

Appendix D3 Civil Engineering Services Report



 **LEGACY** | ENVIRONMENTAL
MANAGEMENT
CONSULTING



DINOKENG WILDLIFE VETERINARY CENTER PROJECT

CIVIL ENGINEERING SERVICES REPORT

NOVEMBER 2021

REPORT COMPLETED FOR:



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1. INTRODUCTION

1.1. General

WEC-Consult (Pty) Ltd was approached by the *Endangered Wildlife Operation Centre (EWOC)* organisation, to act as consulting Civil Engineers for the planning of the Dinokeng Wildlife Veterinary Animal Care Centre; the proposed development.

The proposed development will consist of the construction of various animal conservation, care and enclosure facilities, including a new Veterinary Hospital. Provision for future expansion is also considered.

The purpose of this report is to provide an overview of the civil engineering aspects affecting this development and to discuss the required services for the development. This report should be read in conjunction with the application for NEMA approval.

1.2. Location of the Proposed Development

The applicable site comprises a region of Portion 6 of Ruimte-74 Farm indicated for development with an area of 30.0 Hectares. The location is accessed by gravel roads and approximately 70km north of Tshwane, Gauteng, along the N1 Freeway ($25^{\circ}14'55.75''S$, $28^{\circ}21'16.48''E$).

Geographically, the site is located within the Bela-Bela Local Municipality, just north of the Limpopo-Gauteng provincial border. The Bela-Bela Local Municipality is strategically positioned in the Waterberg District Municipality of the Limpopo province, sharing borders with Gauteng, Mpumalanga and North West provinces. The Pienaars River is also located approximately 3km to the West of the proposed site.

The location of the proposed development can be seen in Figure 1, on the following page.

1.3. Proposed Land Uses and Designations

The facilities and land uses of the proposed development are captured in Table 1.

Table 1: Area Schedule

Habitable Areas	Footprint	Animal Enclosures	Footprint	Other Zones	Footprint
Veterinary Hospital	3783 m ²	Rhino Boma-Paddock Holding	864 m ²	MEP Hub	255 m ²
Holding Area		Elephant Stockades	864 m ²	Future Expansion	30 255 m ²
Outdoor Aviary		Wild Dog Bonding Boma	317 m ²	5m Clearance Building Platforms	18 300 m ²
Theater Rooms		Cheetah Recovery Camp	1 144 m ²	Roads	5423 m ²
Offices		Small Animal Reproduction Area	216 m ²		
Reception		Buffalo Quarantine Boma	1 728 m ²	Total Ruimte Portion 6/74 Area	2 107 500 m ²
Manager's House	192 m ²	Horse Pen	314 m ²	Total Designated Site Area	342 857 m ²
Volunteer's Camp	120 m ²	Horse Stable	64 m ²		
Dining Hall, Kitchen & BOH	216 m ²	Horse Paddock	1 200 m ²	Zone Use: Agricultural - Animal Care Centre	11 277 m ²
Total =	4 311 m ²	Total =	6 711 m ²		

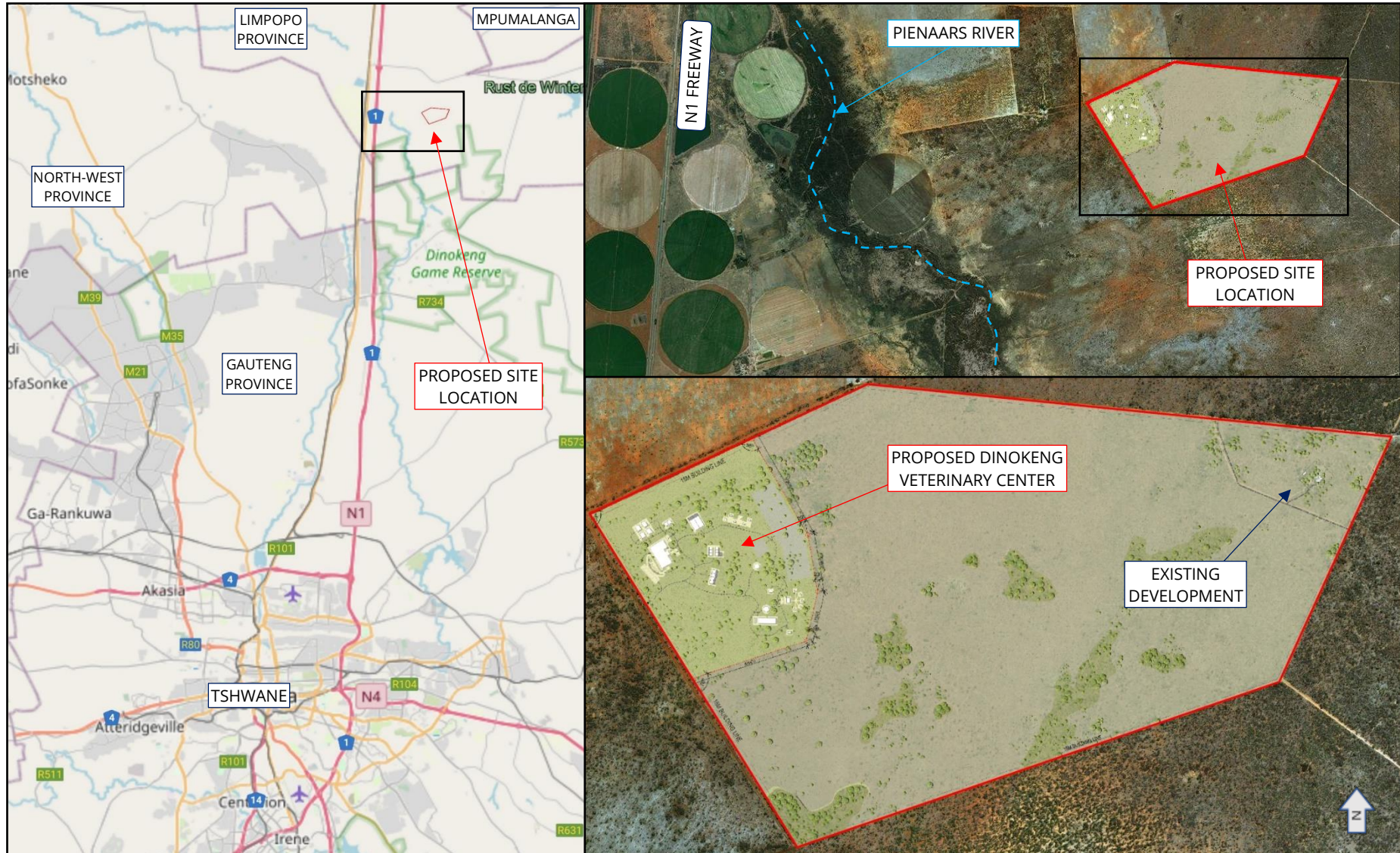


Figure 1: Proposed Development Locality Plan

1.4. Topography of the Existing Site

The proposed development site is situated within the catchment of the Pienaars River. The topography of the site slopes toward the Pienaars River, located approximately 3km to the West. Much of the surrounding area comprises of bosveld vegetation. Referring to Figure 2, the existing terrain of the plot can be described as sandy and flat, with scattered veld vegetation and grass across the entire terrain surface. From this figure, it shows that the proposed location is undeveloped, however, an existing development exists in the eastern corner of the plot.



Figure 2: Aerial Image of Proposed Location

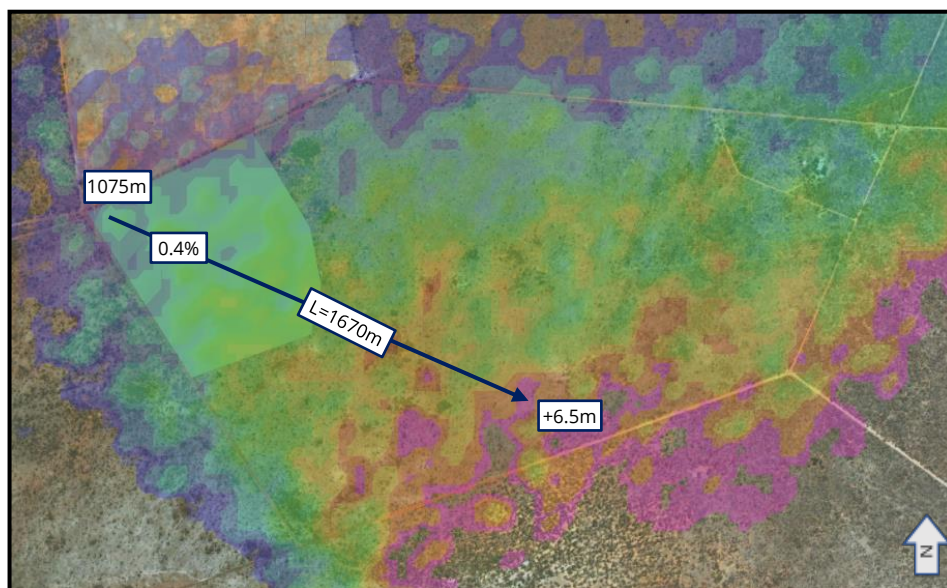


Figure 3: Elevation Map of Site

The elevation difference of the terrain is shown in Figure 3. Note that these are not surveyed elevations, but estimated surface elevations from available sources. From the location of the proposed development, a cross slope of approximately 0.4% stretches to the most elevated region of the plot – with an approximate difference in elevation of about 6m across approximately 1670m. The surface elevation of the western corner, near the proposed development – has an elevation of approximately 1075m MSL.

1.4 Nature of soil

The geology in this region has a dominant parent material known as Leptosols [from '*Soil and Terrain Database (SOTER) for South Africa*', 1972 – 2001]; which are soils with a very shallow profile depth and can often contain amounts of gravel. They typically remain under natural vegetation, being especially susceptible to erosion, desiccation, or waterlogging, depending on climate and topography.

Furthermore, underlying soils found in this region as Para plinthic Acrisols are typically characterized by an accumulation of low activity clays. The overlaying soils (from '*National Soil Map of South Africa*', 1965) mainly comprise of red and grey ferruginous lateritic soils which are typically rich in iron and aluminium.

The exact nature and composition of the soils found at this location are unknown until a geotechnical investigation is carried out.

1.5 Existing services on the site

There is an existing active borehole near the proposed development location. Water for the proposed development is intended to be sourced from this borehole.

Road infrastructure to the location comprise of gravel roadways surrounding the perimeter of the plot, which is accessed mainly via the N1 freeway, onto the R734 offramp and a gravel road (parallel to the N1) for an approximated 25km. There are also minor gravel roads surrounding the nearby existing development to the East.

No formal stormwater or sewer infrastructure currently exists near the proposed site location.

2. WATER SUPPLY

2.1. Total Average Daily Water Demand

Table 2 provides a summary of the average daily water demand for the proposed development. The Average Daily water demand and Peak Factor criteria have been taken from the Neighbourhood Planning and Design Guide (Known as “Red Book” – 2005 & 2019) for zoological activities, amongst the habitable and non-habitable facilities.

Table 2: Average Daily Water Demand

WATER DEMAND						
Designation	Unit	Quantity	Average Daily Flow		Design flows (AADD)	
			Unit	Quantity	kℓ/day	ℓ/s
Animal Enclosures	m ²	6711	kL/day/100m ²	0.1	6.71	0.08
MEP Hub - General Information Centre	m ²	255	kL/day/100m ²	0.2	0.51	0.01
Veterinary Hospital	m ²	3783	kL/day/100m ²	0.4	15.13	0.18
Manager's House	Erven	1	kL/day/Er	0.8	0.80	0.01
Volunteer's Camp	Person	20	L/day/Person	20	0.40	0.00
Dining Hall, Kitchen & BOH	Seat	50	L/day/Seat	10	0.50	0.01
					24.05	0.28
				Peak Factor		3.00
				Peak Flow (l/s)		0.84

2.2. Preliminary Layout of Internal Water Reticulation Network

A preliminary layout of the internal water reticulation network is not yet available.

2.3. Connection to Existing External Network

Water for the proposed development will be sourced from an existing borehole located near the proposed development location.

2.4. Capacity of the Existing External Network

The actual yield of the existing borehole is to be investigated and determined, however, the maximum allowable groundwater volume that may be abstracted from this borehole can be calculated. The proposed site is located within the Quaternary Catchment 'A23C'. The National Water Act (No. 36 of 1998) permits a maximum abstraction volume of groundwater at this location in the 'A23C' catchment at 45 m³/ha/year.

The total surface area of the region which the borehole intends to service is 30 Hectares. Therefore, the maximum abstraction volume will be 30 Ha x 45 m³ = 1.35 ML, per year. Further, this equates to a maximum abstraction rate of approximately 3 700 L/day.

2.5. Provision for Connection of Future Networks

No provision is made for connection to future networks.

3. SEWERAGE

3.1. Total Average Daily Sewerage Runoff

Table 3 provides a summary of the estimated average and peak wet weather flows for the proposed development. The Average Daily Water Demand and Peak Factor criteria have been taken from the Neighbourhood Planning and Design Guide (Known as “Red Book” – 2005 & 2019) for zoological activities, amongst the habitable and non-habitable facilities.

Table 3: Average Daily Sewerage Runoff

SEWERAGE RUNOFF						
Designation	Water TAADD	Quantity	Average Daily Flow		Design flows (AADD)	
			Unit	Quantity	kℓ/day	ℓ/s
Animal Enclosures	kℓ/day	6.71	kℓ/day/100m ²	0.08	0.54	0.01
MEP Hub - General Information Centre	kℓ/day	0.51	kℓ/day/100m ²	0.13	0.07	0.00
Veterinary Hospital	kℓ/day	15.13	kℓ/day/100m ²	0.32	4.84	0.06
Manager's House	kℓ/day	0.80	kℓ/day/Erf	0.64	0.51	0.01
Volunteer's Camp	kℓ/day	0.40	L/day/Person	16	6.40	0.07
Dining Hall, Kitchen & BOH	kℓ/day	0.50	L/day/Seat	6.5	3.25	0.04
					15.61	0.18
				Peak Factor		2.50
				Peak Flow (ℓ/s)		0.45

3.2. Preliminary Layout of Internal Sewer Network

A preliminary layout of the internal sewer reticulation network is not yet available.

3.3. Connection to Existing External Network

Connection of a new internal sewer network cannot be made to nearby existing infrastructure. Sewerage generated by the facilities on the site would need to be discharged onto a conservancy tank treatment system to provide anaerobic treatment to the screened raw sewage. Anaerobic treatment reduces COD, Nitrogen, Phosphorous and pathogenic microorganisms through the formation of sludge and releasing of gases. The effluent of the treated wastewater can be used for irrigation or disposed of by evaporation. An investigation and study for the design and implementation of a potential recommended on-site treatment system may be required.

3.4. Capacity of Existing External System

No existing sewer networks are nearby. The capacity of the proposed conservancy tank is yet to be finalised.

3.5. Provision for Connection of Future Networks

No provision is made for connection to future networks, however, if future expansion is considered the capacities of the proposed treatment system should be taken into account. Alternatively, an additional conservancy tank or expanded treatment system may need to be constructed.

4. STORMWATER

4.1. Routes of Surface Drainage during Major Storms

The proposed development location is situated in the western corner as shown in Figure 3. This location's elevation is the lowest of the surrounding farm portion, near the existing gravel road intersection. No local or regional stormwater detention facilities are located nearby the site. The stormwater should be allowed to discharge safely at a location near the low point of the site, where it will discharge onto the surface of the adjacent land. Erosion protection or energy dissipation structures may need to be utilized due to the nature of the topsoil.

The proposed roadways of the development will also need to convey and channel any surface stormwater runoff into the internal drainage watercourses and overland escape routes. A Stormwater Management Plan (SWMP) will provide detail on the intensity and runoff volumes that can be experienced during a 1:2 year, 1:10 & 1:50 year storm events and whether on-site stormwater detention facilities are required.

4.2. Capacity of existing external network

There is no formal existing stormwater network infrastructure located near the site. The stormwater will discharge onto the surface at the lowest point of the site and join the natural watercourse for runoff flowing towards the Pienaars River.

4.3. Provision for Connection of Future Networks

The proposed location for the future expansion of the site is located at a higher elevation than the proposed development described in this report and would either need to be accommodated now as part of the proposed development or would need its own internal stormwater network to safely discharge stormwater at a suitable drainage location.

5. ROADS

5.1. Preliminary Layout of Roads

A detailed design of the internal road layout is not yet completed; however please refer to the Site Development Plan in Annexure B for a preliminary layout.

5.2. Classification of Roads

All new internal roads that are proposed will be classified as gravel roads with widths of 6m. Road layer works and widths will need to comply with the local municipality for such road classification. Design on the layer works is subject to further investigation on the in-situ soils and their composition.

5.3. Connection to Existing Road Networks

The proposed internal road network can connect to the surrounding existing roadways which currently provides access to the farm Portion 6 of Ruimte-74. The proposed connection to the existing access road is located approximately midspan on the western boundary (edge) of the designated proposed site.

Please contact our Mr. N van der Merwe on 076 484 4495, if you have any queries or require more information related to anything covered in this report.

Yours faithfully,

for: **WEC-Consult (Pty) Ltd**



NORMAN VAN DER MERWE Pr. Eng

ANNEXURES

Annexure A – Preliminary Proposed Site Layout

GENERAL NOTES

- * all work to comply with local authorities & NBR by laws
- * read figured dimensions in preference to scaling
- * the contractor must verify all levels, heights and dimensions on site and to check same against the set of drawings before commencing work and to convince himself that the information given is correct and in accordance with the conditions on site
- * contractors are to locate existing services on site and to protect these from damage throughout the duration of the works.
- * the contractor is responsible for the correct identification of all surveyor pegs and markers and setting out of the building with particular reference to grid lines column positions, internal and external walls from surveyor markers boundaries and building lines etc.
- * any errors, discrepancies or omissions to be reported to the architect before commencing any work.
- * 4 ply damp proof-course under all walls and sills and vertical dip to all changes of floor levels
- * flashing to all changes of roof levels and parapet walls
- * all concrete beds on well compacted filling.

CONCRETE NOTE

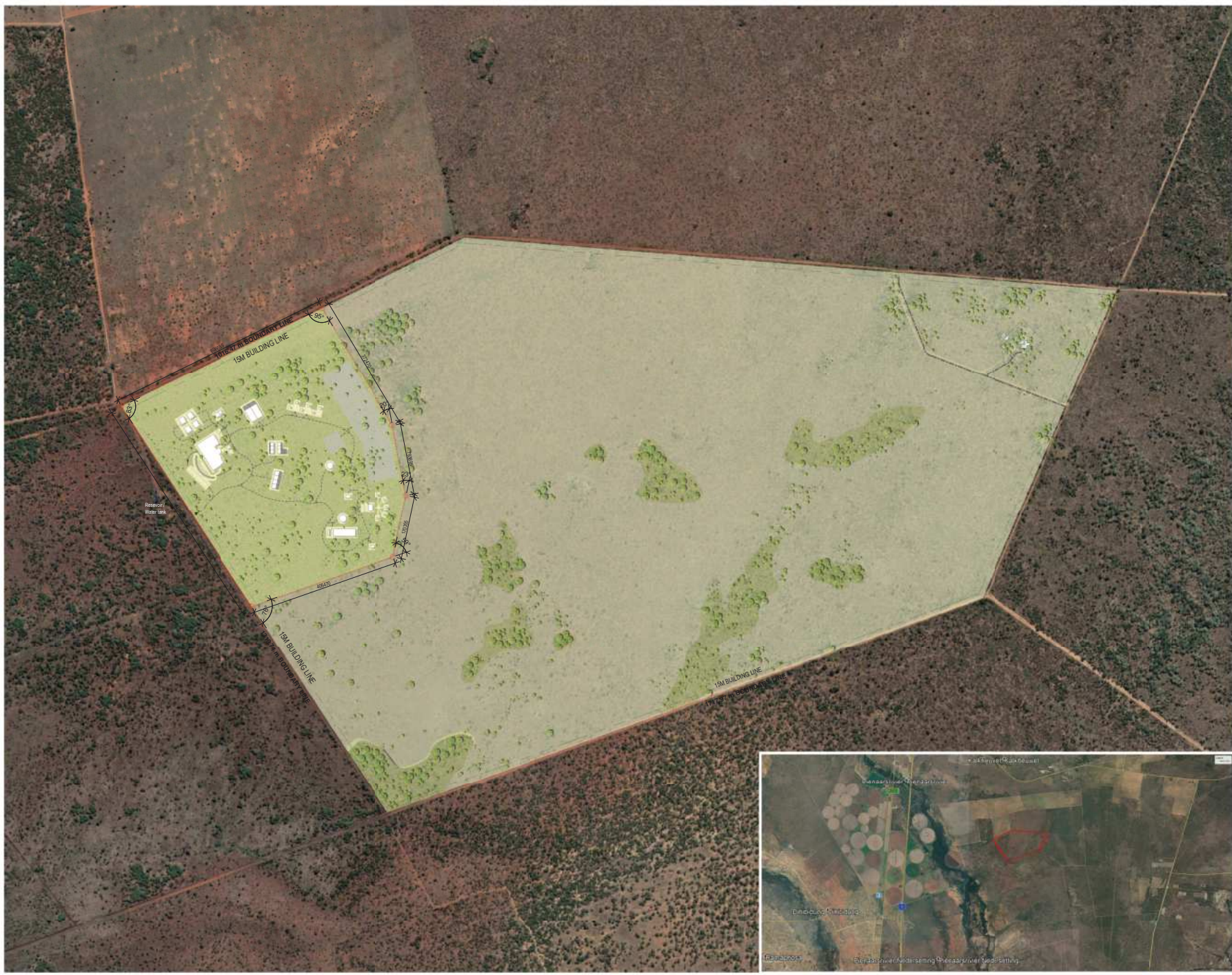
- * unless otherwise instructed by the structural engineer the minimum strength of concrete mixes shall be as follows:
- | | |
|-----------------------------------|----|
| Slabbing: | 10 |
| mpa | |
| slip foundations: | 15 |
| mpa | |
| 75mm traffic surfaces: | 20 |
| mpa | |
| 75mm surface beds to be screeded: | 15 |
| mpa | |
- * reinforced concrete columns, slabs, beams foundations etc. to be strictly in accordance with the structural engineers specifications.

DRAINAGE NOTE

- * drainage layout as per NBR part N7
- * all plumbing and drainage must comply with the relevant local authority and nbr by laws and regulations.
- * all bends and junctions in drain to be fitted with a's and marked covers at ground level.
- * waste fittings to have reset trap and to be fully accessible.
- * rain water down pipes to be min. 2400 from gullies
- * any portion of drain at a depth of 450 mm or less below ground level shall be encased in concrete having a min. thickness of all points of 100mm measured from the external surface of the pipe
- * any portion of drain passing under any part of the building or footing shall be protected against the back, this pipe must be without bends or junctions along its entire length under the building and should have a 1:2 fall below and/or passing under the building.
- * the minimum fall to all drain pipes to be 1 : 40
- * 100mm Ø for drains and ventilation pipes of approved material
- * 50mm dia waste pipes to wash basins
- * 50mm dia waste pipes to all other waste fittings

IMPORTANT NOTE

- * Building must be constructed according to all details & specifications contained in these drawings as per SANS 10400. Any changes to details or specifications must be approved by architects. Energy efficiency specification must be applied to, according to SANS 10400-XX document to be obtained from architect.



FOR INFORMATION

OWNERS SIGNATURE

ARCHITECTS SIGNATURE

ENGINEERS SIGNATURE



GOTSMANN ARCHITECTS

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 e: info@gottsmann.co.za
 217 Kramer Road, Sandton, 2090
 Building No. 3 Kramerville Corner, 2nd floor
 Donovan Gottsmann - Pr. Arch. Reg 21343

Overall Site Plan

CLIENT EWOC

ADDRESS DINOKENG

GA21XX

DATE 2021/05/05

DRAWN BY PB

CHECKED BY DG

SCALE As indicated

001

OVERALL SITE PLAN
 1:5000

LOCALITY MAP n.t.s

GENERAL NOTES

- * all work to comply with local authorities & NBR by laws
- * read figured dimensions in preference to scaling
- * the contractor must verify all levels, heights and dimensions on site and to check same against the set of drawings before commencing work and to convince himself that the information given is correct and in accordance with the conditions on site
- * contractors are to locate existing services on site and to protect these from damage throughout the duration of the works
- * the contractor is responsible for the correct identification of all surveyor pegs and markers and setting out of the building with particular reference to grid lines column positions, internal and external walls from surveyor markers boundaries and building lines etc.
- * any errors discrepancies or omissions to be reported to the architect before commencing any work
- * 4 ply damp proof-course under all walls and sills and vertical dip to all changes of floor levels
- * flashing to all changes of roof levels and parapet walls
- * all concrete beds on well cemented filling

CONCRETE NOTE

- * unless otherwise instructed by the structural engineer the minimum strength of concrete mixes shall be as follows:
- | | |
|----------------------------------|--------|
| blinding | 10 mpa |
| slab foundations | 15 mpa |
| 75mm traffic surfaces | 20 mpa |
| 75mm surface beds to be screeded | 15 mpa |
- * reinforced concrete columns, slabs, beams foundations etc. to be strictly in accordance with the structural engineers specifications.

DRAINAGE NOTE

- * drainage layout as per NBR part 7
- * all plumbing and drainage must comply with the relevant local authority and nbr by laws and regulations
- * all bends and junctions in drain to be fitted with 's' and marked covers at ground level
- * waste fittings to have reset trap and be fully accessible
- * rain water down pipes to be min. 2400 from gullies
- * any portion of drain at a depth of 450 mm or less below ground level shall be encased in concrete having a min. thickness at all points of 100mm measured from the external surface of the pipe
- * any portion of drain passing under any part of the building or footing shall be protected against the back. This pipe must be without bends or junctions along its entire length under the building and should have a 's' before and after passing under the building
- * the minimum fall to all drain pipes to be 1 : 40
- * 100mm Ø for drains and ventilation pipes of approved material
- * 50mm dia waste pipes to wash basins
- * 50mm dia waste pipes to all other waste fittings

IMPORTANT NOTE

* Building must be constructed according to all details & specifications contained in these drawings, as per SANS 10400. Any changes to details or specifications must be approved by architects. Energy efficiency specification must be applied to, according to SANS 10400-XA document to be obtained from architect



LEGEND

	Gravel road - Private
	Gravel road - Public
	Vegetation Clearance
	Designated Site Area
	Undesignated Site Area
	Covered Boma/Paddock Areas
	Future Expansion

AREA SCHEDULE

TOTAL OVERALL SITE AREA	2 107 500 m²	210,75 ha
TOTAL DESIGNATED SITE AREA	342 857 m²	34,3 ha
TOTAL SITE CLEARANCE		
Total Habitable Areas	4 311 m²	
Total Other Areas	255 m²	
Total Animal Enclosures	6 711 m²	
Building clearance - 5m Roads	19 300 m²	
	5 423 m²	
CURRENT TOTAL	35 000 m²	10% (3,5 ha)
Future Expansion	30 255 m²	
TOTAL	65 255 m²	19% (6,5 ha)

AREA SCHEDULE

HABITABLE AREAS		
Veterinary Hospital		3 783 m²
Manager's House		192 m²
Volunteer's Camp		120 m²
Dining Hall, Kitchen & BOH		216 m²
Sub Total:		4 311 m²
ANIMAL ENCLOSURES		
Rhino Boma-Paddock Holding		864 m²
Elephant Stockades		864 m²
Wild Dog Bonding Boma		317 m²
Cheetah Recovery Camp		1 144 m²
Small Animal Reproduction Area		216 m²
Buffalo Quarantine Boma		1 728 m²
Horse Pen		314 m²
Horse Stable		64 m²
Horse Paddock		1 200 m²
Sub Total:		6 711 m²
OTHER AREAS		
MEP Hub		255 m²
Sub Total:		255 m²
Grand Total:		11 277 m²

TOWN PLANNING

Town Planning Scheme : Bela-Bela Local Municipality, Land Use Scheme 2008

Land Use : Agricultural

Uses/Rights permitted : Dwelling unit, agricultural use, farm settlement

Uses/Rights permitted with Special Consent : Animal care centre

ZONE USE : AGRICULTURAL (Designated Site Area)	Animal Care Centre (11 277m²)
PERMISSIBLE	SUPPLIED
COVERAGE (based on designated site area)	
30%	3.3%
F.A.R	0.03
PARKING (G.L.F.A) 2 parking spaces per 100m²	94 parking spaces
	~ 87 parking spaces

OTHER AREAS

MEP Hub	255 m²
Sub Total:	255 m²
Grand Total:	11 277 m²

FOR INFORMATION

OWNERS SIGNATURE _____

ARCHITECTS SIGNATURE _____

ENGINEERS SIGNATURE _____

GA
GOTTSMANN ARCHITECTS

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Building No. 3 Kramerville Corner, 2nd floor
Donovan Gottsmann - Pr. Arch. Reg 21343

Site Plan

CLIENT **EWOC**

ADDRESS **DINOKENG**

GA21XX

DATE **2021/05/05**

DRAWN BY **PNC**

CHECKED BY **PB**

SCALE **1:1000**

002

PLOTTING DATE **2021/05/05 15:58:38**

Annexure B – Preliminary Site Development Plan

