.2.6 Loss of fauna (Biodiversity Loss)

As noted above, habitat within the proposed development footprint will be significantly reduced and fragmentation will also occur where drainage areas are not avoided, due to the construction and operation of the proposed housing development. Loss of habitat has the potential to cause the “loss” of fauna, in particular larger mammals, through displacement. Loss of wetlands and dams will reduce

birds frequenting these habitats. However, fauna are able to move to other parts of the catchment. It is likely that the proposed development site is not home to high densities of larger mammals, but rather provides habitat which these species are able to frequent rather than remain in permanently. It should also be acknowledged that the proposed development site is not vacant, and that rural homesteads, agriculture (livestock grazing) and industry do presently occur on the site, which reduces the frequency of faunal movements within the proposed development footprint.

The Proposed Layout will not provide small scale corridors along the watercourses (non-perennial lines), which will be utilized by fauna. Loss of fauna will therefore be slightly higher than the Alternative Layout, which avoids the watercourse and provides habitat for use by fauna, however the impact remains within the boundaries of the proposed development. The Alternative Layout has a lower final significance score due to the Extent and Magnitude scores being lowered by avoiding the watercourses, which provides a habitat for fauna.

Disturbance of wetlands is regulated through the National Water Act, in that a water use license application must be processed through the Department of Water Affairs to disturb any wetland within 500m of a proposed development/disturbance. Further, the removal of protected species is regulated through the Provincial Nature Conservation Ordinance (Bill), and the National Environmental Management: Biodiversity Act. Although a number of protected species will potentially frequent the study site, the proposed development will not remove or impact significantly on these species as surrounding areas provide available habitat.

Impact Name	<i>Loss of fauna (biodiversity loss)</i>				
Alternative	<i>Proposed Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	3
Extent of Impact	2	2	Reversibility of Impact	4	4
Duration of Impact	4	4	Probability	5	5
Environmental Risk (Pre-mitigation)					-16.25
Mitigation Measures					
<ul style="list-style-type: none"> As per Impact 8.2.2.3 to 8.2.2.5. During the Construction Phase, no poaching or killing of wild animals must be permitted by labour. This should be included as a specification in the Construction Environmental Management Plan. 					
Environmental Risk (Post-mitigation)					-16.25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
As per Impact 8.2.2.3, the current cumulative impacts are moderate-high because the proposed development site is highly degraded and impacted, resulting in reduced faunal diversity on site. Loss and degradation of vegetation and habitat will reduce faunal biodiversity as available habitat is diminished.					
Degree of potential irreplaceable loss of resources					1
The potential for irreplaceable loss of resources is low. The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.					

Prioritisation Factor	1.17
Final Significance	-18.96

Impact Name	<i>Loss of fauna (biodiversity loss)</i>				
Alternative	<i>Watercourse Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	1	Reversibility of Impact	4	3
Duration of Impact	4	4	Probability	5	5
Environmental Risk (Pre-mitigation)					-16.25
Mitigation Measures					
<ul style="list-style-type: none"> As per Impact 8.2.2.3 to 8.2.2.5. During the Construction Phase, no poaching or killing of wild animals must be permitted by labour. This should be included as a specification in the Construction Environmental Management Plan. 					
Environmental Risk (Post-mitigation)					-12.5
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
As per Impact 8.2.2.3, the current cumulative impacts are moderate-high because the proposed development site is highly degraded and impacted, resulting in reduced faunal diversity on site. Loss and degradation of vegetation and habitat will reduce faunal biodiversity as available habitat is diminished.					
Degree of potential irreplaceable loss of resources					1
The potential for irreplaceable loss of resources is low. The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.					
Prioritisation Factor					1.17
Final Significance					-14.58

8.2.2.7 Loss of invertebrates (Biodiversity Loss)

Invertebrates that will inhabit aquatic features, such as rivers and wetlands (as well as dams) range from springtails to damselflies, dragonflies and butterflies. Two important butterfly species may potentially inhabit the aquatic areas, although these are not red data species. If the wetlands and dams are developed during the construction phase, these species will be lost to the site. Invertebrates are however able to move to the surrounding environment. Other invertebrates may include benthic organisms, which will be removed from the sediment during construction; as well as snails, beetles, bugs etc. All, apart from the benthic invertebrates, will be able to move away from construction areas. A benthic study was not conducted, nor a study on aquatic invertebrates within the wetlands.

During the construction phase, the Proposed Layout will remove additional sediment in the buffer areas and will destroy aquatic features and associated invertebrates, whereas the Layout Alternative

will not. This impact is considered negligible (improbable) for the operational phase of both layouts, and is therefore not assessed.

Disturbance of wetlands is regulated through the National Water Act, in that a water use license application must be processed through the Department of Water Affairs to disturb any wetland within 500m of a proposed development/disturbance. Further, the removal of protected species is regulated through the Provincial Nature Conservation Ordinance (Bill), and the National Environmental Management: Biodiversity Act. No protected invertebrate species were recorded within the development footprint, and the Maputoland-Pondoland-Albany Hotspot study (SANParks metadata, 2010) does not map any insect species within close proximity to the site.

Impact Name	<i>Loss of invertebrates (biodiversity loss)</i>				
Alternative	<i>Proposed Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	2	Reversibility of Impact	4	4
Duration of Impact	4	4	Probability	5	5
Environmental Risk (Pre-mitigation)					-16.25
Mitigation Measures					
As per Impact 8.2.2.3 to 8.2.2.5					
Environmental Risk (Post-mitigation)					-15
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
As per Impact 8.2.2.3, the current cumulative impacts are moderate-high because the proposed development site is highly degraded and impacted, resulting in reduced invertebrate diversity on site. Loss and degradation of vegetation and habitat will reduce invertebrate biodiversity as available habitat is diminished.					
Degree of potential irreplaceable loss of resources					1
The potential for irreplaceable loss of resources is low. The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.					
Prioritisation Factor					1.17
Final Significance					-17.5

Impact Name	<i>Loss of invertebrates (biodiversity loss)</i>				
Alternative	<i>Watercourse Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	2	1	Reversibility of Impact	4	3
Duration of Impact	4	4	Probability	5	5
Environmental Risk (Pre-mitigation)					-15

Mitigation Measures	
As per Impact 8.2.2.3 to 8.2.2.5	
Environmental Risk (Post-mitigation)	-11.25
Degree of confidence in impact prediction:	High
Impact Prioritisation	
Public Response	1
No public responses have been received relating to this impact.	
Cumulative Impacts	2
As per Impact 8.2.2.3, the current cumulative impacts are moderate-high because the proposed development site is highly degraded and impacted, resulting in reduced invertebrate diversity on site. Loss and degradation of vegetation and habitat will reduce invertebrate biodiversity as available habitat is diminished.	
Degree of potential irreplaceable loss of resources	1
The potential for irreplaceable loss of resources is low. The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.	
Prioritisation Factor	1.17
Final Significance	-13.13

8.2.2.8 Modification of flow dynamics and flow patterns (Hydrological Processes)

With the construction and operation of the proposed housing development, the flow dynamics and flow patterns (hydrological processes) of the catchment will be modified e.g. increased flow due to exposed areas (construction footprint) and hardened surfaces (e.g. roads, housing) and changes in run-off patterns etc., which will affect natural drainage patterns and hydraulics. In other words, surface flow will be directed along the roads and infrastructural lines. Surface flow (amount and velocity) within the catchment area is likely to increase, which may increase surface water flow into the Tutura River and non-perennial streams / drainage areas, as well as the natural wetlands and existing dams. If natural drainage patterns are not considered, this impact has the potential to cause indirect negative impacts such as soil erosion, and sedimentation and turbidity increases in aquatic resources.

The Proposed Layout does not consider the natural drainage areas, whereas the Layout Alternative does, for both construction and operational impacts, largely due to the extensive nature of the proposed developed. This impact is considered MEDIUM post mitigation for the Proposed Layout (Score = -12.25) and MEDIUM for the Alternative Layout (Score = -9.63) (Refer Table below). The impact is medium as it is an extensive development that will alter hydrological processes outside of the development boundary due to increased storm water flows from hard surfaces etc., whereas the Alternative Layout, although still MEDIUM, should prevent significant impacts beyond the boundary. Adequate storm water management measures can be put in place in order to reduce the significance ratings of this potential impact for both layout options, but due to the Alternative Layout considering natural drainage areas the magnitude of this impact should be lowered.

Disturbance of wetlands is regulated through the National Water Act, in that a water use license application must be processed through the Department of Water Affairs to disturb any wetland within 500m of a proposed development/disturbance.

Impact Name	<i>Modification of flow dynamics and flow patterns (hydrological processes)</i>				
Alternative	<i>Proposed Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	4	3
Extent of Impact	3	3	Reversibility of Impact	4	4
Duration of Impact	4	4	Probability	5	3
Environmental Risk (Pre-mitigation)					-18.75
Mitigation Measures					
<ul style="list-style-type: none"> The new roads and road crossings, depicted in Figure 8 of Appendix C, must be appropriately designed and the most suitable type of crossing must be determined (e.g. low flow crossing or culvert, dimensions, erosion prevention measures etc.) to ensure that natural flow is not disturbed during periods of seasonal surface flow (given these are indicated as non-perennial streams in the South African Topographical data) and potential flood events, as well as seepage, including preventing potential erosion, sedimentation and turbidity impacts. The 1:100 year flood line (which takes into consideration predicted future climate change impacts) must be determined to inform the type and design of crossings. Compilation and implementation of a storm-water management and rehabilitation plan with specifications to reduce soil erosion (e.g. rehabilitation specifications, slope stabilisation, swales, gabions etc.), as part of an Environmental Management Programme (EMP). An EMP is required by the NEMA Environmental Impact Assessment regulations. The detailed storm-water management plan must include the delineation of the 1:100 year flood line for the natural drainage areas (non-perennial streams) and the Tutura River, to be undertaken by a Hydraulic Engineer. If possible, the storm-water management plan should include measures to reduce effluent discharge into aquatic resources e.g. storm-water traps. An appropriate storm-water management scheduling programme should be indicated to ensure that the storm-water infrastructure is properly maintained in the long term (operational phase to be undertaken by the Municipality). Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. 					
Environmental Risk (Post-mitigation)					-10.5
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider the existing impacts in the immediate catchment (past cultivation, livestock grazing, rural homesteads, roads etc.) that currently modify flow dynamics and flow patterns. Signs of erosion were evident above dam 12, while cultivation furrows and uneven ground increase soil saturation levels in the landscape. The most significant land use activity with regards to this impact is the establishment of numerous dams, established as far back as 1939 and possibly earlier than 1939. These dams hold surface water thereby reducing seepage into the Tutura River and other low lying streams. Cumulative impacts are considered moderate because no signs of gully erosion were present, but the occurrence of numerous dams impacts hydrology. The establishment of a high intensive housing development is considered to potentially have a high impact on surface and groundwater hydrological processes due to a significant increase in hard surfaces.</p> <p>As per impact 8.2.2.3, the potential cumulative impacts within the surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera) demonstrates moderate-high land use impacts which will potentially have a Medium-high impact on hydrological processes i.e. loss of vegetation in the catchment areas and along rivers and streams, will increase the potential for soil erosion and, in turn, sedimentation and increased turbidity in rivers and streams due to modified flow dynamics and flow patterns (i.e. increased surface water volume and flow velocities). An increase in alien plant cover along rivers is also another impact that can exacerbate this impact due to destabilisation of stream banks. According to unpublished data from a current Water Research Commission project, the overall Present Ecological State of the Gxulu River (upper reach), into which the Tutura River flows, is Class B (Largely Natural), while a lower reach of the Gxulu River is Class C (Moderately Modified). The Ncera River is Largely Natural, and the Mlele and Mcantsi rivers, are Moderately Modified. The current cumulative impacts can therefore be considered to have a Low to Medium cumulative impact.</p>					

Potential future cumulative impacts should remain Low to Medium, if the municipal Spatial Development Framework is complied with i.e. future development in these catchments reflects predominantly a rural environment.	
Degree of potential irreplaceable loss of resources	1
The potential for irreplaceable loss of resources is low. The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.	
Prioritisation Factor	1.17
Final Significance	-12.25

Impact Name	Modification of flow dynamics and flow patterns (hydrological processes)				
Alternative	Watercourse Alternative				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	2	Reversibility of Impact	3	3
Duration of Impact	4	4	Probability	5	3
Environmental Risk (Pre-mitigation)					-15
Mitigation Measures					
<ul style="list-style-type: none"> The new roads and road crossings, depicted in Figure 8 of Appendix C, must be appropriately designed and the most suitable type of crossing must be determined (e.g. low flow crossing or culvert, dimensions, erosion prevention measures etc.) to ensure that natural flow is not disturbed during periods of seasonal surface flow (given these are indicated as non-perennial streams in the South African Topographical data) and potential flood events, as well as seepage, including preventing potential erosion, sedimentation and turbidity impacts. The 1:100 year flood line (which takes into consideration predicted future climate change impacts) must be determined to inform the type and design of crossings. Compilation and implementation of a storm-water management and rehabilitation plan with specifications to reduce soil erosion (e.g. rehabilitation specifications, slope stabilisation, swales, gabions etc.), as part of an Environmental Management Programme (EMP). An EMP is required by the NEMA Environmental Impact Assessment regulations. The detailed storm-water management plan must include the delineation of the 1:100 year flood line for the natural drainage areas (non-perennial streams) and the Tutura River, to be undertaken by a Hydraulic Engineer. If possible, the storm-water management plan should include measures to reduce effluent discharge into aquatic resources e.g. storm-water traps. An appropriate storm-water management scheduling programme should be indicated to ensure that the storm-water infrastructure is properly maintained in the long term (operational phase to be undertaken by the Municipality). Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. 					
Environmental Risk (Post-mitigation)					-8.25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider the existing impacts in the immediate catchment (past cultivation, livestock grazing, rural homesteads, roads etc.) that currently modify flow dynamics and flow patterns. Signs of erosion were evident above dam 12, while cultivation furrows and uneven ground increase soil saturation levels in the landscape. The most significant land use activity with regards to this impact is the establishment of numerous dams, established as far back as 1939 and possibly earlier than 1939. These dams hold surface water thereby reducing seepage into the Tutura River and other low lying streams. Cumulative impacts are considered moderate because no signs of gully erosion were present, but the occurrence of numerous dams impacts hydrology. The establishment of a high intensive housing development is considered to potentially have a high impact on surface and groundwater hydrological processes due to a significant increase in hard surfaces.</p> <p>As per impact 8.2.2.3, the potential cumulative impacts within the surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera) demonstrates moderate-high land use impacts which will potentially have a Medium-high impact on hydrological processes i.e. loss of vegetation in the catchment areas and along rivers and streams, will increase the potential for soil erosion and, in turn, sedimentation and increased turbidity in rivers and streams due to</p>					

<p>modified flow dynamics and flow patterns (i.e. increased surface water volume and flow velocities). An increase in alien plant cover along rivers is also another impact that can exacerbate this impact due to destabilisation of stream banks. According to unpublished data from a current Water Research Commission project, the overall Present Ecological State of the Gxulu River (upper reach), into which the Tutura River flows, is Class B (Largely Natural), while a lower reach of the Gxulu River is Class C (Moderately Modified). The Ncera River is Largely Natural, and the Mlele and Mcantsi rivers, are Moderately Modified. The current cumulative impacts can therefore be considered to have a Low to Medium cumulative impact.</p> <p>Potential future cumulative impacts should remain Low to Medium, if the municipal Spatial Development Framework is complied with i.e. future development in these catchments reflects predominantly a rural environment.</p>	
Degree of potential irreplaceable loss of resources	1
<p>The potential for irreplaceable loss of resources is low. The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.</p>	
Prioritisation Factor	1.17
Final Significance	-9.63

8.2.2.9 Topsoil loss, soil erosion and sediment deposition (Hydrological Processes)

Although linked to the impact above, this impact considers the ecological risk associated with the activity of removing topsoil. Not only does the topsoil itself place a risk for sedimentation and increased turbidity on aquatic resources and associated impacts on biota using these habitats, but areas where topsoil have been removed may become more susceptible to further erosion. During the construction phase of the proposed housing development, topsoil will be removed, and surface or storm-water run-off may result in an increase in soil erosion within the development site; and sedimentation and increased turbidity (hydrological processes) of wetlands, dams and streams. Note that the loss of topsoil is considered significant as topsoil requires a long period of time to develop naturally.

This impact is considered LOW for the Alternative layout because adequate management measures can be put in place to reduce this potential impact to an acceptable level. The Alternative Layout has a slightly lower score because it includes the buffer areas, compared with the Proposed Layout which is considered HIGH (Refer to Table below).

Disturbance of wetlands is regulated through the National Water Act, in that a water use license application must be processed through the Department of Water Affairs to disturb any wetland within 500m of a proposed development/disturbance.

Impact Name	<i>Topsoil loss, soil erosion and sediment deposition (hydrological processes)</i>				
Alternative	<i>Proposed Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	4	3
Extent of Impact	3	3	Reversibility of Impact	4	4
Duration of Impact	4	4	Probability	5	5
Environmental Risk (Pre-mitigation)					-18.75
Mitigation Measures					

As per Impacts 8.2.2.3 to 8.2.2.8. As part of the Environmental Management Programme, specifications with regards to topsoil removal and stockpiling must be indicated in order to reduce this impact and to ensure that topsoil is re-used in the rehabilitation process (i.e. loss of topsoil is not permanent).	
Environmental Risk (Post-mitigation)	-17.5
Degree of confidence in impact prediction:	High
Impact Prioritisation	
Public Response	1
No public responses have been received relating to this impact.	
Cumulative Impacts	2
<p>The potential cumulative impacts consider the existing impacts in the catchment (past cultivation, livestock grazing, rural homesteads, roads etc.). It is possible that these impacts have exacerbated soil erosion and sedimentation. Signs of erosion were evident above dam 12, while cultivation furrows and uneven ground increase soil saturation levels in the landscape. However, no signs of significant erosion or sedimentation were recorded on site, and therefore current impacts are considered to be Low. A high density housing development may exacerbate these impacts though. Potential cumulative impacts within the proposed development site, with the addition of a new housing development, are considered to be Medium (pre-mitigation), but should be Low (post mitigation).</p> <p>As per impact 8.2.2.3, the potential cumulative impacts within the surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera) demonstrates moderate-high land use activities which may potentially have a Medium impact on topsoil loss, soil erosion and sedimentation in the catchments. Data on these variables is unavailable and a cumulative impact assessment for these quaternary catchments cannot be accurately determined. Although, according to unpublished data from a current Water Research Commission project, the overall Present Ecological State of the Gxulu River (upper reach), into which the Tutura River flows, is Class B (Largely Natural), while a lower reach of the Gxulu River is Class C (Moderately Modified). The Ncera River is Largely Natural, and the Mlele and Mcantsi rivers are Moderately Modified. Final data on flow and water quality is not available at this stage, and therefore, based on overall Present Ecological State, present cumulative impacts are potentially Low to Medium.</p> <p>Potential future cumulative impacts, based on future SDF development scenarios coupled with the proposed development, may result in High impact ratings if appropriate management / mitigation measures are not implemented i.e. pre-mitigation. However, if these are implemented the cumulative impact should remain Low to Medium (post mitigation).</p>	
Degree of potential irreplaceable loss of resources	1
The potential for irreplaceable loss of resources is low. The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.	
Prioritisation Factor	1.17
Final Significance	-20.42

Impact Name	<i>Topsoil loss, soil erosion and sediment deposition (hydrological processes)</i>				
Alternative	<i>Watercourse Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	2	Reversibility of Impact	4	3
Duration of Impact	4	2	Probability	5	3
Environmental Risk (Pre-mitigation)					-17.5
Mitigation Measures					
As per Impacts 8.2.2.3 to 8.2.2.8. As part of the Environmental Management Programme, specifications with regards to topsoil removal and stockpiling must be indicated in order to reduce this impact and to ensure that topsoil is re-used in the rehabilitation process (i.e. loss of topsoil is not permanent).					
Environmental Risk (Post-mitigation)					-6.75
Degree of confidence in impact prediction:					High
Impact Prioritisation					

Public Response	1
No public responses have been received relating to this impact.	
Cumulative Impacts	2
<p>The potential cumulative impacts consider the existing impacts in the catchment (past cultivation, livestock grazing, rural homesteads, roads etc.). It is possible that these impacts have exacerbated soil erosion and sedimentation. Signs of erosion were evident above dam 12, while cultivation furrows and uneven ground increase soil saturation levels in the landscape. However, no signs of significant erosion or sedimentation were recorded on site, and therefore current impacts are considered to be Low. A high density housing development may exacerbate these impacts though. Potential cumulative impacts within the proposed development site, with the addition of a new housing development, are considered to be Medium (pre-mitigation), but should be Low (post mitigation).</p> <p>As per impact 8.2.2.3, the potential cumulative impacts within the surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera) demonstrates moderate-high land use activities which may potentially have a Medium impact on topsoil loss, soil erosion and sedimentation in the catchments. Data on these variables is unavailable and a cumulative impact assessment for these quaternary catchments cannot be accurately determined. Although, according to unpublished data from a current Water Research Commission project, the overall Present Ecological State of the Gxulu River (upper reach), into which the Tutura River flows, is Class B (Largely Natural), while a lower reach of the Gxulu River is Class C (Moderately Modified). The Ncera River is Largely Natural, and the Mlele and Mcantsi rivers are Moderately Modified. Final data on flow and water quality is not available at this stage, and therefore, based on overall Present Ecological State, present cumulative impacts are potentially Low to Medium.</p> <p>Potential future cumulative impacts, based on future SDF development scenarios coupled with the proposed development, may result in High impact ratings if appropriate management / mitigation measures are not implemented i.e. pre-mitigation. However, if these are implemented the cumulative impact should remain Low to Medium (post mitigation).</p>	
Degree of potential irreplaceable loss of resources	1
<p>The potential for irreplaceable loss of resources is low.</p> <p>The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.</p>	
Prioritisation Factor	1.17
Final Significance	-7.88

8.2.2.10 Effluent pollution and solid waste pollution (Biodiversity Loss/Hydrological Processes)

During the construction phase of the proposed housing development, ground and surface water pollution impacts may accrue due to construction materials (i.e. cement, asphalt); and from potential oil and fuel leakages from construction vehicles. The construction area is extensive and therefore the potential for this impact to cause significant environmental harm is high if appropriate management measures are not implemented during the construction phase. Ablution facilities for construction staff that are not properly maintained during the construction phase may also result in pollution of ground and surface water. Solid waste generated during the construction phase (i.e. building rubble and litter) also has the potential to cause pollution of the environment. Pollution impacts can negatively affect flora and fauna, as well as hydrological processes.

This impact is considered LOW post mitigation because adequate management measures can be put in place to reduce this potential impact to an acceptable level (Refer Table below). The Alternative Layout has a slightly lower score of -7.88 because it includes the buffer areas, compared with the Proposed Layout which scores -8.25.

Effluent pollution and solid waste pollution is regulated through the National Water Act and National Environmental Management: Waste Act. Disturbance of rivers and wetlands is regulated through the National Water Act, in that a water use license application must be processed through the Department

of Water Affairs to disturb any river or any wetland within 500m of a proposed development/disturbance.

Impact Name	<i>Effluent pollution and solid waste pollution (biodiversity loss/hydrological processes)</i>				
Alternative	<i>Proposed Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	4	2
Extent of Impact	3	2	Reversibility of Impact	3	3
Duration of Impact	4	3	Probability	5	3
Environmental Risk (Pre-mitigation)					-17.5
Mitigation Measures					
<ul style="list-style-type: none"> • Compilation and implementation of Waste Management Conditions (Specifications) as part of the Environmental Management Programme (EMP) to prevent accidental leakage of pollutants e.g. oil, fuel, cement, sewage, storm water effluent. An EMP is required by the NEMA Environmental Impact Assessment regulations. • Waste Management Conditions to designate an area for the construction camp (which includes ablution facilities, storage of hazardous wastes, maintenance stations etc.) at least 100 m away from the Tutura River, streams, drainage areas, dams and wetlands. • Waste Management Conditions to identify procedures for solid waste disposal (e.g. bins, no littering or burning policy) and the maintenance of ablution facilities, including the disposal of liquid and hazardous waste at a licensed waste disposal site. • Waste Management Conditions (Specifications) to ensure that no re-fuelling of construction vehicles or maintenance activities occur within 100 m of the Tutura River, streams, drainage areas, dams and wetlands. • Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. 					
Environmental Risk (Post-mitigation)					-7.5
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider the existing impacts in the catchment, namely the potential for polluted storm water run-off from vehicles and Escherichia coli contamination from surrounding settlements (i.e. sewage contamination). Currently, these impacts are considered Low. According to unpublished data from a current Water Research Commission project, the Present Ecological State of the Gxulu River (upper reach), into which the Tutura River flows, is Class B (Largely Natural), while a lower reach of the Gxulu River is Class C (Moderately Modified). Final data on water quality is not available at this stage, and therefore, based on overall Present Ecological State, present cumulative impacts are potentially Low to Medium.</p> <p>Potential future cumulative impacts, based on future SDF development scenarios coupled with the proposed development, may result in High impact ratings if appropriate management / mitigation measures are not implemented i.e. pre-mitigation. However, if these are implemented the cumulative impact should remain Low (post mitigation).</p>					
Degree of potential irreplaceable loss of resources					1
<p>The potential for irreplaceable loss of resources is low.</p> <p>The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.</p>					
Prioritisation Factor					1.17
Final Significance					-8.75

Impact Name	<i>Effluent pollution and solid waste pollution (biodiversity loss/hydrological processes)</i>				
Alternative	<i>Watercourse Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation

Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	1	Reversibility of Impact	3	3
Duration of Impact	4	3	Probability	5	3
Environmental Risk (Pre-mitigation)					-16.25
Mitigation Measures					
<ul style="list-style-type: none"> • Compilation and implementation of Waste Management Conditions (Specifications) as part of the Environmental Management Programme (EMP) to prevent accidental leakage of pollutants e.g. oil, fuel, cement, sewage, storm water effluent. An EMP is required by the NEMA Environmental Impact Assessment regulations. • Waste Management Conditions to designate an area for the construction camp (which includes ablution facilities, storage of hazardous wastes, maintenance stations etc.) at least 100 m away from the Tutura River, streams, drainage areas, dams and wetlands. • Waste Management Conditions to identify procedures for solid waste disposal (e.g. bins, no littering or burning policy) and the maintenance of ablution facilities, including the disposal of liquid and hazardous waste at a licensed waste disposal site. • Waste Management Conditions (Specifications) to ensure that no re-fuelling of construction vehicles or maintenance activities occur within 100 m of the Tutura River, streams, drainage areas, dams and wetlands. • Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. 					
Environmental Risk (Post-mitigation)					-6.75
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider the existing impacts in the catchment, namely the potential for polluted storm water run-off from vehicles and Escherichia coli contamination from surrounding settlements (i.e. sewage contamination). Currently, these impacts are considered Low. According to unpublished data from a current Water Research Commission project, the Present Ecological State of the Gxulu River (upper reach), into which the Tutura River flows, is Class B (Largely Natural), while a lower reach of the Gxulu River is Class C (Moderately Modified). Final data on water quality is not available at this stage, and therefore, based on overall Present Ecological State, present cumulative impacts are potentially Low to Medium.</p> <p>Potential future cumulative impacts, based on future SDF development scenarios coupled with the proposed development, may result in High impact ratings if appropriate management / mitigation measures are not implemented i.e. pre-mitigation. However, if these are implemented the cumulative impact should remain Low (post mitigation).</p>					
Degree of potential irreplaceable loss of resources					1
<p>The potential for irreplaceable loss of resources is low.</p> <p>The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.</p>					
Prioritisation Factor					1.17
Final Significance					-7.88

8.2.2.11 Disturbance of important ecological process areas (Biodiversity Loss)

According to the Eastern Cape Biodiversity Conservation Plan, the proposed development site is delineated as a Critical Biodiversity Area (CBA) because it is a non-statutory Protected Area and partly as an Ecological Corridor, which means it is an important ecological/hydrological process area. An aquatic CBA also falls within the corridor. Portions of the Critical Biodiversity Area are indicated as degraded in terms of the Eastern Cape Biodiversity Conservation Plan. A portion of the proposed development site also falls within a Fish Support Area, meaning that land within the catchment should be appropriately managed/developed to safeguard threatened or near-threatened fish. According to

the Buffalo City Metropolitan Municipality Spatial Development Framework (2009), which has taken biodiversity into consideration, the site is not a conservancy or nature reserve, but an area designated for public funding.

The site visit however confirmed that the proposed development site is highly degraded and, as a result, of relatively low biodiversity value. Ecological corridors, however, do not require pristine or near-natural areas, and can be degraded. The importance of parts of the site as an ecological process area can therefore not be discounted. The Eastern Cape Biodiversity Conservation Plan is however a broad scale plan that requires further refinement, which has been done via this study. The Tutura River riparian area and 50 m buffer zone should be implemented and should form part of the ecological corridor, as well as the other buffers indicated in Figure 2d of Appendix C. It should be noted that the boundary of the proposed development site is mostly outside of the 50 m buffer from the riparian zone.

During the construction and operation of the proposed housing development, faunal movement will be significantly restricted as this is a high density development proposal. However, fauna, birds, amphibians (frogs) and invertebrates (wasps, butterflies etc.) are able to move to avoid areas of disturbance, although the extent (ha) of their habitat within the catchments will be reduced by the proposed housing development. Other processes, like nutrient cycling, pollination and soil formation, will also be significantly reduced with the removal of vegetation (habitat). Hydrological process impacts are assessed in Impacts 8.2.2.8, 8.2.2.9 and 8.2.2.10 above.

This impact is considered equivalent during both the construction and operational phases for the Proposed Layout because it is a high density development proposal and the site falls partly within a Critical Biodiversity Area and Fish Support Area. Even though the extent of housing and infrastructure during the construction phase will not be as widespread within the boundaries of the proposed development site compared with the operation phase (i.e. fully developed site), construction activities will probably be sufficient enough to restrict faunal movement and use within the site, while other ecological (e.g. pollination) and hydrological processes (ground and surface water flows) will be impacted on successively, as the construction footprint expands.

This impact is considered MEDIUM (-16.33) for both the Proposed Layout and MEDIUM (-9.63) for the Alternative Layout, during both the construction and operational phases (Refer Table below). The Proposed Layout does not adequately consider processes because it does not include the buffer areas, although it will include storm-water, erosion, pollution and control measures etc., while the Alternative Layout does include the buffer areas coupled with all the other additional mitigation measures. Consequently the impact of the Proposed Layout is assessed as higher, because Extent and Magnitude is higher.

Impact Name	<i>Disturbance of important ecological process areas (biodiversity loss)</i>				
Alternative	<i>Proposed Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	4	4

Extent of Impact	4	3	Reversibility of Impact	4	3
Duration of Impact	4	4	Probability	5	4
Environmental Risk (Pre-mitigation)				-20	
Mitigation Measures					
As per Impacts 8.2.2.3 to 8.2.2.10					
Environmental Risk (Post-mitigation)				-14	
Degree of confidence in impact prediction:				High	
Impact Prioritisation					
Public Response				1	
No public responses have been received relating to this impact.					
Cumulative Impacts				2	
<p>The potential cumulative impacts consider existing and potential future impacts within the sub-quaternary catchments (R40A with key rivers Gxulu and Ncera). Existing impacts (i.e. livestock grazing, roads, rural housing etc.) on the ecological processes of the proposed development site, is considered low as ecological processes are being maintained, albeit somewhat modified due to the degraded state of the site and the occurrence of numerous dams. Hydrological processes are however modified due to the occurrence of numerous dams.</p> <p>The proposed housing development will have a high impact on ecological processes within the proposed development site because it is a high density housing development. The potential for and degree of rural expansion in the future within the sub-quaternary catchments is considered low given that cultivation / agriculture has ceased rather than expanded, although the potential for future housing in the area is possible given that there are a number of rural communities with inadequate housing and associated infrastructure in the catchments. However, based on the municipal Spatial Development Framework (2009), the potential future cumulative impacts on ecological processes are assessed as Low because proposed developments within the area are low i.e. compliance with maintaining ecological corridors in terms of the municipal Spatial Development Framework and Eastern Cape Biodiversity Conservation Plan's Critical Biodiversity Areas (CBA) Map should not result in high cumulative impacts in the long term.</p> <p>As per impact 8.2.2.3, the potential cumulative impacts within the surrounding sub-quaternary catchments (R40A with key rivers Gxulu and Ncera) demonstrates moderate-high land use impacts which will potentially have a Medium impact on ecological processes. Refer to Impacts 8.2.2.8 – 8.2.2.10 for Present Ecological State and impacts relating to hydrological processes i.e. overall Low to Medium cumulative impacts.</p>					
Degree of potential irreplaceable loss of resources				1	
<p>The potential for irreplaceable loss of resources is low.</p> <p>The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.</p>					
Prioritisation Factor				1.17	
Final Significance				-16.33	

Impact Name	<i>Disturbance of important ecological process areas (biodiversity loss)</i>				
Alternative	<i>Watercourse Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	4	2
Extent of Impact	2	2	Reversibility of Impact	3	3
Duration of Impact	4	4	Probability	5	3
Environmental Risk (Pre-mitigation)				-16.25	
Mitigation Measures					
As per Impacts 8.2.2.3 to 8.2.2.10					
Environmental Risk (Post-mitigation)				-8.25	
Degree of confidence in impact prediction:				High	
Impact Prioritisation					
Public Response				1	

No public responses have been received relating to this impact.	
Cumulative Impacts	2
<p>The potential cumulative impacts consider existing and potential future impacts within the sub-quaternary catchments (R40A with key rivers Gxulu and Ncera). Existing impacts (i.e. livestock grazing, roads, rural housing etc.) on the ecological processes of the proposed development site, is considered low as ecological processes are being maintained, albeit somewhat modified due to the degraded state of the site and the occurrence of numerous dams. Hydrological processes are however modified due to the occurrence of numerous dams.</p> <p>The proposed housing development will have a high impact on ecological processes within the proposed development site because it is a high density housing development. The potential for and degree of rural expansion in the future within the sub-quaternary catchments is considered low given that cultivation / agriculture has ceased rather than expanded, although the potential for future housing in the area is possible given that there are a number of rural communities with inadequate housing and associated infrastructure in the catchments. However, based on the municipal Spatial Development Framework (2009), the potential future cumulative impacts on ecological processes are assessed as Low because proposed developments within the area are low i.e. compliance with maintaining ecological corridors in terms of the municipal Spatial Development Framework and Eastern Cape Biodiversity Conservation Plan's Critical Biodiversity Areas (CBA) Map should not result in high cumulative impacts in the long term.</p> <p>As per impact 8.2.2.3, the potential cumulative impacts within the surrounding sub-quaternary catchments (R40A with key rivers Gxulu and Ncera) demonstrates moderate-high land use impacts which will potentially have a Medium impact on ecological processes. Refer to Impacts 8.2.2.8 – 8.2.2.10 for Present Ecological State and impacts relating to hydrological processes i.e. overall Low to Medium cumulative impacts.</p>	
Degree of potential irreplaceable loss of resources	1
<p>The potential for irreplaceable loss of resources is low.</p> <p>The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.</p>	
Prioritisation Factor	1.17
Final Significance	-9.63

8.2.2.12 Soil pollution

During construction, localized pollution may occur as a result of hazardous substances coming into contact with the soil, for example, leaking petrochemical/ hydrocarbon products from construction vehicles and storage facilities; spills at the construction camps; sewerage and grey water from ablution facilities; and waste water from wash bays and batching plants. The area has several sensitive areas including wetlands and watercourses and therefore uncontrolled and un-remedied pollution may pose a threat to these water bodies.

Impact Name	<i>Soil pollution</i>				
Alternative	<i>All Alternatives</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	2	Reversibility of Impact	3	2
Duration of Impact	1	1	Probability	3	2
Environmental Risk (Pre-mitigation)					-6.75
Mitigation Measures					
Ensure all site personnel have been trained regarding the use and disposal of hazardous substances. Spill procedures must be in place in case of an accidental spill. Ensure all machinery and vehicles on site are regularly inspected for leaks. The necessary spill materials must be available on site. All waste on site must be disposed of in the correct manner.					
Environmental Risk (Post-mitigation)					-3.5
Degree of confidence in impact prediction:					High
Impact Prioritisation					

Public Response	1
No public responses have been received relating to this impact.	
Cumulative Impacts	1
Due to the extent and duration of the project, it is unlikely that the impact will result in spatial and temporal cumulative change	
Degree of potential irreplaceable loss of resources	1
Due to the extent and duration of the project, it is unlikely that the impact will result in irreplaceable loss.	
Prioritisation Factor	1.00
Final Significance	-3.5

8.2.2.13 Geotechnical stability

The geotechnical investigation (see Section 7.3) concluded that the in situ soils will not meet the SABS 1200 LB specification for selected granular material for pipe bedding or blanket and therefore these materials should be imported. Foundations for single and double storey structures should be founded on dense or well compacted in situ soil cover. In situ soil cover may be problematic for use as a natural filling material (in the case of cut to fill platforms) due to the typically fine grained nature of the soils which are very moisture sensitive and difficult to compact when wet. Due to the potentially problematic soil conditions, the recommended foundation type throughout the entire development is stiffened rafts (H1-2 conditions).

The presence of a shallow aquiclude (layer of restricted permeability) may have an affect the efficacy of Ventilated-Improved-Pit (VIP) latrines. Therefore, due to possible groundwater contamination from the VIP toilets, it is recommended that these toilets will be equipped with lined pits to mitigate this potential impact (see Appendix E).

Impact Name	Geotechnical stability				
Alternative	All Alternatives				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	1	1	Reversibility of Impact	3	3
Duration of Impact	3	4	Probability	4	2
Environmental Risk (Pre-mitigation)					-10
Mitigation Measures					
<ul style="list-style-type: none"> Due to the potentially problematic soil conditions, the recommended foundation type throughout the entire development is stiffened rafts (H1-2 conditions). Clear and grub all organic material (approximately 100mm of surficial soil). No structures should be placed on uncontrolled fill (a competent contractor should be able to recognise uncontrolled fill and be aware of the problems associated with founding structures on uncontrolled fill). Uncontrolled fill should be cut to spoil or as directed by the engineer. Localised depressions in the topography requiring filling should be filled with suitable local or imported material and compacted to the same degree as the surrounding soil. Do not try to compact saturated soil. Rather remove and replace. The finished floor level of all houses should be a minimum of 150mm above final ground level to prevent flooding. Foundations should be inspected by the engineer's representative to assess founding conditions, such as soil types, consistency in density and moisture levels. The ponding of storm water around the exterior of houses can be avoided by constructing a 1m wide a concrete 					

apron with a 10% fall away from the house.	
<ul style="list-style-type: none"> • Road construction should be carried out according to SABS 1200 or COLTO 3000 specifications. • Design and construction of stormwater drainage should be carried out according to SABS 1200LE or COLTO 2000 specifications. 	
Environmental Risk (Post-mitigation)	-5
Degree of confidence in impact prediction:	High
Impact Prioritisation	
Public Response	1
No public responses have been received relating to this impact.	
Cumulative Impacts	1
No cumulative impacts are associated with this impact.	
Degree of potential irreplaceable loss of resources	1
The potential for irreplaceable loss of resources is low.	
Prioritisation Factor	1
Final Significance	-5

8.2.2.14 Noise

Construction activities will take place over phases which are anticipated to take place over one year. Due to the fact that construction will take place in close proximity of residential, commercial and institutional areas during this time it is anticipated that the noise resulting from construction vehicles, machinery and earthworks may impact on the local population.

Impact Name	Noise				
Alternative	All Alternatives				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	2	2
Extent of Impact	3	3	Reversibility of Impact	1	1
Duration of Impact	1	1	Probability	4	3
Environmental Risk (Pre-mitigation)					-7
Mitigation Measures					
All activities should comply with the approved construction schedule to ensure no noise disturbance occurs outside of working hours. All residents within close vicinity to the site should be notified if working hours are to be extended. During construction, the contractor shall endeavour to keep noise generating activities to a minimum.					
Environmental Risk (Post-mitigation)					-5.25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					1
No cumulative impacts are associated with this impact.					
Degree of potential irreplaceable loss of resources					1
The potential for irreplaceable loss of resources is low.					
Prioritisation Factor					1
Final Significance					-5.25

8.2.2.15 Visual Impacts

Although degraded, the proposed development is situated within a natural area which creates a visually appealing aspect when viewed from the surrounding areas. It is anticipated that construction activities will detract from this and possibly result in a less visually stimulating environment. This impact is mainly restricted to the local communities and landowners as the site is fairly rural. With the implementation of the recommended mitigation measures this impact is anticipated to be of LOW negative significance for construction related activities.

Impact Name	Visual impact				
Alternative	All Alternatives				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	2	Reversibility of Impact	3	2
Duration of Impact	4	4	Probability	4	3
Environmental Risk (Pre-mitigation)					-12
Mitigation Measures					
<ul style="list-style-type: none"> • Areas that area to be rehabilitated are to be rehabilitated (using vegetation appropriate to the specific area) in such a way as to resemble the natural environment prior to construction. Landscaping should occur to ensure that the development site is visually pleasing. • The colour of paint chosen for the top structures should be one that blends in with the surrounding environment (bright colours should be avoided). 					
Environmental Risk (Post-mitigation)					-7.5
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					1
No cumulative impacts are associated with this impact.					
Degree of potential irreplaceable loss of resources					1
The potential for irreplaceable loss of resources is low.					
Prioritisation Factor					1
Final Significance					-7.5

8.2.2.16 Traffic

Although ready access to the construction sites exists through under developed internal road infrastructure, access occurs to the greater property through the R347. Heavy construction vehicles delivering materials and equipment to the site may lead to further deterioration in the condition of the R347. Due to the rural nature of the site, traffic congestion should not be much of a concern. The implementation of the mitigation measures will likely reduce the significance of the impact from MEDIUM negative to LOW negative.

Impact Name	Traffic				
Alternative	All Alternatives				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	3	Reversibility of Impact	3	2
Duration of Impact	1	1	Probability	4	3
Environmental Risk (Pre-mitigation)					-10
Mitigation Measures					
<ul style="list-style-type: none"> All construction vehicles are to abide by the construction schedule and ensure only approved access routes are used. The contractor is to ensure adequate access to private properties. Where obvious damage to the road infrastructure has occurred as a result of the project, repairs should be undertaken in accordance with the local municipality specifications and requirements. 					
Environmental Risk (Post-mitigation)					-6
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					1
No cumulative impacts are associated with this impact.					
Degree of potential irreplaceable loss of resources					1
The potential for irreplaceable loss of resources is low.					
Prioritisation Factor					1
Final Significance					-6

8.2.2.17 Fire Hazards

The area already experiences uncontrolled veld fires and therefore, the storage of fuel and other flammable solvents on site during construction may increase the risk of fire on the site. Fire on site may lead to damage to infrastructure and the biophysical environment and impact on the working environment.

Impact Name	Fire hazards				
Alternative	All Alternatives				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	5	4
Extent of Impact	2	2	Reversibility of Impact	4	4
Duration of Impact	1	1	Probability	4	2
Environmental Risk (Pre-mitigation)					-12
Mitigation Measures					
<ul style="list-style-type: none"> Contracting personnel must be well versed in fire and safety management procedures and activities to be established prior to commencement of the project. Implement suitable material storage practices. Implement fire hazard sensitive on- and offloading procedures. Designate a site safety official and ensure that personal are adequately trained regarding fire hazards and procedures. 					

Environmental Risk (Post-mitigation)	-5.5
Degree of confidence in impact prediction:	High
Impact Prioritisation	
Public Response	1
No public responses have been received relating to this impact.	
Cumulative Impacts	1
The cumulative impact would be minimal due to the nature of the project and the current state of the wetland environments	
Degree of potential irreplaceable loss of resources	1
The potential for irreplaceable loss of resources is low.	
Prioritisation Factor	1
Final Significance	-5.5

8.2.2.18 Impacts on existing property/infrastructure

It is anticipated that there might be some significant impact to the building structures (existing informal housing and commercial infrastructure) and soccer field that currently exist on the proposed site during the construction phase. It is recommended that residents currently occupying informal houses on site must be relocated to a developed erf within the project site boundary and within close proximity to their existing residential dwellings. The implementation of the mitigation measures will likely reduce the significance of the impact from MEDIUM negative to a MEDIUM positive.

Impact Name	<i>Impacts on existing property/infrastructure</i>				
Alternative	<i>All Alternatives</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	1	Magnitude of Impact	3	2
Extent of Impact	2	2	Reversibility of Impact	4	4
Duration of Impact	5	4	Probability	3	3
Environmental Risk (Pre-mitigation)					-10.5
Mitigation Measures					
<ul style="list-style-type: none"> Residents occupying informal houses must be relocated to a developed erf within the project site boundary and within close proximity to their existing residential dwellings. 					
Environmental Risk (Post-mitigation)					9
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					1
It is unlikely that any cumulative impacts will result					
Degree of potential irreplaceable loss of resources					2
Could lead to irreplaceable loss of resources, in this case property/infrastructure. The value of the resource depends on the point of view of the individual. However, it is expected that the social benefits of the project will outweigh the negative impact of existing property/infrastructure.					
Prioritisation Factor					1.17
Final Significance					10.5

8.2.2.19 Destruction of colonial period structures

The Heritage Assessment identified two colonial structures of significance. The destruction of these structures will result in a loss of features of heritage value to the immediate area. If the structures are to be destroyed, a permit from ECPHRA will need to be obtained before this may occur.

Impact Name	<i>Destruction of colonial period structures</i>				
Alternative	<i>All Alternatives</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	4	2
Extent of Impact	2	2	Reversibility of Impact	5	5
Duration of Impact	5	5	Probability	3	2
Environmental Risk (Pre-mitigation)					-12
Mitigation Measures					
<ul style="list-style-type: none"> It is recommended that these structures be documented and conserved as much as possible. If they are to be destroyed, a permit from ECPHRA will have to be obtained before this can occur. 					
Environmental Risk (Post-mitigation)					-7
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					1
No cumulative impacts have been noted					
Degree of potential irreplaceable loss of resources					2
The degree of potential irreplaceable loss will be high if the structure is demolished. However, if conserved, the impact will unlikely result in irreplaceable loss.					
Prioritisation Factor					1.17
Final Significance					-8.17

8.2.2.20 Impacts on human graves

There have been graves identified within the development site. This may pose a high negative social impact to the families of the grave sites if the graves are not conserved *in situ* or relocated to the proposed community cemetery after extensive consultation with the affected families.

Impact Name	<i>Impacts on human graves</i>				
Alternative	<i>All Alternatives</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	4	2
Extent of Impact	2	2	Reversibility of Impact	4	2
Duration of Impact	5	1	Probability	4	2

Environmental Risk (Pre-mitigation)	-15
Mitigation Measures	
<ul style="list-style-type: none"> It is recommended that graves are conserved in situ and that the relevant beneficiaries be awarded that specific erf to avoid the relocation of the graves. It is recommended that a community cemetery be developed within the area. Where graves are to be relocated, it is recommended that they be relocated to the proposed community cemetery after extensive consultation with the families has been done. 	
Environmental Risk (Post-mitigation)	-3.5
Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Public Response	1
I&APs voiced concern over the need for a formal community graveyard within the proposed site	
Cumulative Impacts	1
No cumulative impacts have been noted	
Degree of potential irreplaceable loss of resources	1
The degree for irreplaceable loss of resources will be low if the graves are conserved in situ as well as if they are relocated to a community cemetery and in consultation with the community members and the ECPHRA	
Prioritisation Factor	1.00
Final Significance	-3.5

8.2.2.21 Discovery of sub-surface paleontological finds

The paleontological study concluded that it is likely that the site may be underlain by some features of paleontological value. The project will encompass a range of activities during the construction phase, including ground clearance and excavation of trenches for services. It is possible that cultural material may be exposed during operations and may be recoverable. Development surrounding infrastructure and construction of facilities results in significant disturbance, however, construction trenches sometimes offer a window into the past and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project and these must be catered for. Temporary infrastructure is often changed or added to the subsequent history of the project. In general these are low impact developments as they are superficial, resulting in little alteration of the land surface.

Impact Name	<i>Discovery of sub-surface paleontological finds</i>				
Alternative	<i>All Alternatives</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	2	Reversibility of Impact	5	3
Duration of Impact	4	3	Probability	3	2
Environmental Risk (Pre-mitigation)					-10.5
Mitigation Measures					
<ul style="list-style-type: none"> 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. Any substantial fossil remains (e.g. vertebrates, petrified wood) encountered during excavation should be reported 					

to SAHRA for possible mitigation by a professional palaeontologist.	
<ul style="list-style-type: none"> • A paleontological site inspection be done by a qualified palaeontologist once the vegetation has been cleared during the early stages of construction in areas with a Moderate sensitivity rating for the occurrence of fossils. • The EAP of the project team should be made aware of the possible occurrence of fossils. If any fossils are recorded during initial field visits, a trained palaeontologist must be notified to assess the finds. 	
Environmental Risk (Post-mitigation)	-5
Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Public Response	1
No public responses have been received relating to this impact.	
Cumulative Impacts	1
The cumulative impact on the discovery of subsurface archaeological find is seen as low due to the low incidence of such finds	
Degree of potential irreplaceable loss of resources	3
In most cases the discovery of paleontological material and deposits of artefacts during construction leads to the total destruction of the section unearthed. However, through mitigation by means of systematic rescue excavations and documentation of the finds, the impact can be minimised and in some cases reversed to a positive impact depending on the outcome of mitigation and the extent of the mitigation being done on such a site	
Prioritisation Factor	1.33
Final Significance	-6.65

8.2.3 Operational Phase Impacts

8.2.3.1 Visual impacts

The visual impacts associated with construction have been described above. Similar to the discussion during construction, this impact is mainly restricted to the local communities and landowners as the site is typically situated in a semi-remote area. However, the duration of this impact will be permanent and will not be reversible without significant input costs.

Impact Name	<i>Visual Impact</i>				
Alternative	<i>All Alternatives</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	2	2
Extent of Impact	3	3	Reversibility of Impact	4	4
Duration of Impact	5	5	Probability	2	2
Environmental Risk (Pre-mitigation)					-7
Mitigation Measures					
<ul style="list-style-type: none"> • Landscaping should be undertaken with as much locally indigenous species as possible and should be maintained in order to ensure that the visual impact is reduced. • Consideration should be given to the use of materials that would blend in with the surrounding landscape when viewed from prominent angles, e.g. roofing materials, colours, building design. 					
Environmental Risk (Post-mitigation)					-7
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					

Cumulative Impacts	1
No cumulative impacts are associated with this impact.	
Degree of potential irreplaceable loss of resources	1
The potential for irreplaceable loss of resources is low.	
Prioritisation Factor	1
Final Significance	-7

8.2.3.2 Increased fire risk

Although veld fires do occur naturally, the establishment of Sunny South will lead to the concentration of a high amount of families and with this, there will be an increase in the likelihood of veld fires. As this is a relatively low density development, it is anticipated that veld fires could easily spread between the residential units and cause damage to property and infrastructure, and lead to injury and loss of biodiversity.

Impact Name	Increased fire risk				
Alternative	All Alternatives				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	4	2
Extent of Impact	3	2	Reversibility of Impact	3	3
Duration of Impact	4	4	Probability	3	3
Environmental Risk (Pre-mitigation)					-10.5
Mitigation Measures					
<ul style="list-style-type: none"> It must be ensured that all fire fighting equipment and infrastructure is in place and fully functional by the time that a particular residential area within Sunny South is completed. Community organisations and structures should be put in place or established (or the existing utilised) to ensure that emergencies and veld fires can be effectively reported and responded to timeously by the BCMM. The BCMM must ensure that Sunny South is adequately covered in terms of fire fighting capabilities and capacity. The conditions of the Veld and Forest Fire Act (Act No. 101 of 1998) must be effectively communicated to the community members and adhered to at all times. 					
Environmental Risk (Post-mitigation)					-8.25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response	1				
No public responses have been received relating to this impact.					
Cumulative Impacts	1				
No cumulative impacts are associated with this impact.					
Degree of potential irreplaceable loss of resources	1				
The potential for irreplaceable loss of resources is low.					
Prioritisation Factor	1				
Final Significance	-8.25				

8.2.3.3 Increased waste generation

Despite the fact that this is a residential development of low density, there would be a large concentration of beneficiaries and their families that would be concentrated in an area that is not currently serviced by municipal waste collection services. The site is also located in a relatively remote part of the BCMM and outside of the urban boundary which could cause delays and present the BCMM with difficulties with regards to the adequate and timely collection and disposal of waste. This could in turn lead to the spread of domestic waste in the immediate surrounds.

Furthermore, the development will be utilising lined VIP toilets, which would require adequate and timely servicing by the BCMM and its service providers.

Impact Name	<i>Increased waste generation</i>				
Alternative	<i>All Alternatives</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	2	Reversibility of Impact	2	2
Duration of Impact	4	4	Probability	4	3
Environmental Risk (Pre-mitigation)					-12
Mitigation Measures					
<ul style="list-style-type: none"> Provide waste bins and facilities (with proper licensing if required) to the residents. Ensure that the area is included in planning and servicing for solid and VIP waste collection activities undertaken by the BCMM 					
Environmental Risk (Post-mitigation)					-7.5
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					1
No cumulative impacts are associated with this impact.					
Degree of potential irreplaceable loss of resources					1
The potential for irreplaceable loss of resources is low.					
Prioritisation Factor					1
Final Significance					-7.5

8.2.3.4 Loss of vegetation

During the operational phase, further vegetation loss will most likely take place (highly probable) due to rural activities that will be permitted within each individual erf post construction, namely: food crop gardens, livestock grazing/kraals and possibly gardening, workshops, shops etc. However, when considering these impacts post construction, i.e. on undisturbed land within each individual erf, all pre-mitigation and post-mitigation consequence scores (i.e. extent, duration, magnitude, reversibility) are not elevated by these impacts due to the size and nature of the proposed development. In this case,

disassociating the construction impact (high loss of vegetation) from the operational vegetation loss (high loss) is not considered reasonable.

Impact Name	Loss of vegetation				
Alternative	Proposed Alternative				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	2	Reversibility of Impact	4	4
Duration of Impact	4	4	Probability	5	4
Environmental Risk (Pre-mitigation)					-16.25
Mitigation Measures					
<ul style="list-style-type: none"> During the operational phase, the Municipality should encourage homeowners to practice indigenous gardening, where appropriate i.e. where food crop gardens or livestock activities are not being practised by a landowner. 					
Environmental Risk (Post-mitigation)					-15
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider the existing extent of transformation and degradation within the study site and surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera) and the potential of the proposed development resulting in significant cumulative impacts in this region. Transformed areas are represented by rural housing (communal areas), industry (buildings), agriculture, urban areas, roads, and alien plant cover, while degraded areas are representative of land under grazing and impacted by past intensive agriculture. On consultation of available land use data (Eastern Cape Biodiversity conservation Plan), the present cumulative impacts are considered moderate-high as the percentage cover of transformed and degraded terrestrial areas is relatively extensive when compared to the percentage natural plant cover.</p> <p>Potential future cumulative impacts must also be considered which are based on potential future development scenarios. These development scenarios should be based on available municipal Spatial Development Frameworks (SDF) as the SDF guides development within the municipal domain. Municipal Spatial Development Frameworks are supposed to integrate biodiversity into the SDF planning process, as has been done for the Buffalo City Metropolitan Municipality SDF (2009). Consequently, if future spatial planning takes into consideration the municipal Spatial Development Framework, as well as the Eastern Cape Biodiversity Conservation Plan Critical Biodiversity Areas Map (which requires further fine-scale mapping, which has been done via this study), Strategic Environmental Assessments, State of Environment Reports and Environmental Management Frameworks (e.g. the Coastal EMF from Cannon Rocks to Kei Mouth) etc., long term cumulative impacts of potential future developments should not cause significant environmental damage with regards to biodiversity loss.</p>					
Degree of potential irreplaceable loss of resources					1
<p>The potential for irreplaceable loss of resources is low.</p> <p>The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.</p>					
Prioritisation Factor					1.17
Final Significance					-17.50

Impact Name	Loss of vegetation				
Alternative	Watercourse Alternative				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation

Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	1	Reversibility of Impact	3	3
Duration of Impact	4	4	Probability	5	5
Environmental Risk (Pre-mitigation)					-15
Mitigation Measures					
<ul style="list-style-type: none"> During the operational phase, the Municipality should encourage homeowners to practice indigenous gardening, where appropriate i.e. where food crop gardens or livestock activities are not being practised by a landowner. 					
Environmental Risk (Post-mitigation)					-12.5
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider the existing extent of transformation and degradation within the study site and surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera) and the potential of the proposed development resulting in significant cumulative impacts in this region. Transformed areas are represented by rural housing (communal areas), industry (buildings), agriculture, urban areas, roads, and alien plant cover, while degraded areas are representative of land under grazing and impacted by past intensive agriculture. On consultation of available land use data (Eastern Cape Biodiversity conservation Plan), the present cumulative impacts are considered moderate-high as the percentage cover of transformed and degraded terrestrial areas is relatively extensive when compared to the percentage natural plant cover.</p> <p>Potential future cumulative impacts must also be considered which are based on potential future development scenarios. These development scenarios should be based on available municipal Spatial Development Frameworks (SDF) as the SDF guides development within the municipal domain. Municipal Spatial Development Frameworks are supposed to integrate biodiversity into the SDF planning process, as has been done for the Buffalo City Metropolitan Municipality SDF (2009). Consequently, if future spatial planning takes into consideration the municipal Spatial Development Framework, as well as the Eastern Cape Biodiversity Conservation Plan Critical Biodiversity Areas Map (which requires further fine-scale mapping, which has been done via this study), Strategic Environmental Assessments, State of Environment Reports and Environmental Management Frameworks (e.g. the Coastal EMF from Cannon Rocks to Kei Mouth) etc., long term cumulative impacts of potential future developments should not cause significant environmental damage with regards to biodiversity loss.</p>					
Degree of potential irreplaceable loss of resources					1
<p>The potential for irreplaceable loss of resources is low.</p> <p>The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.</p>					
Prioritisation Factor					1.17
Final Significance					-14.58

8.2.3.5 Spread of alien invasive plant species (Biodiversity Loss)

The operational phase impact of alien plant invasion relates to continued encroachment of the surrounding area by alien invasive species, especially if an alien management plan has not been implemented during the construction phase. Even if an alien management plan is implemented, seed production will maintain this impact into the operational phase. Once again, as per impact 8.2.2.3, consequence scores (i.e. extent, duration, magnitude, reversibility) are not elevated due to the size and nature of the proposed development. The impact is therefore considered equivalent to the significance rating for the construction phase due to the extent of the consequence going beyond the boundaries of the proposed development.

Impact Name	<i>Spread of alien invasive plant species (biodiversity loss)</i>
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Alternative	All Alternatives				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	1
Extent of Impact	3	1	Reversibility of Impact	3	3
Duration of Impact	4	2	Probability	5	3
Environmental Risk (Pre-mitigation)					-16.25
Mitigation Measures					
<ul style="list-style-type: none"> • Compilation and implementation of an Environmental Management Programme (EMP), with rehabilitation plan, that provides specifications with regards to alien clearing and management. (NOTE: Any municipal owned land must have an alien management control plan in place in terms of the NEMBA). An EMP is required by the NEMA Environmental Impact Assessment regulations. • Rehabilitation will be required within the construction footprint. • Alien plants growing within the construction area must be removed during the construction period by the Contractor, and alien clearing must be implemented by the municipality during the operational phase. • Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. 					
Environmental Risk (Post-mitigation)					-5.25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider the existing extent of alien invasive plants within the study site and the surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera), and the potential of the proposed development resulting in significant cumulative impacts in these catchments. Within the proposed development site, alien plant cover is relatively low compared with the natural plant cover. Percentage alien plant cover in the catchment areas is unknown and therefore a rating for this cannot be provided. It is highly likely, however, that <i>Acacia mearnsii</i> and <i>Cestrum laevigatum</i> are among the key alien invasive species along streams and rivers in the catchment, as is the case for many rivers in the region e.g. Buffalo River and East London. Refer to Impact 8.2.2.8 and 8.2.2.9 with regards to alien vegetation and how this may potentially impact on hydrology (i.e. erosion of stream banks, sedimentation of streams etc.).</p> <p>Potential future cumulative impacts due to potential future developments in the catchments, such as housing and agriculture, could increase this impact due to an increase in exposed soil, if alien management procedures are not implemented. However, it is considered unlikely that future rural agricultural activities will expand based on the fact that cultivation in the area has ceased, while rural housing demands may escalate considering that there are several rural communities in the catchments. If alien management plans are implemented this impact is considered manageable and reversible, but without such management plans alien invasion can become a serious problem. The Buffalo City Metropolitan Municipality Spatial Development Framework (2003) highlighted alien invasion in areas of endemism as an area of concern.</p>					
Degree of potential irreplaceable loss of resources					1
If alien management plans are implemented this impact is considered manageable and reversible, but without such management plans alien invasion can become a serious problem.					
Prioritisation Factor					1.17
Final Significance					-6.13

8.2.3.6 Loss and degradation of different habitat types (Biodiversity Loss)

During the operational phase (pre-mitigation), further habitat loss will most likely take place within the individual erfes and other un-developed areas due to food crop gardens, livestock farming, gardening, workshops and shops. Habitat loss is assessed as HIGH for the Proposed Alternative because

sensitive habitats and process areas will not be avoided i.e. wetlands and drainage areas, and even possibly along the Tutura River (outside of the thicket/forest band), which is situated outside of the boundary of the development footprint. Degradation of habitats may potentially occur if pollution management (from solid waste and sewage pit latrines) is not implemented i.e. storm-water, erosion and sewage management. For the Alternative Layout, the buffer recommendations should lower habitat loss even further (extent), permitting a lower score (-14.58) compared with the Proposed Layout score (-17.50).

Impact Name	LOSS AND DEGRADATION OF DIFFERENT HABITAT TYPES (BIODIVERSITY LOSS)				
Alternative	Proposed Alternative				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	2	Reversibility of Impact	4	4
Duration of Impact	4	4	Probability	5	5
Environmental Risk (Pre-mitigation)					-16.25
Mitigation Measures					
<ul style="list-style-type: none"> • Removal of vegetation habitat within the construction and development footprint only. • Rehabilitation of construction footprints or disturbed areas. • Compilation and implementation of an Environmental Management Programme (EMP) that indicates method statements and specifications with regards to the above. An EMP is required by the NEMA Environmental Impact Assessment regulations. • Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. • The housing development to be serviced by the Buffalo City Metropolitan Municipality waste disposal services department. • Buffalo City Metropolitan Municipality to investigate the establishment of a waste recycling depot to service this region. Any waste disposal site to be located outside of the 1:100 year flood line of the Tutura River, or at least 100 m from the water's edge of the Tutura River, including the drainage areas (non-perennial streams), as indicated by the recommended buffers, which will form part of the CEMP. • Buffalo City Metropolitan Municipality to ensure that the sewage reticulation, water and storm-water infrastructure is appropriately maintained and upgraded in the long term. Sewage wastewater storage and disposal sites will need to be located above the 1:100 year flood line or at least 100m from the water's edge of the Tutura River, including the drainage areas (non-perennial streams), as indicated by the recommended buffers which will form part of the CEMP. In terms of dry pit latrines (ablution facilities), these should also be located outside of the 1:100 year flood line. The DWA should be consulted to determine if this is an adequate buffer. 					
Environmental Risk (Post-mitigation)					-15
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider the existing extent of transformation and degradation within the study site and surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera) and the potential of the proposed development resulting in significant cumulative impacts in this region. Transformed areas are represented by rural housing (communal areas), industry (buildings), agriculture, urban areas, roads, and alien plant cover, while degraded areas are representative of land under grazing and impacted by past intensive agriculture. On consultation of available land use data (Eastern Cape Biodiversity conservation Plan), the present cumulative impacts are considered moderate-high as the percentage cover of transformed and degraded terrestrial areas is relatively extensive when compared to the percentage natural plant cover.</p> <p>Potential future cumulative impacts must also be considered which are based on potential future development scenarios. These development scenarios should be based on available municipal Spatial Development Frameworks (SDF) as the SDF guides development within the municipal domain. Municipal Spatial Development Frameworks are</p>					

<p>supposed to integrate biodiversity into the SDF planning process, as has been done for the Buffalo City Metropolitan Municipality SDF (2009). Consequently, if future spatial planning takes into consideration the municipal Spatial Development Framework, as well as the Eastern Cape Biodiversity Conservation Plan Critical Biodiversity Areas Map (which requires further fine-scale mapping, which has been done via this study), Strategic Environmental Assessments, State of Environment Reports and Environmental Management Frameworks (e.g. the Coastal EMF from Cannon Rocks to Kei Mouth) etc., long term cumulative impacts of potential future developments should not cause significant environmental damage with regards to biodiversity loss.</p>	
Degree of potential irreplaceable loss of resources	1
<p>The potential for irreplaceable loss of resources is low. The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.</p>	
Prioritisation Factor	1.17
Final Significance	-17.50

Impact Name	LOSS AND DEGRADATION OF DIFFERENT HABITAT TYPES (BIODIVERSITY LOSS)				
Alternative	Watercourse Alternative				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	2	2
Extent of Impact	2	1	Reversibility of Impact	4	3
Duration of Impact	4	4	Probability	5	5
Environmental Risk (Pre-mitigation)					-15
Mitigation Measures					
<ul style="list-style-type: none"> Removal of vegetation habitat within the construction and development footprint only. Rehabilitation of construction footprints or disturbed areas. Compilation and implementation of an Environmental Management Programme (EMP) that indicates method statements and specifications with regards to the above. An EMP is required by the NEMA Environmental Impact Assessment regulations. Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. The housing development to be serviced by the Buffalo City Metropolitan Municipality waste disposal services department. Buffalo City Metropolitan Municipality to investigate the establishment of a waste recycling depot to service this region. Any waste disposal site to be located outside of the 1:100 year flood line of the Tutura River, or at least 100 m from the water's edge of the Tutura River, including the drainage areas (non-perennial streams), as indicated by the recommended buffers, which will form part of the CEMP. Buffalo City Metropolitan Municipality to ensure that the sewage reticulation, water and storm-water infrastructure is appropriately maintained and upgraded in the long term. Sewage wastewater storage and disposal sites will need to be located above the 1:100 year flood line or at least 100m from the water's edge of the Tutura River, including the drainage areas (non-perennial streams)), as indicated by the recommended buffers which will form part of the CEMP. In terms of dry pit latrines (ablution facilities), these should also be located outside of the 1:100 year flood line. The DWA should be consulted to determine if this is an adequate buffer. 					
Environmental Risk (Post-mitigation)					-12.5
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider the existing extent of transformation and degradation within the study site and surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera) and the potential of the proposed development resulting in significant cumulative impacts in this region. Transformed areas are represented by rural housing (communal areas), industry (buildings), agriculture, urban areas, roads, and alien plant cover, while degraded areas are representative of land under grazing and impacted by past intensive agriculture. On consultation of available</p>					

land use data (Eastern Cape Biodiversity conservation Plan, the present cumulative impacts are considered moderate-high as the percentage cover of transformed and degraded terrestrial areas is relatively extensive when compared to the percentage natural plant cover. Potential future cumulative impacts must also be considered which are based on potential future development scenarios. These development scenarios should be based on available municipal Spatial Development Frameworks (SDF) as the SDF guides development within the municipal domain. Municipal Spatial Development Frameworks are supposed to integrate biodiversity into the SDF planning process, as has been done for the Buffalo City Metropolitan Municipality SDF (2009). Consequently, if future spatial planning takes into consideration the municipal Spatial Development Framework, as well as the Eastern Cape Biodiversity Conservation Plan Critical Biodiversity Areas Map (which requires further fine-scale mapping, which has been done via this study), Strategic Environmental Assessments, State of Environment Reports and Environmental Management Frameworks (e.g. the Coastal EMF from Cannon Rocks to Kei Mouth) etc., long term cumulative impacts of potential future developments should not cause significant environmental damage with regards to biodiversity loss.	
Degree of potential irreplaceable loss of resources	1
The potential for irreplaceable loss of resources is low. The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.	
Prioritisation Factor	1.17
Final Significance	-14.58

8.2.3.7 Modification of flow dynamics and flow patterns (Hydrological Processes)

During the operational phase (pre-mitigation), modifications in hydrological processes would be equivalent to the construction phase impacts. In other words, blanket development without considering natural drainage patterns and flow dynamics, as well as the vegetation buffer should result in impacts that are similar (i.e. not significantly different) during both phases.

Disturbance of wetlands is regulated through the National Water Act, in that a water use license application must be processed through the Department of Water Affairs to disturb any wetland within 500m of a proposed development/disturbance.

Impact Name	<i>Modification of flow dynamics and flow patterns (hydrological processes)</i>				
Alternative	<i>Proposed Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	4	3
Extent of Impact	3	3	Reversibility of Impact	4	4
Duration of Impact	4	4	Probability	5	3
Environmental Risk (Pre-mitigation)					-18.75
Mitigation Measures					
An appropriate storm-water management scheduling programme should be indicated to ensure that the storm-water infrastructure is properly maintained in the long term (operational phase to be undertaken by the Municipality).					
Environmental Risk (Post-mitigation)					-10.5
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1

No public responses have been received relating to this impact.	
Cumulative Impacts	2
<p>The potential cumulative impacts consider the existing impacts in the immediate catchment (past cultivation, livestock grazing, rural homesteads, roads etc.) that currently modify flow dynamics and flow patterns. Signs of erosion were evident above dam 12, while cultivation furrows and uneven ground increase soil saturation levels in the landscape. The most significant land use activity with regards to this impact is the establishment of numerous dams, established as far back as 1939 and possibly earlier than 1939. These dams hold surface water thereby reducing seepage into the Tutura River and other low lying streams. Cumulative impacts are considered moderate because no signs of gully erosion were present, but the occurrence of numerous dams impacts hydrology. The establishment of a high intensive housing development is considered to potentially have a high impact on surface and groundwater hydrological processes due to a significant increase in hard surfaces.</p> <p>As per impact 8.2.2.3, the potential cumulative impacts within the surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera) demonstrates moderate-high land use impacts which will potentially have a Medium-high impact on hydrological processes i.e. loss of vegetation in the catchment areas and along rivers and streams, will increase the potential for soil erosion and, in turn, sedimentation and increased turbidity in rivers and streams due to modified flow dynamics and flow patterns (i.e. increased surface water volume and flow velocities). An increase in alien plant cover along rivers is also another impact that can exacerbate this impact due to destabilisation of stream banks. According to unpublished data from a current Water Research Commission project, the overall Present Ecological State of the Gxulu River (upper reach), into which the Tutura River flows, is Class B (Largely Natural), while a lower reach of the Gxulu River is Class C (Moderately Modified). The Ncera River is Largely Natural, and the Mlele and Mcantsi rivers, are Moderately Modified. The current cumulative impacts can therefore be considered to have a Low to Medium cumulative impact.</p> <p>Potential future cumulative impacts should remain Low to Medium, if the municipal Spatial Development Framework is complied with i.e. future development in these catchments reflects predominantly a rural environment.</p>	
Degree of potential irreplaceable loss of resources	1
<p>The potential for irreplaceable loss of resources is low. The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.</p>	
Prioritisation Factor	1.17
Final Significance	-12.25

Impact Name	Modification of flow dynamics and flow patterns (hydrological processes)				
Alternative	Watercourse Alternative				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	2	Reversibility of Impact	3	3
Duration of Impact	4	4	Probability	5	3
Environmental Risk (Pre-mitigation)					-15
Mitigation Measures					
An appropriate storm-water management scheduling programme should be indicated to ensure that the storm-water infrastructure is properly maintained in the long term (operational phase to be undertaken by the Municipality).					
Environmental Risk (Post-mitigation)					-8.25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider the existing impacts in the immediate catchment (past cultivation, livestock grazing, rural homesteads, roads etc.) that currently modify flow dynamics and flow patterns. Signs of erosion were evident above dam 12, while cultivation furrows and uneven ground increase soil saturation levels in the landscape. The</p>					

<p>most significant land use activity with regards to this impact is the establishment of numerous dams, established as far back as 1939 and possibly earlier than 1939. These dams hold surface water thereby reducing seepage into the Tutura River and other low lying streams. Cumulative impacts are considered moderate because no signs of gully erosion were present, but the occurrence of numerous dams impacts hydrology. The establishment of a high intensive housing development is considered to potentially have a high impact on surface and groundwater hydrological processes due to a significant increase in hard surfaces.</p> <p>As per impact 8.2.2.3, the potential cumulative impacts within the surrounding quaternary catchments (R40A with key rivers Gxulu and Ncera) demonstrates moderate-high land use impacts which will potentially have a Medium-high impact on hydrological processes i.e. loss of vegetation in the catchment areas and along rivers and streams, will increase the potential for soil erosion and, in turn, sedimentation and increased turbidity in rivers and streams due to modified flow dynamics and flow patterns (i.e. increased surface water volume and flow velocities). An increase in alien plant cover along rivers is also another impact that can exacerbate this impact due to destabilisation of stream banks. According to unpublished data from a current Water Research Commission project, the overall Present Ecological State of the Gxulu River (upper reach), into which the Tutura River flows, is Class B (Largely Natural), while a lower reach of the Gxulu River is Class C (Moderately Modified). The Ncera River is Largely Natural, and the Mlele and Mcantsi rivers, are Moderately Modified. The current cumulative impacts can therefore be considered to have a Low to Medium cumulative impact. Potential future cumulative impacts should remain Low to Medium, if the municipal Spatial Development Framework is complied with i.e. future development in these catchments reflects predominantly a rural environment.</p>	
Degree of potential irreplaceable loss of resources	1
<p>The potential for irreplaceable loss of resources is low. The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.</p>	
Prioritisation Factor	1.17
Final Significance	-9.63

8.2.3.8 Effluent pollution and solid waste pollution (Biodiversity Loss/Hydrological Processes)

Operational phase pollution impacts will relate to potential sewage impacts (dry pit latrines), pets, livestock, composting food crops and gardens, storm-water run-off and vehicular use (oil and fuel leakages). Pollution may be in the form of high nutrient loads (manure, sewage, faecal matter, composting) and *Escherichia coli*. Due to the high density nature of this development type and the associated number of dry pit latrines etc., as well as the potential for solid waste to be dispersed within the development footprint (without management), the pollution impact is considered high pre-mitigation. Although sewage related pollution impacts should be lower during the construction phase (i.e. less ablution facilities), the other pollution types, as well as sewage pollution impacts, may potentially be felt outside of the development footprint. The key consequence score relates to Extent, which is scored a 3, because, if underground or surface water is contaminated by pollutants, it has the potential to impact beyond the site boundaries i.e. impacting on the Tutura River through seepage.

Although vegetation, riparian and wetland plants have a natural ability to biodegrade pollutants, the capacity to biodegrade these pollutants will be exceeded if appropriate measures are not put into effect during both the construction and operational phase due to the size of the housing development. Movement through the sediment also allows for biodegradation.

Effluent pollution and solid waste pollution is regulated through the National Water Act and National Environmental Management: Waste Act. Disturbance of rivers and wetlands is regulated through the National Water Act, in that a water use license application must be processed through the Department

of Water Affairs to disturb any river or any wetland within 500m of a proposed development/disturbance.

Impact Name	<i>Effluent pollution and solid waste pollution (biodiversity loss/hydrological processes)</i>				
Alternative	<i>Proposed Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	4	2
Extent of Impact	3	2	Reversibility of Impact	3	3
Duration of Impact	4	3	Probability	5	3
Environmental Risk (Pre-mitigation)					-17.5
Mitigation Measures					
<ul style="list-style-type: none"> • Compilation and implementation of Waste Management Conditions (Specifications) as part of the Environmental Management Programme (EMP) to prevent accidental leakage of pollutants e.g. oil, fuel, cement, sewage, storm water effluent. An EMP is required by the NEMA Environmental Impact Assessment regulations. • The housing development to be serviced by the Buffalo City Metropolitan Municipality waste disposal services department. • Buffalo City Metropolitan Municipality to investigate the establishment of a waste recycling depot to service this region. Any waste disposal site to be located outside of the 1:100 year flood line of the Tutura River, or at least 100 m from the water's edge of the Tutura River, including the drainage areas (non-perennial streams), as indicated by the recommended buffers, which will form part of the CEMP. • Buffalo City Metropolitan Municipality to ensure that the sewage reticulation, water and storm-water infrastructure is appropriately maintained and upgraded in the long term. Sewage wastewater storage and disposal sites will need to be located above the 1:100 year flood line or at least 100m from the water's edge of the Tutura River, including the drainage areas (non-perennial streams) , as indicated by the recommended buffers which will form part of the CEMP. In terms of dry pit latrines (ablution facilities), these should also be located outside of the 1:100 year flood line. The DWA should be consulted to determine if this is an adequate buffer. 					
Environmental Risk (Post-mitigation)					-7.5
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider the existing impacts in the catchment, namely the potential for polluted storm water run-off from vehicles and Escherichia coli contamination from surrounding settlements (i.e. sewage contamination). Currently, these impacts are considered Low. According to unpublished data from a current Water Research Commission project, the Present Ecological State of the Gxulu River (upper reach), into which the Tutura River flows, is Class B (Largely Natural), while a lower reach of the Gxulu River is Class C (Moderately Modified). Final data on water quality is not available at this stage, and therefore, based on overall Present Ecological State, present cumulative impacts are potentially Low to Medium.</p> <p>Potential future cumulative impacts, based on future SDF development scenarios coupled with the proposed development, may result in High impact ratings if appropriate management / mitigation measures are not implemented i.e. pre-mitigation. However, if these are implemented the cumulative impact should remain Low (post mitigation).</p>					
Degree of potential irreplaceable loss of resources					1
<p>The potential for irreplaceable loss of resources is low.</p> <p>The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.</p>					
Prioritisation Factor					1.17
Final Significance					-8.75

Impact Name	<i>Effluent pollution and solid waste pollution (biodiversity loss/hydrological processes)</i>
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Alternative	<i>Watercourse Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	1	Reversibility of Impact	3	3
Duration of Impact	4	3	Probability	5	3
Environmental Risk (Pre-mitigation)					-16.25
Mitigation Measures					
<ul style="list-style-type: none"> • Compilation and implementation of Waste Management Conditions (Specifications) as part of the Environmental Management Programme (EMP) to prevent accidental leakage of pollutants e.g. oil, fuel, cement, sewage, storm water effluent. An EMP is required by the NEMA Environmental Impact Assessment regulations. • The housing development to be serviced by the Buffalo City Metropolitan Municipality waste disposal services department. • Buffalo City Metropolitan Municipality to investigate the establishment of a waste recycling depot to service this region. Any waste disposal site to be located outside of the 1:100 year flood line of the Tutura River, or at least 100 m from the water's edge of the Tutura River, including the drainage areas (non-perennial streams), as indicated by the recommended buffers, which will form part of the CEMP. • Buffalo City Metropolitan Municipality to ensure that the sewage reticulation, water and storm-water infrastructure is appropriately maintained and upgraded in the long term. Sewage wastewater storage and disposal sites will need to be located above the 1:100 year flood line or at least 100m from the water's edge of the Tutura River, including the drainage areas (non-perennial streams) , as indicated by the recommended buffers which will form part of the CEMP. In terms of dry pit latrines (ablution facilities), these should also be located outside of the 1:100 year flood line. The DWA should be consulted to determine if this is an adequate buffer. 					
Environmental Risk (Post-mitigation)					-6.75
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider the existing impacts in the catchment, namely the potential for polluted storm water run-off from vehicles and Escherichia coli contamination from surrounding settlements (i.e. sewage contamination). Currently, these impacts are considered Low. According to unpublished data from a current Water Research Commission project, the Present Ecological State of the Gxulu River (upper reach), into which the Tutura River flows, is Class B (Largely Natural), while a lower reach of the Gxulu River is Class C (Moderately Modified). Final data on water quality is not available at this stage, and therefore, based on overall Present Ecological State, present cumulative impacts are potentially Low to Medium.</p> <p>Potential future cumulative impacts, based on future SDF development scenarios coupled with the proposed development, may result in High impact ratings if appropriate management / mitigation measures are not implemented i.e. pre-mitigation. However, if these are implemented the cumulative impact should remain Low (post mitigation).</p>					
Degree of potential irreplaceable loss of resources					1
<p>The potential for irreplaceable loss of resources is low.</p> <p>The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.</p>					
Prioritisation Factor					1.17
Final Significance					-7.88

8.2.3.9 Disturbance of important ecological process areas (Biodiversity Loss)

During the construction and operation of the proposed housing development (pre-mitigation), faunal movement will be significantly restricted as this is a high density development proposal. However,

fauna, birds, amphibians (frogs) and invertebrates (wasps, butterflies etc.) are able to move to avoid areas of disturbance, although the extent (ha) of their habitat within the catchments will be reduced by the proposed housing development. Other processes, like nutrient cycling, pollination and soil formation, will also be significantly reduced with the removal of vegetation (habitat). Hydrological process impacts are assessed in Impacts 8.2.2.8, 8.2.2.9 and 8.2.2.10 above.

This impact is considered equivalent during both the construction and operational phases for the Proposed Layout because it is a high density development proposal and the site falls partly within a Critical Biodiversity Area and Fish Support Area. Even though the extent of housing and infrastructure during the construction phase will not be as widespread within the boundaries of the proposed development site compared with the operation phase (i.e. fully developed site), construction activities will probably be sufficient enough to restrict faunal movement and use within the site, while other ecological (e.g. pollination) and hydrological processes (ground and surface water flows) will be impacted on successively, as the construction footprint expands.

Impact Name	<i>Disturbance of important ecological process areas (biodiversity loss)</i>				
Alternative	<i>Proposed Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	4	4
Extent of Impact	4	3	Reversibility of Impact	4	3
Duration of Impact	4	4	Probability	5	4
Environmental Risk (Pre-mitigation)					-20
Mitigation Measures					
As per Impacts 8.2.2.3 to 8.2.2.10					
Environmental Risk (Post-mitigation)					-14
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider existing and potential future impacts within the sub-quaternary catchments (R40A with key rivers Gxulu and Ncera). Existing impacts (i.e. livestock grazing, roads, rural housing etc.) on the ecological processes of the proposed development site, is considered low as ecological processes are being maintained, albeit somewhat modified due to the degraded state of the site and the occurrence of numerous dams. Hydrological processes are however modified due to the occurrence of numerous dams.</p> <p>The proposed housing development will have a high impact on ecological processes within the proposed development site because it is a high density housing development. The potential for and degree of rural expansion in the future within the sub-quaternary catchments is considered low given that cultivation / agriculture has ceased rather than expanded, although the potential for future housing in the area is possible given that there are a number of rural communities with inadequate housing and associated infrastructure in the catchments. However, based on the municipal Spatial Development Framework (2009), the potential future cumulative impacts on ecological processes are assessed as Low because proposed developments within the area are low i.e. compliance with maintaining ecological corridors in terms of the municipal Spatial Development Framework and Eastern Cape Biodiversity Conservation Plan's Critical Biodiversity Areas (CBA) Map should not result in high cumulative impacts in the long term.</p> <p>As per impact 8.2.2.3, the potential cumulative impacts within the surrounding sub-quaternary catchments (R40A with key rivers Gxulu and Ncera) demonstrates moderate-high land use impacts which will potentially have a Medium impact on ecological processes. Refer to Impacts 8.2.2.8 – 8.2.2.10 for Present Ecological State and impacts relating to hydrological processes i.e. overall Low to Medium cumulative impacts.</p>					

Degree of potential irreplaceable loss of resources	1
The potential for irreplaceable loss of resources is low. The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.	
Prioritisation Factor	1.17
Final Significance	-16.33

Impact Name	<i>Disturbance of important ecological process areas (biodiversity loss)</i>				
Alternative	<i>Watercourse Alternative</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	4	2
Extent of Impact	2	2	Reversibility of Impact	3	3
Duration of Impact	4	4	Probability	5	3
Environmental Risk (Pre-mitigation)					-16.25
Mitigation Measures					
As per Impacts 8.2.2.3 to 8.2.2.10					
Environmental Risk (Post-mitigation)					-8.25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
<p>The potential cumulative impacts consider existing and potential future impacts within the sub-quaternary catchments (R40A with key rivers Gxulu and Ncera). Existing impacts (i.e. livestock grazing, roads, rural housing etc.) on the ecological processes of the proposed development site, is considered low as ecological processes are being maintained, albeit somewhat modified due to the degraded state of the site and the occurrence of numerous dams. Hydrological processes are however modified due to the occurrence of numerous dams.</p> <p>The proposed housing development will have a high impact on ecological processes within the proposed development site because it is a high density housing development. The potential for and degree of rural expansion in the future within the sub-quaternary catchments is considered low given that cultivation / agriculture has ceased rather than expanded, although the potential for future housing in the area is possible given that there are a number of rural communities with inadequate housing and associated infrastructure in the catchments. However, based on the municipal Spatial Development Framework (2009), the potential future cumulative impacts on ecological processes are assessed as Low because proposed developments within the area are low i.e. compliance with maintaining ecological corridors in terms of the municipal Spatial Development Framework and Eastern Cape Biodiversity Conservation Plan's Critical Biodiversity Areas (CBA) Map should not result in high cumulative impacts in the long term.</p> <p>As per impact 8.2.2.3, the potential cumulative impacts within the surrounding sub-quaternary catchments (R40A with key rivers Gxulu and Ncera) demonstrates moderate-high land use impacts which will potentially have a Medium impact on ecological processes. Refer to Impacts 8.2.2.8 – 8.2.2.10 for Present Ecological State and impacts relating to hydrological processes i.e. overall Low to Medium cumulative impacts.</p>					
Degree of potential irreplaceable loss of resources					1
The potential for irreplaceable loss of resources is low. The ecological impact is reversible i.e. the ecological condition of the site would improve with time and biodiversity would be restored to some degree, although not to the original condition prior to human settlement.					
Prioritisation Factor					1.17
Final Significance					-9.63

8.2.3.10 Impact on Community Structure

The establishment of a community settlement may impose certain risks related to increased crime and health issues to the local community. Local residents and businesses in close proximity to the proposed development may be vulnerable to acts of crime during the operational phase of the project. It is therefore recommended that community structures or residence associations be established which should work in collaboration with the local police to address acts of crime. In addition to this, the increase in the number of people living in an area may increase the spread of diseases, particularly the spread of sexually transmitted diseases (HIV/AIDS, etc.). In order to reduce the likelihood of this, it is recommended that an investigation into the feasibility of establishing a local clinic within/in close proximity to the proposed development, which could act as a training, treatment and distribution centre for the provision of health care services.

It is anticipated that, after the implementation of the recommended mitigation measures, the impact will have a LOW negative significance rating.

Impact Name	<i>Impact on community structure</i>				
Alternative	<i>All Alternatives</i>				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	3	Reversibility of Impact	3	2
Duration of Impact	4	4	Probability	3	2
Environmental Risk (Pre-mitigation)					-9.75
Mitigation Measures					
<ul style="list-style-type: none"> Establishment of community structures or residence associations in collaboration with the local police to set up procedures for reporting and addressing acts of crime within the local community. It is recommended that an investigation into the feasibility of establishing a local clinic takes place. A local clinic may play a vital role in providing information about the spread of sexually transmitted diseases, such as Hiv/Aids. 					
Environmental Risk (Post-mitigation)					-5.5
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
No public responses have been received relating to this impact.					
Cumulative Impacts					2
The establishment of a community settlement may impose certain risks related to increased crime and health to the local community. Local residents and businesses in close proximity to the proposed development may be vulnerable to acts of crime during the operational phase of the project. It is therefore recommended that community structures or residence associations be established which should work in collaboration with the police to address acts of crime. In addition to this, the increase in the number of people living in an area may increase the spread of diseases, particularly the spread of sexually transmitted diseases (Hiv/Aids, etc.). In order to reduce the likelihood of this, it is recommended that an investigation into the feasibility of establishing a local clinic within/in close proximity to the proposed development.					
Degree of potential irreplaceable loss of resources					1
Due to the nature of the impact, it is unlikely that it will result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-6.42

9. COMPARATIVE ASSESSMENT OF ALTERNATIVES BASED ON OVERALL SIGNIFICANCE RATINGS

Table 18 provides a summary of the significance ratings of all the identified impacts after the successful implementation of mitigation measures and impact prioritisation, based on the findings in Section 8.2. The significance ratings are utilised to assist in identifying the most suitable alternatives applicable to the project.

9.1 WATERCOURSE ALTERNATIVE

In terms of the two alternatives, namely the Proposed Alternative and the alternative of avoiding all sensitive wetland and aquatic areas (Watercourse Alternative), it can be observed that the Wetland Alternative is preferred in terms of overall significance rating. The main contributing factors to the preference of this alternative include physical wetland destruction, loss of vegetation, loss of habitat function, ecosystem services and biodiversity, modification of flow dynamics and patterns, and disturbance of important ecological processes.

The specialist studies concluded that the Tutura River riparian area and 50 m buffer zone should be implemented, including the other buffers (as indicated in Figure 23); which should form part of the ecological corridor and Gxulu quaternary catchment's Fish Support Area. The overall ecological impact of the proposed housing development should have a Low impact if these recommended buffers and the recommended mitigation measures discussed in Section 8.2 are implemented (summarized in Table 19 below).

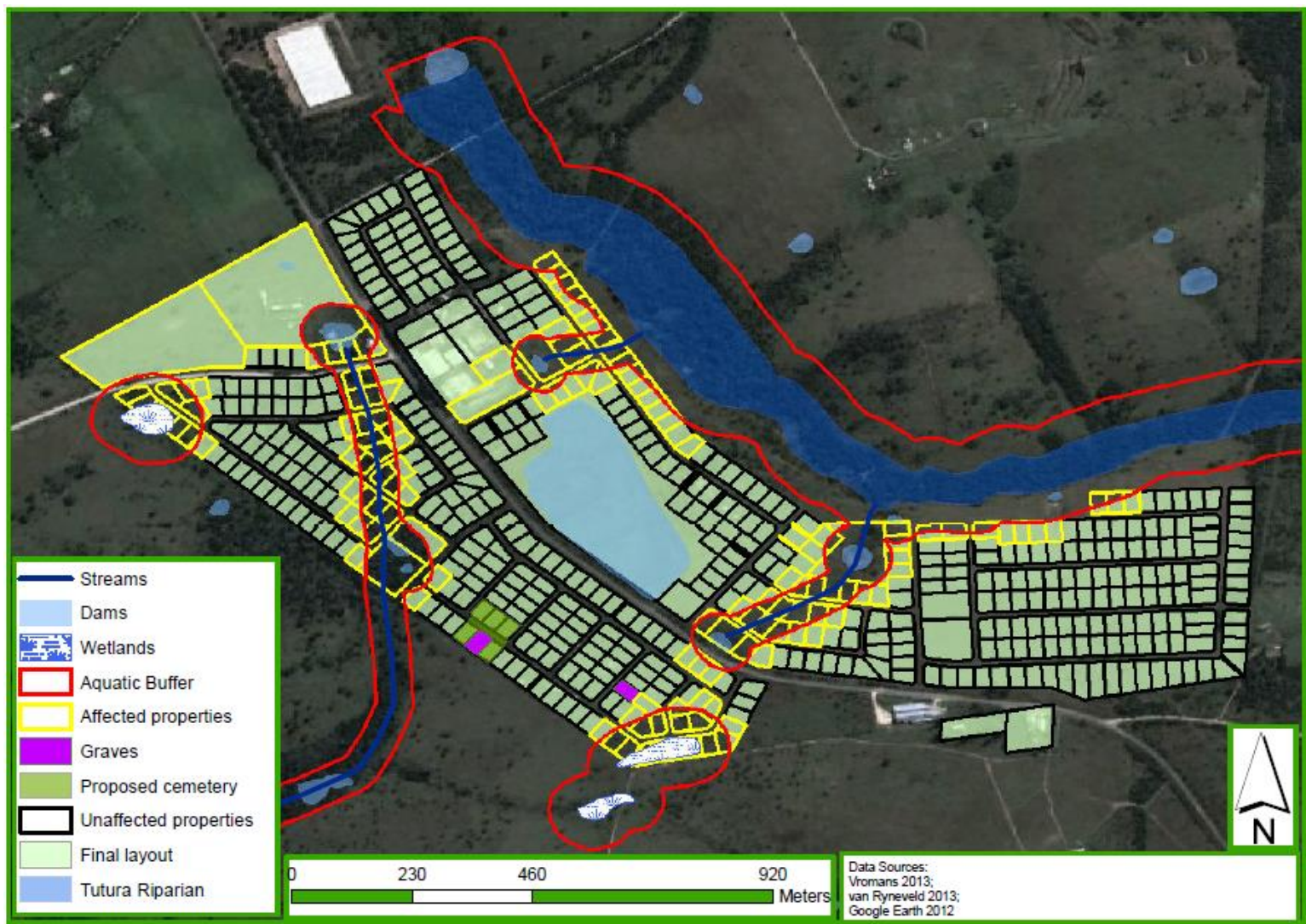


Figure 23: The final proposed layout

9.2 Consideration of the No-Go Alternative

Due to the past and current land use practices, the landscape surrounding the current wetland/riparian areas were found in a degraded state. The numerous dams within the study site have modified the hydrology of the area, since the dams hold surface water for extended periods. However, the three wetlands are sited upslope of these dams and are therefore not significantly impacted by this change in hydrology.

The three natural wetlands were assessed as having a Present Ecological State of Largely Natural, meaning that the wetlands have been modified to some degree, but that only a small change in the habitat and biota may have taken place and that the ecosystem functions are essentially unchanged. These wetlands are considered to be of moderate ecological importance or sensitivity, but of low hydrological and anthropogenic importance.

However, the site is extensively impacted by past agricultural and agro-industrial practices and is also impacted by large portions of land being overgrown with invasive species, which does not seem to be actively managed. There are also minor pockets of informal residential units that impact on the current natural environment, which could expand over time to become larger informal settlements that would likely be formalised by the BCMM. The site is also used for grazing by the local communities. The proposed buffers (see specialist report in Appendix C) around the natural wetlands, drainage areas, river and riparian areas will act as an open space system that ensures connectivity with the surrounding natural environment, from an ecological and hydrological process perspective. These buffers will help ensure that the impacts of developing the site will most likely remain low.

As such, if the No-Go alternative was implemented, the impacts associated with this development and as detailed in the sections above, would not take place. However, the site would continue to not be managed effectively from an ecological point of view. Furthermore, the proper conservation of graves and the proper documentation and conservation of old buildings and heritage features would also not take place.

Table 18: Impact Matrix

Phase	Impact	Significance Rating	
		Proposal Layout	Watercourse Alternative
Planning and Design	Job Creation	10.00	10.00
Construction	Job Creation	13.30	13.30
	Nuisance due to dust	-2.50	-2.50
	Loss of vegetation	-17.50	-14.58
	Spread of alien invasive plant species (Biodiversity Loss)	-6.30	-6.30
	Loss and degradation of different habitat types (Biodiversity Loss)	-17.50	-16.04
	Loss of fauna (Biodiversity Loss)	-18.96	-14.58
	Loss of invertebrates (Biodiversity Loss)	-17.50	-13.13
	Modification of flow dynamics and flow patterns (Hydrological Processes)	-12.25	-9.63
	Topsoil loss, soil erosion and sediment deposition (Hydrological Processes)	-20.42	-7.88
	Effluent pollution and solid waste pollution (Biodiversity Loss/Hydrological Processes)	-8.75	-7.88
	Disturbance of important ecological process areas (Biodiversity Loss)	-16.33	-9.63
	Soil pollution	-3.50	-3.50
	Geotechnical stability	-5.00	-5.00
	Noise	-5.25	-5.25
	Visual Impacts	-7.50	-7.50
	Traffic	-6.00	-6.00
	Fire Hazards	-5.50	-5.50
	Impacts on existing property/infrastructure	10.50	10.50
	Destruction of colonial period structures	-8.17	-8.17
	Impact on human graves	-3.50	-3.50
Discovery of sub-surface archaeological finds	-6.67	-6.67	
Operational	Visual Impacts	-7.00	-7.00
	Increased fire risk	-8.25	-8.25

Increased waste generation	-7.50	-7.50
Loss of vegetation	-17.50	-14.58
Spread of alien invasive plant species (Biodiversity Loss)	-6.13	-6.13
Loss and degradation of different habitat types (Biodiversity Loss)	-17.50	-14.58
Modification of flow dynamics and flow patterns (Hydrological Processes)	-12.25	-9.63
Effluent pollution and solid waste pollution (Biodiversity Loss/Hydrological Processes)	-8.75	-7.88
Disturbance of important ecological process areas (Biodiversity Loss)	-16.33	-9.63
Impact on community structure	-6.42	-6.42
Total Significance Rating	-262.93	-211.04

10. ENVIRONMENTAL MANAGEMENT PROGRAMME

Regulation 31 (p) of GN R. 543 requires that an EIAR must contain an Environmental Management Programme (EMPR) that complies with Regulation 32 of GN R. 543. An EMPR has been compiled according to the specifications of the above mentioned regulations and has been included in Appendix F.

11. ASSUMPTIONS AND LIMITATIONS

It is assumed that all information provided by the applicant, the technical team and specialists that informed the environmental consultants and the information in this report is reliable, accurate and up to date.

It is also assumed that the applicant will comply with all legislation pertaining to the activities of this proposed project and that all permits and licences that may be required will be identified and applied for prior to commencement of construction activities.

12. ENVIRONMENTAL IMPACT STATEMENT

The proposed Sunny South Housing Development requires environmental authorization from the ECDEDEAT. The current conditions that the beneficiaries are living under are undesirable and have, consequently, in combination with BCMM's need to provide formal housing infrastructure to growing communities which currently reside in informal dwellings, has led to the initiation of the proposed development.

Two alternatives, including the Proposed Alternative (see Figure 2) and the Watercourse Alternatives (see Figure 23), were identified during the Scoping phase of this development and these were comparatively assessed in greater detail during the EIA phase.

Although the proposed development will serve to improve the current state of living, the construction and operational phases are likely to significantly transform the surrounding environment posing risks due to the scale and activities to be undertaken.

During the EIA phase, several specialist studies were undertaken in order to determine impacts of the proposed development on the environment. The following specialist studies were conducted:

- Wetland and Ecological Assessment;
- Heritage Impact Assessment, and;
- Geotechnical Investigations.

EIMS and the specialist studies identified the impacts as listed in Table 18. Each of the impacts identified were assessed and given a significance rating as stated in Section 8.2. Regarding the significance of the impacts identified, the following can be concluded:

- During the Planning and Design Phase, only one impact was identified – Job Creation- and it is anticipated that this will have a MEDIUM positive significance.
- The impacts anticipated to occur during the construction phase range from HIGH to LOW negative significance rating that, in certain cases, can possibly be reduced to a MEDIUM and LOW negative rating with the successful implementation of suggested mitigation measures.
- From a socio-economic point of view, Job Creation during the construction phase will have a MEDIUM positive significance.
- The impacts anticipated to occur during the operation phase range from HIGH to LOW negative significance rating that, in certain cases, can possibly be reduced to a MEDIUM and LOW negative rating with the successful implementation of suggested mitigation measures.
- The Ecological and Wetland/Aquatic Impact Assessment found that there were three natural wetlands and three natural drainage areas, including numerous dams, located within and surrounding the proposed development site. The site assessment confirmed that the proposed development site is highly degraded and, as a result, of relatively low biodiversity value. The Tutura River riparian area and 50 m buffer zone should be implemented, including the other buffers (as indicated in Figure 23); which should form part of the ecological corridor and Gxulu quaternary catchment's fish support area (as per the mitigation measures summarised below). Legislative requirements triggered by the proposed development, besides the Scoping and Environmental Impact Assessment in terms of the National Environmental Management Act (107 of 1998), include:
 - Water use license application for the proposed development as it is within 500 m of three wetlands (in terms of Section 21(c) and (i) of the National Water Act (36 of 1998). In terms of sewage reticulation, if relevant, the National Water Act will need to be complied with in terms of ensuring that sewage wastewater storage and disposal sites will need to be located above the 1:100 year flood line or at least 100 m from the Tutura River, as well as the drainage areas (non-perennial streams). Further, in terms of section 144, the developer (Municipality) of the proposed settlement will need to determine the 1:100 year flood line of the Tutura River, as well as the drainage areas.
 - Waste Management Conditions (Specifications), as part of the Construction and Operational Environmental Management Plan, will need to be compiled that are aligned with the general measures of the National Environmental Management: Waste Management Act (59 of 2008) Act, where applicable, as part of the Environmental Impact Assessment Report.
 - Waste generated during construction must be disposed of at a licensed waste disposal site, which may still be licensed in terms of the Environmental Conservation Act (73 of 1989), as per Section 81 of the National Environment: Waste Management Act (NEMWA), or licensed in terms of NEMWA.

- The developer (Buffalo City Metropolitan Municipality) will be responsible for clearing alien invasive plants within the development footprint and immediate surrounds, because all municipalities are responsible for alien clearing and management on municipal owned land (National Environmental Management: Biodiversity Act, 10 of 2004).
- The Wetland and Ecological Assessment concluded that the Watercourse Alternative (see Figure 23) has a lower impact on the ecology of the study site, and should therefore be implemented.
- The Heritage Impact Assessment found human graves and colonial period structures within the development site. It was found that the impact on human graves will have a LOW negative significance if the recommended mitigation measures are implemented (see Table 19). The impact on the colonial period structure will have a MEDIUM negative significance. Furthermore, it is recommended that the developer considers the creation of a small cemetery area, as per the suggested layout in Figure 23, and that the community be consulted with regards to the relocation/*in situ* conservation of the grave sites in consultation with the Eastern Cape Provincial Heritage Resources Authority (ECPHRA).
- From the comparative assessment of the alternatives (see Table 18), derived from the summation of the significance ratings, it was concluded that the Watercourse Alternative (final significance rating of -211.04) would be most suitable from an environmental perspective in comparison to the Proposed Alternative (final significance rating of -262.93).
- The relevant mitigation measures identified have been incorporated into the EMPR (Appendix F). A summary of these mitigation measures are included in Table 19.

Table 19: Recommended mitigation measures

Phase	Impact	Mitigation Measures
Planning and Design	Job Creation	<ul style="list-style-type: none"> It is recommended that the beneficiary areas benefit from the job creation as much as possible.
	Job Creation	<ul style="list-style-type: none"> It is recommended that the beneficiary areas benefit from the job creation as much as possible.
Construction	Nuisance due to dust	<ul style="list-style-type: none"> Ensure stockpiles are adequately protected from wind and that regular spraying of exposed soils occurs to minimise dust generation
	Loss of vegetation	<ul style="list-style-type: none"> Removal of vegetation within the construction and development footprint only. Rehabilitation of disturbed areas with indigenous plants. Compilation and implementation of an Environmental Management Programme (EMP), with rehabilitation plan, that indicates method statements and specifications in this regard. An EMP is required by the NEMA Environmental Impact Assessment regulations. Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. During the operational phase, the Municipality should encourage homeowners to practice indigenous gardening, where appropriate i.e. where food crop gardens or livestock activities are not being practised by a landowner.
	Spread of alien invasive plant species (Biodiversity Loss)	<ul style="list-style-type: none"> Compilation and implementation of an Environmental Management Programme (EMP), with rehabilitation plan, that provides specifications with regards to alien clearing and management. (NOTE: Any municipal owned land must have an alien management control plan in place in terms of the NEMBA). An EMP is required by the NEMA Environmental Impact Assessment regulations. Rehabilitation will be required within the construction footprint. Alien plants growing within the construction area must be removed during the construction period by the Contractor, and alien clearing must be implemented by the municipality during the operational phase. Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation.
	Loss and degradation of different habitat types (Biodiversity Loss)	<ul style="list-style-type: none"> Removal of vegetation habitat within the construction and development footprint only Rehabilitation of construction footprints or disturbed areas. Compilation and implementation of an Environmental Management Programme (EMP) that indicates method statements and specifications with regards to the above. An EMP is required by the NEMA Environmental Impact Assessment regulations. Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation. Waste Management Conditions to designate an area for the construction camp (which includes ablution facilities, storage of hazardous wastes, maintenance stations etc.) at least 100 m away from the Tutura River, streams, drainage areas, dams and wetlands. Waste Management Conditions to identify procedures for solid waste disposal (e.g. bins, no littering or burning policy) and the maintenance of ablution facilities, including the disposal of liquid and hazardous waste at a licensed waste disposal site. Waste Management Conditions (Specifications) to ensure that no re-fuelling of construction vehicles or maintenance activities occur within 100 m of the Tutura River, streams, drainage areas, dams and wetlands. Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation.
	Loss of fauna (Biodiversity Loss)	<ul style="list-style-type: none"> As per Impact 8.2.2.3 to 8.2.2.5

	<ul style="list-style-type: none"> • During the Construction Phase, no poaching or killing of wild animals must be permitted by labour. This should be included as a specification in the Construction Environmental Management Plan.
Loss of invertebrates (Biodiversity Loss)	<ul style="list-style-type: none"> • As per Impact 8.2.2.3 to 8.2.2.5
Modification of flow dynamics and flow patterns (Hydrological Processes)	<ul style="list-style-type: none"> • The new roads and road crossings, depicted in Figure 8 of Appendix C, must be appropriately designed and the most suitable type of crossing must be determined (e.g. low flow crossing or culvert, dimensions, erosion prevention measures etc.) to ensure that natural flow is not disturbed during periods of seasonal surface flow (given these are indicated as non-perennial streams in the South African Topographical data) and potential flood events, as well as seepage, including preventing potential erosion, sedimentation and turbidity impacts. The 1:100 year flood line (which takes into consideration predicted future climate change impacts) must be determined to inform the type and design of crossings. • Compilation and implementation of a storm-water management and rehabilitation plan with specifications to reduce soil erosion (e.g. rehabilitation specifications, slope stabilisation, swales, gabions etc.), as part of an Environmental Management Programme (EMP). An EMP is required by the NEMA Environmental Impact Assessment regulations. • The detailed storm-water management plan must include the delineation of the 1:100 year flood line for the natural drainage areas (non-perennial streams) and the Tutura River, to be undertaken by a Hydraulic Engineer. • If possible, the storm-water management plan should include measures to reduce effluent discharge into aquatic resources e.g. storm-water traps. • An appropriate storm-water management scheduling programme should be indicated to ensure that the storm-water infrastructure is properly maintained in the long term (operational phase to be undertaken by the Municipality). • Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation.
Topsoil loss, soil erosion and sediment deposition (Hydrological Processes)	<ul style="list-style-type: none"> • As per Impacts 8.2.2.3 to 8.2.2.8. • As part of the Environmental Management Programme, specifications with regards to topsoil removal and stockpiling must be indicated in order to reduce this impact and to ensure that topsoil is re-used in the rehabilitation process (i.e. loss of topsoil is not permanent).
Effluent pollution and solid waste pollution (Biodiversity Loss/Hydrological Processes)	<ul style="list-style-type: none"> • Compilation and implementation of a Waste Management Programme as part of the Environmental Management Programme (EMP) to prevent accidental leakage of pollutants e.g. oil, fuel, cement, sewage, storm water effluent. An EMP is required by the NEMA Environmental Impact Assessment regulations. • The Waste Management Programme to designate an area for the construction camp (which includes ablution facilities, storage of hazardous wastes, maintenance stations etc.) at least 100 m away from the Tutura River, streams, drainage areas, dams and wetlands. • The Waste Management Programme to identify procedures for solid waste disposal (e.g. bins, no littering or burning policy) and the maintenance of ablution facilities, including the disposal of liquid and hazardous waste at a licensed waste disposal site. • The Waste Management Programme to ensure that no re-fuelling of construction vehicles or maintenance activities occur within 100 m of the Tutura River, streams, drainage areas, dams and wetlands. • Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation.
Disturbance of important ecological process areas (Biodiversity Loss)	<ul style="list-style-type: none"> • As per Impacts 8.2.2.3 to 8.2.2.10
Soil pollution	<ul style="list-style-type: none"> • Ensure all site personnel have been trained regarding the use and disposal of hazardous substances. Spill procedures must be in place in case of an accidental spill. Ensure all machinery and vehicles on site are regularly inspected for leaks. The necessary spill materials must be available on site. All waste on site must be disposed of in the correct manner.

<p>Geotechnical stability</p>	<ul style="list-style-type: none"> • Due to the potentially problematic soil conditions, the recommended foundation type throughout the entire development is stiffened rafts (H1-2 conditions). • Clear and grub all organic material (approximately 100mm of surficial soil). • No structures should be placed on uncontrolled fill (a competent contractor should be able to recognise uncontrolled fill and be aware of the problems associated with founding structures on uncontrolled fill). Uncontrolled fill should be cut to spoil or as directed by the engineer. • Localised depressions in the topography requiring filling should be filled with suitable local or imported material and compacted to the same degree as the surrounding soil. • Do not try to compact saturated soil. Rather remove and replace. • The finished floor level of all houses should be a minimum of 150mm above final ground level to prevent flooding. • Foundations should be inspected by the engineer's representative to assess founding conditions, such as soil types, consistency in density and moisture levels. • The ponding of storm water around the exterior of houses can be avoided by constructing a 1m wide a concrete apron with a 10% fall away from the house. • Road construction should be carried out according to SABS 1200 or COLTO 3000 specifications. <p>Design and construction of stormwater drainage should be carried out according to SABS 1200LE or COLTO 2000 specifications.</p>
<p>Noise</p>	<ul style="list-style-type: none"> • All activities should comply with the approved construction schedule to ensure no noise disturbance occurs outside of working hours. All residents within close vicinity to the site should be notified if working hours are to be extended. During construction, the contractor shall endeavour to keep noise generating activities to a minimum.
<p>Visual Impacts</p>	<ul style="list-style-type: none"> • Areas that area to be rehabilitated are to be rehabilitated (using vegetation appropriate to the specific area) in such a way as to resemble the natural environment prior to construction. Landscaping should occur to ensure that the development site is visually pleasing. • The colour of paint chosen for the top structures should be one that blends in with the surrounding environment (bright colours should be avoided).
<p>Traffic</p>	<ul style="list-style-type: none"> • All construction vehicles to abide by the construction schedule and ensure only approved access routes are used. • The contractor is to ensure adequate access to private properties. • Where obvious damage to the road infrastructure has occurred as a result of the project, repairs should be undertaken in accordance with the local municipality specifications and requirements.
<p>Fire Hazards</p>	<ul style="list-style-type: none"> • Contracting personnel must be well versed in fire and safety management procedures and activities to be established prior to commencement of the project. • Implement suitable material storage practices. • Implement fire hazard sensitive on- and offloading procedures. • Designate a site safety official and ensure that personal are adequately trained regarding fire hazards and procedures
<p>Impacts on existing property/infrastructure</p>	<ul style="list-style-type: none"> • Residents occupying informal houses must be relocated to a developed erf within the project site boundary and within close proximity to their existing residential dwellings.
<p>Destruction of colonial period structures</p>	<ul style="list-style-type: none"> • It is recommended that these structures be documented and conserved as much as possible. • If they are to be destroyed, a permit from ECPHRA will have to be obtained before this can occur.
<p>Impact on human graves</p>	<ul style="list-style-type: none"> • It is recommended that graves are conserved in situ and that the relevant beneficiaries be awarded that specific erf to avoid the relocation of the graves. • It is recommended that a community cemetery be developed within the area. • Where graves are to be relocated, it is recommended that they be relocated to the proposed community cemetery after extensive consultation with the families has been done.

<p>Discovery of sub-surface archaeological finds</p>	<ul style="list-style-type: none"> • 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. • Any substantial fossil remains (e.g. vertebrates, petrified wood) encountered during excavation should be reported to SAHRA for possible mitigation by a professional palaeontologist. • A paleontological site inspection be done by a qualified palaeontologist once the vegetation has been cleared during the early stages of construction in areas with a Moderate sensitivity rating for the occurrence of fossils. • The EAP of the project team should be made aware of the possible occurrence of fossils. If any fossils are recorded during initial field visits, a trained palaeontologist must be notified to assess the finds.
<p>Visual Impacts</p>	<ul style="list-style-type: none"> • Landscaping should be undertaken with as much locally indigenous species as possible and should be maintained in order to ensure that the visual impact is reduced. • Consideration should be given to the use of materials that would blend in with the surrounding landscape when viewed from prominent angles, e.g. roofing materials, colours, building design.
<p>Increased Fire Risk</p>	<ul style="list-style-type: none"> • It must be ensured that all fire fighting equipment and infrastructure is in place and fully functional by the time that a particular residential area within Sunny South is completed. • Community organisations and structures should be put in place or established (or the existing utilised) to ensure that emergencies and veld fires can be effectively reported and responded to timeously by the BCMM. • The BCMM must ensure that Sunny South is adequately covered in terms of fire fighting capabilities and capacity. • The conditions of the Veld and Forest Fire Act (Act No. 101 of 1998) must be effectively communicated to the community members and adhered to at all times.
<p>Increased waste generation</p>	<ul style="list-style-type: none"> • Provide waste bins in the vicinity of sensitive aquatic ecosystems to promote waste management. Regular clearing/maintenance of bins would be required. • Ensure that any rest stops and associated structures are not situated adjacent to riverine habitats
<p>Loss of vegetation</p>	<ul style="list-style-type: none"> • During the operational phase, the Municipality should encourage homeowners to practice indigenous gardening, where appropriate i.e. where food crop gardens or livestock activities are not being practised by a landowner.
<p>Operational</p> <p>Spread of alien invasive plant species (Biodiversity Loss)</p>	<ul style="list-style-type: none"> • Compilation and implementation of an Environmental Management Programme (EMP), with rehabilitation plan, that provides specifications with regards to alien clearing and management. (NOTE: Any municipal owned land must have an alien management control plan in place in terms of the NEMBA). An EMP is required by the NEMA Environmental Impact Assessment regulations. • Rehabilitation will be required within the construction footprint. • Alien plants growing within the construction area must be removed during the construction period by the Contractor, and alien clearing must be implemented by the municipality during the operational phase. • Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation.
<p>Loss and degradation of different habitat types (Biodiversity Loss)</p>	<ul style="list-style-type: none"> • Waste Management Conditions to designate an area for the construction camp (which includes ablution facilities, storage of hazardous wastes, maintenance stations etc.) at least 100 m away from the Tutura River, streams, drainage areas, dams and wetlands. • Waste Management Conditions to identify procedures for solid waste disposal (e.g. bins, no littering or burning policy) and the maintenance of ablution facilities, including the disposal of liquid and hazardous waste at a licensed waste disposal site. • Waste Management Conditions (Specifications) to ensure that no re-fuelling of construction vehicles or maintenance activities occur within 100 m of the Tutura River, streams, drainage areas, dams and wetlands. • Employment of an Environmental Control Officer to ensure compliance with the EMP and Record of Decision/Environmental Authorisation.
<p>Modification of flow dynamics and flow patterns (Hydrological Processes)</p>	<ul style="list-style-type: none"> • An appropriate storm-water management scheduling programme should be indicated to ensure that the storm-water infrastructure is properly maintained in the long term (operational phase to be undertaken by the

	Municipality).	
	Effluent pollution and solid waste pollution (Biodiversity Loss/Hydrological Processes)	<ul style="list-style-type: none"> • Compilation and implementation of a Waste Management Programme as part of the Environmental Management Programme (EMP) to prevent accidental leakage of pollutants e.g. oil, fuel, cement, sewage, storm water effluent. An EMP is required by the NEMA Environmental Impact Assessment regulations. • The housing development to be serviced by the Buffalo City Metropolitan Municipality waste disposal services department. • Buffalo City Metropolitan Municipality to investigate the establishment of a waste recycling depot to service this region. Any waste disposal site to be located outside of the 1:100 year flood line of the Tutura River, or at least 100 m from the water's edge of the Tutura River, including the drainage areas (non-perennial streams), as indicated by the recommended buffers (Figure 2d) which will form part of the CEMP. • Buffalo City Metropolitan Municipality to ensure that the sewage reticulation, water and storm-water infrastructure is appropriately maintained and upgraded in the long term. Sewage wastewater storage and disposal sites will need to be located above the 1:100 year flood line or at least 100m from the water's edge of the Tutura River, including the drainage areas (non-perennial streams)), as indicated by the recommended buffers (Figure 2d) which will form part of the CEMP.
	Disturbance of important ecological process areas (Biodiversity Loss)	<ul style="list-style-type: none"> • As per Impacts 8.2.2.3 to 8.2.2.10
	Impact on Community Structure	<ul style="list-style-type: none"> • Establishment of community structures or residence associations in collaboration with the local police to set up procedures for reporting and addressing acts of crime within the local community. • It is recommended that an investigation into the feasibility of establishing a local clinic takes place. A local clinic may play a vital role in providing information about the spread of sexually transmitted diseases, such as Hiv/Aids.

13. AUTHORITY CONSULTATION

The following steps will be undertaken to ensure authority consultation:

- The ECDEDEAT will be provided with a copy of the Draft EIR for distribution to other relevant organs of state and authorities, prior to placement for public review; and
- The Final EIAR will be submitted to the ECDEDEAT for review and decision making.

14. REFERENCE LIST

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