

WATER USE LICENCE APPLICATION SUMMARY REPORT

NAME OF APPLICANT:

Plett Lagoon Estate Pty (Ltd)

Compiled by

Confluent Environmental (Pty) Ltd

**Authors: Sonia Jordaan
Reviewed: Dr. Jackie Dabrowski
October 2023**

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1. Applicant details

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2. Person submitting the application

Jackie Dabrowski (Ph.D., Pr.Sci.Nat. Aquatic Science)
The South African Council for Natural Scientific Professions (SACNASP)
Registration Number 11516
Date of registration 27 January 2016

3. Background and purpose

3.1 Background

The applicant, Plett Lagoon Estate (Pty) Ltd, hereafter referred to as the developer is applying for a Water Use License (WUL) in terms of the National Water Act (NWA; Act 36 of 1998), to build a housing estate in Plettenberg Bay, Western Cape. The proposed housing development will be on RE/6503, located largely within the Estuarine Functional Zone (EFZ) of the Keurbooms Estuary (Figure 1). Site access will be from Beacon Way at the southwestern corner of the development. The development will be known as Plett Lagoon Estate.



Figure 1: Proposed location of Plett Lagoon Estate, Plettenberg Bay: within the Estuarine Function Zone of the Keurbooms Estuary.

The applicant is applying for the authorisation of water uses in terms of Section 21 of the NWA as follows:

Section 21(c); Impeding or diverting the flow of water in a watercourse and
Section 21 (i); Altering the bed, banks, course or characteristics of a watercourse.

There are no existing lawful water uses on the property.

3.2 Location of water uses

The water uses take place in quaternary catchment K60E, within the Gouritz Catchment, located within the Bitou Municipality and administrative district of Knysna, Western Cape (Figure 2).

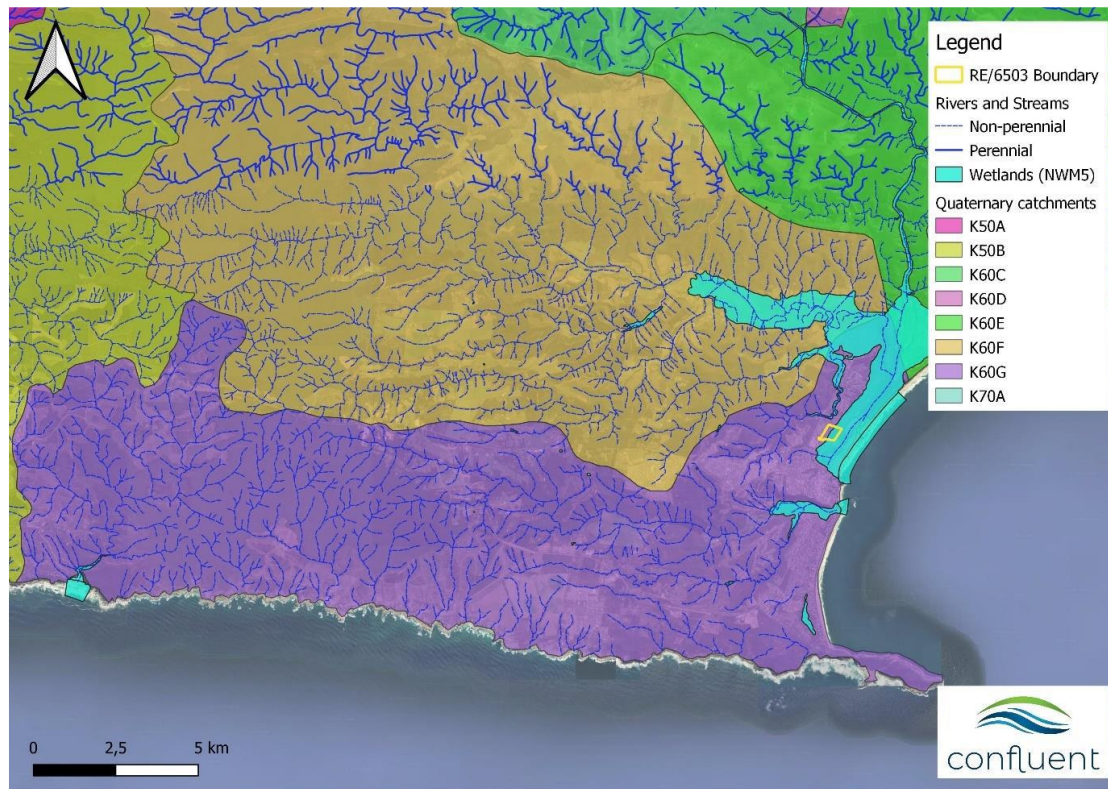


Figure 2: Location of the site in quaternary catchment K60E showing mapped wetlands and rivers.

The property is approximately 18.4 hectares in extent and is in the town of Plettenberg Bay between the Keurbooms Estuary to the east and the Plettenberg Bay Primary School to the west. A wetland was identified and delineated southeast of the proposed development (Figure 3) The Site Development Plan was scaled back to exclude the wetland, so that 60% of the site will be zoned as public open space and managed as a nature conservation area by the development's body. The eastern portion of the site is below the 5 m.a.m.s.l. contour which places it in the Estuarine Functional Zone of the Keurbooms Estuary (Aquatic specialist report, Appendix 1Appendix 2).



Figure 3: Site Development Plan, Delineated wetland and 30 m wetland buffer on the development site for Plett Lagoon Estate, RE/6503, Plettenberg Bay

The geographic location at the property where the water uses will take place is:
 Latitude: -34° 2' 23.6646" and Longitude: 23° 22' 29.2614"

Property details of Plett Lagoon Estate are presented in Table 1.

Table 1: Property details

Property description	Title Deed number	Owner details on Title Deed
RE/ 6503	T98661/1996	SG Storey RA Cook

4. Administrative documents and other technical reports submitted to support the WULA

4.1 Administrative documents

- 4.1.1 Letter of Appointment
- 4.1.2 Title deed of property
- 4.1.3 Tax invoice of Breede-Gouritz administration fee
- 4.1.4 Applicant's company registration certificate
- 4.1.5 Applicant's contact details

4.2 Reports and other technical documents

Table 2 lists reports and other documents submitted as part of the application.

Table 2: List of reports and other technical documents submitted

Report Title	Compiled by	Date of report
Civil Engineering Services Report	VITA Consulting Engineers, Riaan van Dyk	June 2023
Aquatic Specialist Assessment: Aquatic Biodiversity Impact Assessment	Confluent Environmental (Pty) Ltd, Jackie Dabrowski	July 2023
WULA Technical document with Section 27 Motivation	Confluent Environmental (Pty) Ltd, Sonia Jordaan	October 2023

5. Project Description

The Site Development Plan (SDP) had to be scaled back to exclude the delineated wetland and the wetland buffer zone (Figure 3). The exclusion of the wetland area resulted in the development area occupying only 40% of the site, with the remaining almost 60% of the site to be zoned as public open space to be managed as a nature conservation area by the development's body corporate.

The proposed residential development at Plett Lagoon Estate will have split zoning units as follows:

- Residential Zone I: 2.27ha
- Residential Zone II: 2.67ha
- Residential Zone IV: 0.74ha
- Open Space Zone II: 0.66ha
- Open Space Zone III: 10.44ha (includes wetland area)

The development is classified as a Greenfields Development and will consist of the following amenities:

- Single Residential: 37 Erven
- General Apartments: 40 Units
- Guardhouse, Refuse room etc.

See Figure 4 for the SDP of Plett Lagoon Estate.

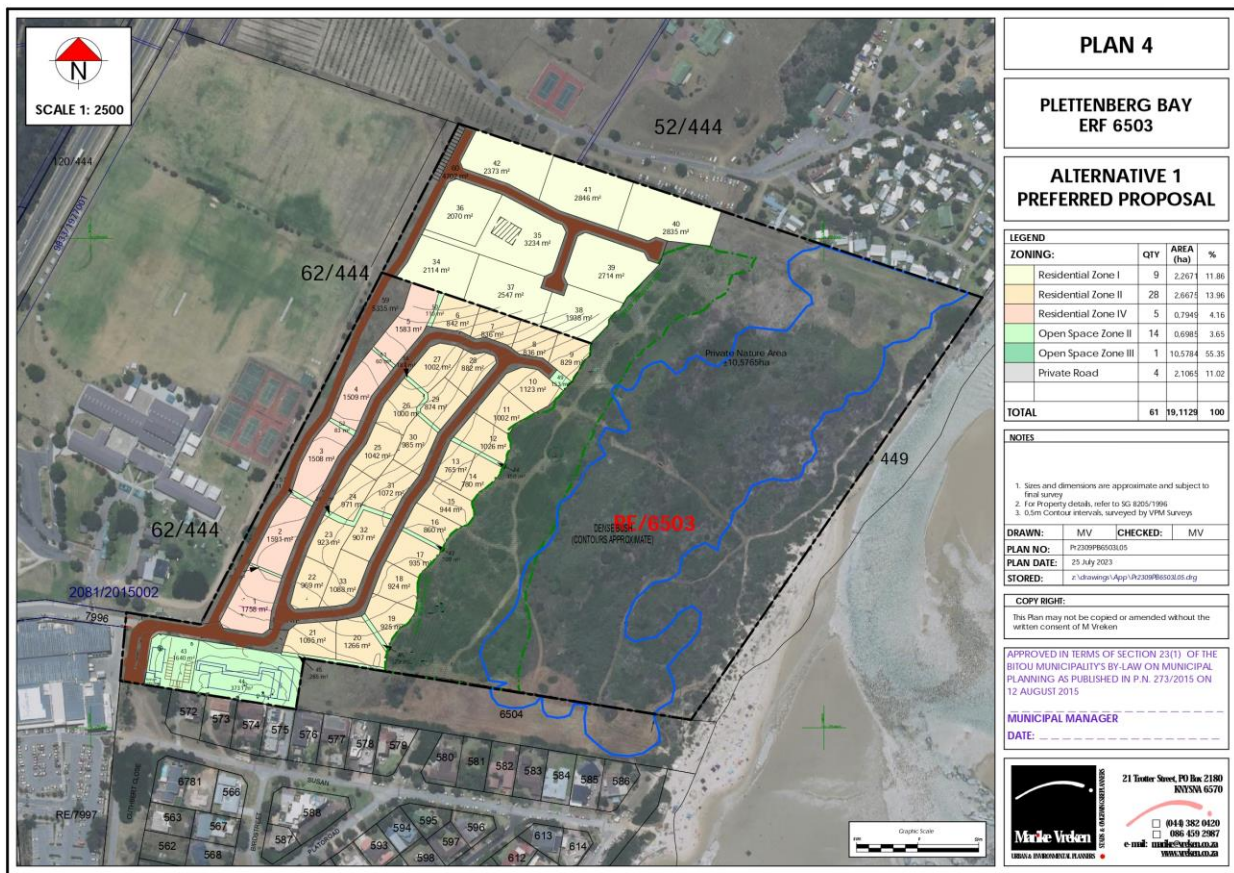


Figure 4: Site Development Plan for Plett Lagoon Estate on RE/6503, Plettenberg Bay

The construction of Plett Lagoon Estate is within 500 m of a wetland and therefore in the regulated area of a watercourse. It includes sewer lines within the regulated area of a watercourse, which is excluded from a General Authorisation and therefore requires a WULA as per Section 36 of the NWA of 1998. The water uses which will be applied for are:

- 21(c): Impeding or diverting the flow of water in a water course.
- 21(j): Altering the bed, banks, course or characteristics of a water course.

Bulk water services, in other words potable water supply and wastewater treatment from the housing development, will be provided by the Bitou Municipality (Appendix 2 Appendix 1, Municipal approval letter).

6. Methods statement (only for 21 (c) and (i) activities)

Construction methods, typical for a housing estate would be followed. This would include earth moving, the use of heavy machinery and excavation work for the construction of the housing development on RE/6503 in an urban area.

The aquatic specialist report (Appendix 1) recommends that demarcated no-go areas must be temporarily fenced off to protect the sensitive wetland and buffer area thereof. This will ensure that the construction of the development adjacent to the wetland will have as low an impact as possible on the water resource. The possible impacts and mitigation measures of the construction and operational phase are addressed in the Aquatic specialist report. Specific detail on the stormwater management is given in the following section of this report.

There is sufficient capacity in the existing Plettenberg Bay sewer system to accommodate the proposed housing development. The bulk water reservoir supply should be upgraded according to the master plan to accommodate the additional development (GLS report, Appendix 3).

7. Stormwater Management Plan

The stormwater management plan for the proposed housing development is guided by SuDS design principles. VITA Consulting Engineers, Civil Engineering Services Report (Appendix 4), further provides information on measures to be taken to control stormwater in the proposed housing development.

According to the report, the high permeability of the *in situ* sands, will ensure high permeability of stormwater into the subsoil layers. Therefore, a formalised stormwater connection is not required for this housing development.

The pre- and post-development peak run-off flow coefficients were compared. The conclusion was made that the housing development will add less than 10% impermeable surfaces to the catchment area. Therefore, it will have little impact on the run-off coefficients. The open swale stormwater network will be able to convey up to a 1:5 year rainfall event. For rainfall events larger than the 1:5 year, stormwater will be conveyed over internal roadways towards the lower laying eastern portion of the site, to follow the existing natural drainage routes and permeate through the *in situ* soils to the subsurface water reserves.

The report states that subsoil drainage networks will be used to allow for seasonal perched ground water table. A 110 mm perforated pipe network will be installed 800 mm below the final road level to act as the subsoil drainage network. The open swale network will have an attenuation function to ensure peak flows will be the same as pre-development rates and also to treat stormwater runoff.

The detention capacity and percolation rate of the stormwater swales, together with the gradient of the swales being less than the pre-development crossfalls, allows stormwater run-off to accumulate inside the swales and allow for contact time with the permeable *in situ* dune sands. The percolation rate of the *in situ* dune sands is estimated at 86 mm/day (VITA Consulting Engineers, Appendix 4).

7.1 Erosion prevention

Since the cohesion of the dune sands is poor and susceptible to erosion, erosion preventative measures will be put in place. According to the Civil Engineering Services report, the detailed stormwater design, will therefore include the following erosion preventative measures:

- Concentration of stormwater will be minimised to prevent high volume/flow rates
- Hard surface run-off (*driveways*) will be routed into swales via the internal roadways
- Sheet flow into open swales will be promoted to maximise contact time with permeable dune sands
- All channels with an internal velocity higher than 1m/s will be formalised (*armorflex*)
- All unlined channels will be landscaped with appropriate vegetation
- Energy dissipation structures will be installed at high energy discharge points

Further mitigative measures to prevent erosion on the site is given in the Aquatic Specialist report (Appendix 1):

- Wherever possible driveways and parking areas must use open paver / permeable paving systems such as grass blocks or sudpave-type products.
- Stormwater outlets leading towards the wetland will need to consider the steep slope between the development level and wetland. On average there is a drop of approximately 4 m over which stormwater must be delivered to the wetland without causing erosion. It is recommended that stormwater outlets:
 - a) Follow existing roads and pathways where vegetation is regularly trimmed to navigate the slope between the higher ground and wetland area. This will have the added benefit

that residents will see any erosion, slippage or litter accumulated in the stormwater outflows, and report it to the Homeowners Association for attention.

- b) The stormwater outflow point use a series of stepped gabions protected by reno mattress to break the fall of water to navigate the slope. This should end in a stilling basin which would act as a sump.
- c) A gabion walled stilling basin with no concentrated outflow at the lower ground level be constructed to break the final fall of water and to allow water to seep out of gabions in multiple directions to the wetland beyond. The base of the stilling basin should be slightly below ground level on reno mattress to reduce subsidence, and all reno or gabion structures must be protected with geotextile to prevent malformation due to slumping in the sandy soil.

8. Rehabilitation Plan

According to the Aquatic specialist report (Appendix 1), the wetland is in a very good ecological state. A few impacts are discussed in the PES section of the report. The recommendation is to deal with these impacts prior to starting construction, so that the wetland's condition can be improved, and best practice management of the wetland started early on.

There is no rehabilitation plan for this housing development.

9. Water Uses applied for

The application includes the following water uses as detailed in Table 3.

Table 3: Water Uses Applied for

Water use(s) activities	Purpose	Capacity/ Volume	Property Description	Co-ordinates
Section 21 (c) – impeding or diverting the flow of water to a watercourse				
Impeding the flow of water within 500 m of a wetland with the construction of a housing development	To build a housing development	N/A	RE/6503	34.041842°S 23.372702°E & 34.038037°S 23.375591°E
Section 21 (i) – altering the bed, banks course or characteristics of a watercourse				
Altering the characteristics of a wetland with the construction of a housing development	Construction of wastewater pipes within the development to convey it to the municipal bulk sewer connection	N/A	Consolidated Erf 18214	34.041842°S 23.372702°E & 34.038037°S 23.375591°E

10. Description of the Environment

The site to be developed is located at the lower extent of quaternary catchments K60E and K60G, which drain the Keurbooms River to the east and the Piesang River to the west respectively (Aquatic Specialist Report, Appendix 1). The Mean Annual Precipitation is 647 mm, which falls with a very high intensity. According to Cape Farm Mapper the average temperature is 16.5 °C with a temperate climate, no dry season and warm summers (Köppen-Geiger Climate Zones, 1980-2016). The property is located adjacent to the Keurbooms River, with the Keurbooms Estuary mapped as aquatic feature proximal to the site.

The Present Ecological State of the estuary is classified as A/B, and the same category is applicable for the Recommended Ecological Category. The estuary has a high conservation value, supporting

one of only three known populations of the iconic Knysna Seahorse occurring in *Zostera* (seagrass) beds.

The Ecological Importance and Sensitivity of the wetland was determined to be 'Very High' (Aquatic specialist report, Appendix 2).

11. Impacts and mitigation measures

The potential impacts and mitigation measures that are expected from the proposed activities are presented in Table 4. The phases assessed by the aquatic specialist, were the design and layout, construction and operational phases of the proposed housing development.

11.1 Design and layout phase

11.1.1 Stormwater management

The stormwater management plan compiled by Vita Consulting Engineers proposes SuDS-type design features for the management of stormwater, which are fully supported. The report acknowledges the high erodibility of soils on the site. Being downslope of the proposed development, the wetland is vulnerable to smothering by transported sediment from eroded slopes, and being inward draining, this material would eventually form terrestrialised islands with different vegetation, most likely being colonised by alien plant species. Avoidance of erosion is therefore the primary aim of managing stormwater on the site. The following additional mitigation measures are recommended to further reduce impacts:

- Wherever possible driveways and parking areas must use open paver / permeable paving systems such as grass blocks or sudpave-type products. This will utilise the highly permeable nature of soils at the site to reduce runoff to roads in > 1:5 year rainfall events
- Stormwater outlets leading towards the wetland will need to consider the steep slope between the development level and wetland. On average there is a drop of approximately 4 m over which stormwater must be delivered to the wetland without causing erosion. It is recommended that stormwater outlets:
 - a) Follow existing roads and pathways where vegetation is regularly trimmed to navigate the slope between the higher ground and wetland area. This will have the added benefit that residents will see any erosion, slippage or litter accumulated in the stormwater outflows, and report it to the Homeowners Association for attention.
 - b) The stormwater outflow point use a series of stepped gabions protected by reno mattress to break the fall of water to navigate the slope. This should end in a stilling basin which would act as a sump.
 - c) A gabion walled stilling basin with no concentrated outflow at the lower ground level be constructed to break the final fall of water and to allow water to seep out of gabions in multiple directions to the wetland beyond. The base of the stilling basin should be slightly below ground level on reno mattress to reduce subsidence, and all reno or gabion structures must be protected with geotextile to prevent malformation due to slumping in the sandy soil.

11.1.2 Fenceline

As the wetland area is the last remaining area of significant wetland and natural vegetation remaining along the western shoreline of the Keurbooms Lagoon, it is important to protect the function as an ecological corridor. Wildlife currently moves between the wetland and lagoon area, and an important function of the wetland is the provision of shelter and habitat for feeding, breeding and movement. The following mitigation measures are recommended:

- The fence line should enclose the residential area only and not the wetland area. The final location is yet to be determined but should minimise the disturbance of natural vegetation on the slope as far as possible. This is very important for the ongoing stability of the slope which is protected by established vegetation.
- Install code-operated pedestrian gates along the fence line aligned to existing pathways and roads to allow joggers and walkers access to the wetland and lagoon.
- Use alternative security measures to monitor the wetland such as guarding or cctv cameras.
- It is assumed that typical Clearvu-type fencing would be preferred, however this seriously restricts the movement of any animals. Install larger grid sections along the base of the fence line in a few sections, to allow smaller-bodied vertebrates to move in and out of the residential area.
- Do not use any electric strands along the base of the fence line.



Table 4: Summary of impacts and mitigation measures

Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
Construction Phase			
Pre-construction wetland rehabilitation	Habitat degradation by alien vegetation and through mowing	<ul style="list-style-type: none"> • Control alien vegetation in isolated stands where it occurs. No herbicide to be used in the wetland. Large trees must be fully ring-barked, while smaller plants can be hand-pulled or removed using a tree popper. Shrubs of bramble and Lantana must be cut back with clippers until the stump is visible, which must then be removed. • All vegetation biomass must be removed from the wetland and disposed of at a green waste dump. No vegetation must be dumped in the wetland. • Follow up alien must be conducted every 6 months following initial clearing to ensure emergent seedlings are consistently removed. • Cease mowing the northern area of the wetland barring one path that can be maintained for access 	Minor - Positive Mitigation exists and will considerably reduce the significance of impacts
Disturbance to wetland and buffer areas	Vehicles, workers and materials active in wetland and buffer area	<ul style="list-style-type: none"> • Pre-construction, temporary fencing must be erected along No-Go areas with the top of the slope leading to the wetland indicated as the sensitive feature. • Signage indicating No-go areas must be placed on fencing. • All contractors must attend a site induction and be briefed that vehicles, workers, equipment and materials may not encroach into No-Go areas around wetlands. • Consider the termination of contracts or fines for encroachment into the no-go area. 	Negligible-Negative Mitigation exists and will considerably reduce the significance of impacts
Stormwater runoff from the site	Sedimentation in the wetland and creation of preferential flow paths	<ul style="list-style-type: none"> • The objective of stormwater management during the construction phase is to eliminate the risk as far as possible of discharging sediment-laden water downslope into the wetland. • Daily and weekly site meetings must consider forecasted rainfall to avoid working during such periods, and to plan accordingly for predicted high 	Negligible-Negative Mitigation exists and will notably reduce significance of impacts

Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
		<p>rainfall events. Work on the site must cease altogether during rainfall.</p> <ul style="list-style-type: none"> • The site office must have a store of materials suitable for rapid response to erosion control such as shade-cloth (silt-fencing), haybales (check-dams), wooden droppers, hessian fabric, and fencing wire. • All material stores should be kept on flat areas and banded to prevent material loss during rainfall. • When construction commences in the residential area, create a compacted, low soil berm along the perimeter of the site approximately 400 mm high to retain stormwater on site and reduce runoff to surrounding areas. • Monitor the site during / following periods of rainfall, and install haybale check dams at points where runoff collects and could overtop / breach the soil berm. • Following rainfall, any water that must be pumped out of pools in excavated areas must not be directed to the wetland. The soil berm system or a temporary haybale check dam can be constructed to contain 	
Excessive disturbance for construction of stormwater outflows	Loss of stabilising vegetation leading to erosion and sedimentation in the wetland	<ul style="list-style-type: none"> • A maximum 2 m footprint of disturbance either side of each stormwater outlet to the wetland is acceptable. This area must be fenced off with temporary fencing or pegged, so that workers know the maximum limit of disturbance to soil or vegetation. • Where vegetation is in the way of works, it should be trimmed or cut, and the roots and soil must not be disturbed. • Where gabions / reno mattresses must be installed, excavations and installation should be undertaken by hand wherever possible, and work should preferably be done from the road / pathway-side as the primary access point. 	Negligible-Negative Mitigation exists and will notably reduce significance of impacts

Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
		<ul style="list-style-type: none"> All excavated soil and / or cut and removed vegetation must be disposed of via the residential area and not dumped in the wetland. No materials used in the construction of the stormwater outflow can be dumped in the wetland. Works should commence in the direction from bottom to top, so that the stilling basin is created first and can catch any sedimentation that occurs upslope during construction of the outflow. 	
Installation of fence line	Loss of stabilising vegetation habitat disturbance	<ul style="list-style-type: none"> The limit of disturbance along the fenceline area is 2 m on the residential side of the development. The fenceline can be installed with the help of a small machine such as a bobcat, but should otherwise be installed by hand. Vegetation obstructing work on the fenceline should be cut or trimmed, and not uprooted. As this could lead to soil erosion. Disturbed soil along the fenceline on the side of the residential development should be revegetated with low growing indigenous grass such as <i>Cynodon dactylon</i> (kweek) and / or <i>Stenotaphrum secundatum</i> (buffalo grass). This can create a relatively open area along the fenceline which can be monitored or patrolled. 	Negligible-Negative Mitigation exists and will considerably reduce the significance of impacts
Operational Phase			
Stormwater management runoff. Slope erosion and sedimentation of the wetland	Damage caused by stormwater runoff	<ul style="list-style-type: none"> The site should be assessed by an aquatic specialist 6 months following conclusion of construction to confirm that stormwater management infrastructure is functional and not causing any impacts to the wetland. Stormwater management infrastructure such as swales, drains and culverts must be routinely monitored and maintained to ensure they are free of blockages and functional. This includes a regular inspection of all stormwater outflows to identify any emerging erosion issues, and keep the structures clear of excessive siltation and litter. 	Negligible-Negative Mitigation exists and will notably reduce significance of impacts

Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
		<ul style="list-style-type: none"> • Where erosion is occurring, immediately identify and control the origin of the flow path, and protect the site of erosion by replacing soil with soil from the site, and stabilising with indigenous vegetation found on the site. Where more serious interventions are required spot installations of gabions may be suitable for stabilisation provided they are not in the wetland buffer or in the wetland itself. As far as possible, flows must be attenuated, and the source of erosion controlled upslope within the residential area. • Eroded areas of the steep banks must be refilled with topsoil (from the site), reseeded with indigenous vegetation, covered with a light mulch and protected with soil saver mats. The use of silt fencing can be extended to problem areas to provide further protection. 	
Alien vegetation establishment	Establishment of aliens in disturbed areas post-construction resulting in habitat degradation	<ul style="list-style-type: none"> • Follow up inspection and control of alien vegetation in the residential development and the wetland on a 6-monthly basis. • No herbicides to be used in the wetland or wetland buffer. Sprays and / or cut-stump treatments may be used in the residential areas. • Ensure bare areas of vegetation are replanted with indigenous vegetation that occurs naturally on the site. • Under no circumstances may removed alien plants be discarded in the wetland. The HOA must inform the landscaping / gardening team that no dumping of vegetation or discarding of waste material may happen in the wetland or buffer area. 	Negligible-positive Mitigation exists and will considerably reduce the significance of impacts
Landscaping and recreational pathways maintenance	Inappropriate mowing, planting or trimming of vegetation leading to habitat degradation	<ul style="list-style-type: none"> • Mowing of the wetland area to the north of the site must cease altogether. The only areas that can be mowed are the existing pathways and a 2 m strip along the residential side of the fence line. One pathway can be maintained through the northern area of the wetland which is currently mowed. 	Negligible-positive Mitigation exists and will considerably reduce the significance of impacts

Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
		<ul style="list-style-type: none"> • Only existing pathways through the wetland and buffer may be maintained. Maintenance involves removal of alien vegetation (previously discussed), trimming and weed eating of pathways. No disturbance to plant roots or soil is permitted. • No herbicides can be used to maintain pathways in the wetland area or buffer. • The existing footprint of the pathways may not be enlarged. • Do not plant any exotic plants that do not occur naturally at the site in any area of the wetland or buffer. ie. under no circumstances may kikuyu grass be planted in any part of the wetland or buffer. 	
Leaking, blocked or overflowing sewerage infrastructure	Pollution and eutrophication of the wetland leading to habitat degradation and impacts to biota	<ul style="list-style-type: none"> • All sewerage infrastructure must be well maintained and kept free of obscuring vegetation. Manholes, sewer lines, and the pump stations must be accessible, easily observed, and routinely inspected for leaks or blockages. • Emergency response measures to sewage spillages should be maintained on site, including lime to treat sewage and sand bags to contain spill and limit their dispersal. An emergency response protocol must be established by management of the HOA. • Residents should be provided with information of what can / cannot be flushed into toilets. This knowledge is often assumed, but is frequently over-estimated. Even educated people treat a toilet like a rubbish bin. • Ensure sufficient backup power systems are available for the operation of pump stations during load shedding and at peak times (e.g. December). 	Negligible-Negative Mitigation exists and will considerably reduce the significance of impacts

12. Water demand and water supply Analysis

12.1 Water demand

A capacity analysis was drawn up by GLS Consultancy (Appendix 3) for Plett Lagoon Estate. The purpose was to determine if the existing water network system has sufficient capacity to accommodate the proposed new housing development.

According to VITA Consulting Engineers, the potable water demand for the development will be as follows:

- Gross annual average daily demand = 61 m³/day
- Instantaneous peak demand (peak factor – 10) = 7.06 l/s
- Fire flow criteria (low risk) = 15 l/s @ 10 m

12.2 Water supply analysis

Bitou Municipality (Appendix 2) confirmed that bulk infrastructure can be supplied for the proposed housing development from the existing water reticulation system, provided that the developer implements the upgrade of services as detailed in the GLS network analysis report of 27 February 2027 (Appendix 3).

According to GLS consultancy, the Goose Valley, Wittedrift and Matjiesfontein reservoirs are at capacity and should be upgraded according to the master plan before additional developments within the supply areas of the reservoirs can be accommodated.

To accommodate the proposed housing development as well as other potential development areas within the Goose Valley, Wittedrift and Matjiesfontein reservoirs, the minimum upgrades required to improve the existing bulk supply system are stipulated in the report.

The Plettenberg Bay sewer reticulation system can accommodate the proposed development, with the sewer connection position proposed to be at the existing 150 mm diameter outfall sewer in Susan Street (GLS Consultancy, Appendix 3).

13. Water quality

Possible negative impacts on water quality of the wetland which could be caused during the construction and operational phase of the project has been addressed. During the operational phase of the housing development, stormwater runoff is primarily associated with impacts on water quality. These impacts have been anticipated and mitigation measures are provided in Table 4 of this report.

14. Public participation

The public participation (PP) process must be completed in terms of Section 41 (4) of the National Water Act, Act no 36 of 1998. The public participation (PP) will start 10 November 2023 until 1 February 2024, with the outcome thereof to be summarised in a PP report.

15. Inputs/Authorisations from other Departments /Stakeholders

1. Municipal approval for development (Appendix 2).

16. Section 27 (1)

The requirements contained in Section 27(1) of the National Water Act, 1998 (Act 36 of 1998) have been considered and are discussed further below.

a) Existing lawful water uses

There is no existing lawful water use in place.

b) Need to redress the results of past racial and gender discrimination

The development of the housing development, Plett Lagoon Estate on RE/6503 in Plettenberg Bay, will contribute to redressing the results of past racial and gender discrimination. It will create work opportunities during the construction and operational phase of the project.

The proposed project's focus is on using local labour and local professionals in all phases of the project. Approximately 80% of the workforce during the construction phase will be locally sourced, with approximately 95% of the workforce employed from the local area during operational phase of the development. Skilled and unskilled job opportunities will be created during the construction phase of the project, of which some will become permanent opportunities once the development is in the operational phase.

Small, Medium and Micro Enterprises (SMME) subcontractors will be used. The value of the combined construction phase of the different houses and infrastructure thereof is estimated to be approximately R500 million. A significant contribution and job creation for SMME contractors. Approximately 80% of consultants for the project will be sourced locally.

Depending on the skills available, all phases of the project will source locally skilled and unskilled contractors. Material suppliers for the project will be largely local suppliers from Plettenberg Bay and the surrounding areas. Local consultants from various specialised fields will be used. This will include:

- A town planner
- Civil engineering services and consultants
- Electrical design consultants and contractors
- Sales personnel
- Landscaping engineers
- Structural engineers
- Conveyancers
- Environmental consultants etc.

During the construction and operational phase of the project it is estimated that 200-300 of skilled and unskilled workers will be needed. This will allow further economic growth and development for these individuals and businesses, while benefitting their families. With the start of the operation of the mall, additional work opportunities will be created by shop owners who are likely to employ a variety of workers for the different services to be provided by shops.

Table 5 indicates the employment opportunities foreseen to be created due to the project. The job opportunities created with this project will allow further economic growth and development for these individuals and businesses, while benefitting their families. With occupation of the development, additional work opportunities will be created by owners who are likely to employ domestic workers, service providers, garden services and security guards etc.

The applicant does not have a BBBEE status.

c) Efficient and beneficial use of water in the public interest

In terms of the improvement and enhancement of the economy the proposed housing development will provide both temporary and permanent employment and contribute to the local economy. The water use in this case is Section 21 (c) and (i) for the development of the housing estate within 500 m of the wetland. The people that will benefit from this water use will be the community of Plettenberg Bay, since many jobs will be created both during the construction and operational phase of the housing development.

The proposed development occurs adjacent to a wetland area, classified as a depression with a PES of A (Natural) and an EIS of 'Very High'. It has a wide variety of wetland plant species. Freshwater species were dominant, but a few species typically located in the supratidal zone of estuaries were recorded. Species considered to be obligate as well as facultative wetland plants were found. A 30 m wetland buffer was recommended by the aquatic specialist, as it will protect the wetland from the residential development upslope, but also provides a level of connectivity between the terrestrial and wetland areas with the lagoon. The aquatic specialist considered impacts which may occur during the construction and operation phase of the project. The conclusion was that most of the impacts will be Negligible negative with some impacts being negligible positive (Aquatic specialist report, Appendix 1).

The buffer of 30 m around the delineated wetland performs an important function for the maintenance of connectivity between the lagoon and the wetland. It buffers the lagoon from the development as well as the wetland from the development. The aquatic specialist supports the development of the Plett Lagoon Estate, provided that the residential areas are outside the wetland and buffer area and that the wetland is conserved and well maintained.

d) Socio-economic impact

Housing for a growing population is becoming increasingly important on a global, national and local level. Building houses not only creates part-time employment during the construction phase, but also ensures permanent work opportunities, which in turn create downstream employment opportunities.

This project is expected to contribute approximately R550 million a year to the economy through:
Seasonal contract work – R200 million
Permanent work – R100 million
Direct costs to local suppliers – R250 million.

With permanent direct and indirect work, such as domestic workers as well as skilled vocations such as plumbers and electricians. Indirect job opportunities will also be created during operational phase when homeowners enter into contracts with local service providers such as fibre contracts. The total cost for this project is expected to be R600 million

The expected annual income, either through direct or indirect job creation, is expected to benefit the local Plettenberg Bay community and surrounding areas. The expected annual income created by the development is approximately R120 million, for labourer jobs, consultants employed, materials bought and capital investment. People who will be employed for this development will consist of skilled and unskilled workers, providing opportunity for different social areas to be uplifted by means of employment. A total of ±R300 million is expected to be for employment during construction.

Socio-economic impacts are expected to be positive, by reducing unemployment within the local municipality of Bitou, benefitting the local economy as well as living conditions of the community. Failure of this project to be approved will result in loss of employment opportunities listed in Table 5.

i) Of water use or uses if authorised:

The development of the housing estate will create not only part-time employment during the construction phase, but also ensure permanent work opportunities once it is operational. The estimated job opportunities that will be created is summarised in Table 5 below.

Table 5: Employment opportunities created by the Plett Lagoon Estate development

Job Opportunities	Number of Job Opportunities	Type of employment	Affected sectors of the economy
Direct	300	Contract: Construction	Civils
	35	Contract: Operational	Planning
	80	Permanent: Operational	Surveying
Indirect	70	Permanent: Domestic	Security
		Gardeners	Town planners
		Security	Environmental specialists
		Contract: Plumbers	Architects
		Electricians	Engineers
		Service providers	Geologists
		Estate maintenance	Heritage consultants

The total cost expected for this project is ±R500 million, with approximately R300 million thereof being for employment. The contribution to the municipality due to the development is envisaged to be approximately R15-20 million, which can be used to support a range of municipal services. The expected annual contribution to the economy by direct and indirect work being created, is estimated to generate a spending turnover of at least R550 million.

The development will help to reduce unemployment within the local municipality of Bitou, benefitting the local economy and wellbeing of the living conditions of the community. Failure of this project to be approved will result in the loss of employment opportunities as listed in Table 5 above.

Bitou Municipality supports the development of the proposed housing development and confirmed that civil services will be available for this development (Appendix 2).

ii) Of the failure to authorise water use or uses:

Failure to authorise the water use of the proposed Plett Lagoon Estate, will forfeit the economical benefits to the local area as well as local people who can benefit from work opportunities during the construction and operational phase of the project.

e) Any catchment management strategy applicable to the relevant water resource

The dynamic nature of local, national and global environments constantly presents local government with new challenges and demands. Similarly, the needs and priorities of the local communities within Plettenberg Bay are ever-changing. This presupposes greater co-ordination and integration with other external stakeholders such as national and provincial government, business community and civil society.

The Keurbooms Estuary resource quality objectives indicates that the key threats to the system includes barriers to flow and movement of fauna within the system, alien invasive vegetation in the catchment, habitat loss and modification, reduction in freshwater runoff and disturbance caused by recreational activities.

The Bitou municipality's vision is to '*partner with communities and stakeholders to sustainably deliver quality services so that everyone in Bitou can live and prosper together*'. Economic development and job creation is one of the strategies of Bitou Municipality, which is stipulated in the IDP 2022-2027. Although not a function of the municipality, they are obligated to create an environment for economic growth and job creation. Their strategy is to create a safe environment for investors and develop investor friendly policies. Their plan is to support township tourism and other SMME ventures.

The aquatic specialists' finding was that the wetland's Present Ecological State (PES) is A (Natural), but had a score close to the boundary with B (Largely Natural). Minor impacts slightly reduced the state of the wetland from its natural reference condition, due to isolated areas invaded with invasive plants, mowing of some areas of wetland vegetation and existing roads and paths through the wetland. Most impacts affect vegetation which is reflected in the score of B, Largely Natural, determined in the PES assessment. Minimal impacts were observed to affect the wetland's hydrology water quality or geomorphology (Aquatic specialist report).

The EIS of the wetland was determined to be 'Very High', with a definition of this category wetland as follows:

"Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these floodplains is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers."

The aquatic specialist advised that an important aspect of this wetland type's sensitivity is that it is inward draining (endorheic) and therefore any water, sediment or material inputs cannot be 'flushed out' of the system. Therefore, careful consideration was given to mitigation measures to manage the stormwater and sewage on site with SuDS- type interventions to effectively manage stormwater on site with minimal risk to the wetland habitat and water quality.

Application for the WUL and the implementation of associated licensing conditions such that the Reserve and Resource Quality Objectives are met is linked directly to Strategic Area 1 of the BOCMA management strategy:

"Protecting People and Nature as well as sharing for Equity and Development."

The WUL application process has been implemented to ensure that water use activities are authorised in a manner that achieves these broad mission statements, particularly the mission of ensuring healthy water resources and allocating water for all forever.

f) Likely effect of the water use to be authorized on the water resource and on other water users.

Stormwater run-off is a factor which can potentially cause harm to the wetland adjacent to the property development, if not adequately managed. Increased volumes and velocities of stormwater discharging into the wetland have the potential to cause down cutting and channel incision. However, mitigation factors have been put in place to prevent damage to the adjacent wetland.

The development will occur outside of the delineated area of the wetland which is also buffered by a vegetated buffer zone of 30 m in width. The aquatic specialist supports the SuDS-type design features for the stormwater management of the property. The Engineering report acknowledges the erodibility of the soils on the site and with the wetland being downslope of the proposed development, the smothering of the wetland due to transported sediment from eroded slopes needs to be avoided. Therefore, the primary aim is to avoid erosion by managing the stormwater from the site.

With the measures put in place to manage stormwater through SuDS-type interventions, the aquatic specialist concluded that there should be minimal risk to the wetland's habitat and water quality. In addition, if the development is planned outside of the wetland and buffer area, the wetland is conserved and well maintained, hence the development of Plett Lagoon Estate is supported.

g) Class and the resource quality objectives (RQO) of the water resource

Plett Lagoon Estate on RE/6503, falls within the Gouritz Catchment, within quaternary catchment K60E (Figure 2). The eastern portion of the site is below the 5 m.a.m.s.l. contour which places it in the Estuarine Functional Zone of the Keurbooms Estuary (Figure 1). The quaternary catchment falls

within the G15 Coastal Integrated Unit of Analysis (IUA). The Water Resource Class for this IUA is II, indicating moderate protection and moderate utilisation, with a Targeted Ecological Category (TEC) of B. The wetland to the south of the development (Figure 3) lies below the 5 m contour line and is protected by a 30 m buffer.

RQO's are defined as clear goals (numerical or descriptive statements) relating to the quality of a water resource and are set in accordance to the management class for the resource to ensure the water resource is protected. The purpose of RQO's is to set clear objectives for the resource against which water use licenses and the related impacts can be evaluated and managed to achieve a balance between the need to protect and utilise the resource.

The Present Ecological State of the wetland is A (Natural) but had a score close to the boundary with B (Largely Natural), and the Recommended Ecological Category (REC) is therefore A/B. Every effort must therefore be made to minimise impacts to the wetland and ensure that it's PES does not deteriorate.

The estuary has a high conservation value; therefore guidelines are provided in the Keurbooms-Bitou Estuarine Management Plan (K-BEMP) to protect and conserve the status for land parcels within or spanning the EFZ, which will be considered in view of the proposed development of the Plett Lagoon Estate (Aquatic Specialist Report).

h) Investments already made and to be made by the water user in respect of the water use in question

Significant investments have already been made in the acquisition of the property, appointment of contractors and various environmental authorisation and planning development processes in excess of R65 million.

i) Strategic importance of the water use to be authorised

The Bitou Integrated Development Plan (2022-2027) has seven strategic objectives. Three of these are applicable to the proposed new development:

- *Re-establish, grow and expand tourism within the municipality*
This development contributes to this objective by attracting more people to either move to Plettenberg Bay or rent the newly built houses as holiday accommodation, which supports the tourism industry locally.
- *Facilitate growth, jobs and empowerment of the people of Bitou*
This is enhanced by the development through job creation and expanding the number of residents in the municipal area who will spend money locally.
- *To build institutional and financial sustainability*
Providing direct, permanent employment to skilled and unskilled people will provide financial support to families.

Some of the Strategic objective focus areas of Bitou municipality fall under Town Planning, where interventions in land use management (development control), spatial planning, compliance motoring, SMME contractor support and informal trading forms part of it. The Municipality is a major role player in development planning, where people's needs and priorities must be considered and linked with national guidelines. The development strategies of Bitou Municipality are focused on delivering the expected outcomes of the local development mandate.

The proposed development project will create a significant number of employment opportunities (Table 5). Work opportunities have already been created in the planning phase with land surveying, as well as the employment of numerous and various local professionals, including but not limited to town planners, environmental specialists, architects, heritage consultants, geologists, archaeologists and engineers.

Should this water use be authorised, it will create the opportunity for high income earners to contribute to the wealth of people in the area from disposable income that will be spent in the area. Rental opportunities within the homes will also encourage new visitors to the area, contributing to the local economy.

j) The quality of water in the water resource which may be required for the Reserve and for meeting international obligations

It is not foreseen that there will be a significant impact on downstream water quality or quantity in the adjacent wetland. This development will not be taking water from a watercourse and Bitou Municipality has sufficient raw water for the development with the implementation of upgrades (Appendix 2.). Therefore, the ecological reserve in terms of water quantities is not applicable

Mitigating measures that have been recommended by the aquatic specialist, including the wetland buffer and on-site stormwater management, aim to ensure that the water quality is maintained in the adjacent depression wetland during the construction and operational phases.

k) Probable duration of any undertaking for which a water use is to be authorised

The duration of the project's water uses is permanent.

17. Declaration by the applicant with signature confirming that the information submitted is correct.

[END OF WULA SUMMARY REPORT]



18. Appendices

Appendix 1 – Aquatic Specialist Report

Appendix 2 - Bulk Civil Services provision letter from Bitou Municipality



Our Ref. Erven 6504 &RE/6503	Enquiries A. Mgoqi	Tel 044- 501 3264	email address amgoqi@plett.gov.za
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05 OCTOBER 2023

**VITA CONSULTING ENGINEERS
51 Lourensford Estate
Somerset West
7130**

Attention: Riaan van Dyk

Dear Sir

CONFIRMATION OF BULK SERVICES: ERVEN 6504 & RE/6503

We confirm that Bitou Municipality has bulk infrastructure capacity in its networks and can accommodate the proposed development, subject to the following conditions.

1. That the developer enters and sign a Service Level Agreement with Bitou Municipality,
2. That the developer implements the upgrade of services as detailed and required in the GLS network analysis report, dated 27 February 2023.

Please contact the official dealing with this project for any further information in this regard.

Yours faithfully

**MR. VW. FELTON
DIRECTOR: ENGINEERING SERVICES**

Official dealing with this;
Miss Asiphe Mgoqi: Engineering Services: Project Manager: Planning & Development

Appendix 3 – GLS Consulting (Pty) report

Appendix 4 – Civil Engineering Services Report



Aquatic Biodiversity Impact Assessment

**Proposed construction of Plett Lagoon residential estate on Erf
6503, Plettenberg Bay, Western Cape**



Prepared for Cape EAPrac (Pty) Ltd

by

Dr. Jackie Dabrowski

Confluent Environmental (Pty) Ltd



Tel: 083 256 3159

Email: jackie@confluent.co.za

DECLARATION OF CONSULTANTS INDEPENDANCE

I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP);

- At the time of conducting the study and compiling this report I did not have any interest, hidden or otherwise, in the proposed development that this study has reference to, except for financial compensation for work done in a professional capacity;
- Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favourable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part, other than being members of the general public;
- I declare that there are no circumstances that may compromise my objectivity in performing this specialist investigation. I do not necessarily object to or endorse any proposed developments, but aim to present facts, findings and recommendations based on relevant professional experience and scientific data;
- I do not have any influence over decisions made by the governing authorities;
- I undertake to disclose all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by a competent authority to such a relevant authority and the applicant;
- I have the necessary qualifications and guidance from professional experts in conducting specialist reports relevant to this application, including knowledge of the relevant Act, regulations and any guidelines that have relevance to the proposed activity;
- This document and all information contained herein is and will remain the intellectual property of Confluent Environmental. This document, in its entirety or any portion thereof, may not be altered in any manner or form, for any purpose without the specific and written consent of the specialist investigators.
- All the particulars furnished by me in this document are true and correct.



Jackie Dabrowski (Ph.D., Pr.Sci.Nat. *Aquatic Science*)
SACNASP Registration Number 115166
Co-director: Confluent Environmental (Pty) Ltd

Qualifications: BSc, BSc Honours (Entomology), MSc & PhD (Veterinary Science)

Expertise: > 13 years' experience working on aquatic ecosystems across South Africa, with a focus on the Southern Cape in the last 6 years. Includes research and consulting expertise, having published > 10 water-related research articles and compiled > 150 aquatic specialist reports. Research and consulting have been in a range of sectors including agriculture, urban developments, linear structures, renewable energy, conservation, and mining.

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1. INTRODUCTION

Confluent Environmental Pty (Ltd) were appointed by Cape EAPrac to provide aquatic specialist inputs to the proposed residential development known as Plett Lagoon Estate on RE/6503 (Figure 1). The property is approximately 18.4 hectares in extent and is in the town of Plettenberg Bay between the Keurbooms Estuary to the east and the Plettenberg Bay Primary School to the west. Site access is via Beacon Way on the southwestern corner of the property. The eastern portion of the site is below the 5 m.a.m.s.l. contour which places it in the Estuarine Functional Zone of the Keurbooms Estuary Figure 1.



Figure 1. Proposed site of a housing development known as Plett Lagoon Estate on RE/6503, Plettenberg Bay.

1.1 The Proposed Development

The Site Development Plan (SDP) is presented in Figure 2. The proposed residential development at Plett Lagoon Estate will have split-zoning as follows:

- Residential Zone 1: 2.27 ha
- Residential Zone 2: 2.67 ha
- Residential Zone 4: 0.74 ha
- Open Space Zone 2: 0.66 ha
- Open Space Zone 3: 10.44 ha (includes wetland area)

Housing and amenities will consist of:

- Single Residential: 37 Erven

- General Apartments: 40 Units
- Guardhouse, Refuse room etc.

Following identification and delineation of the wetland on site, the Site Development Plan was scaled back to exclude the wetland with the result that 10.5 hectares (almost 60%) of the site will be zoned as public open space and managed as a nature conservation area by the development's body corporate (Figure 2).

Aspects of the development that may influence the wetland and Keurbooms estuary include the management of stormwater and wastewater from the site. Vita Engineers provided a Civil Engineering Services Report (June 2023) for the site which states the following:

Stormwater Management

- The pre-development site drains from the higher lying western boundary to the lower lying eastern boundary.
- The site is underlain by aeolian sands several metres thick with high permeability, therefore promoting the infiltration of surface water runoff from the site.
- A network of swales along roads has been proposed as the main SuDS-based attenuation feature. The swales aim to attenuate peak flows to pre-development runoff rates and to treat stormwater runoff by percolation through sands.
- Channels with flow velocities > 1m/s will be lined and protected with open pavers, while unlined channels with lower flow velocities will be vegetated.

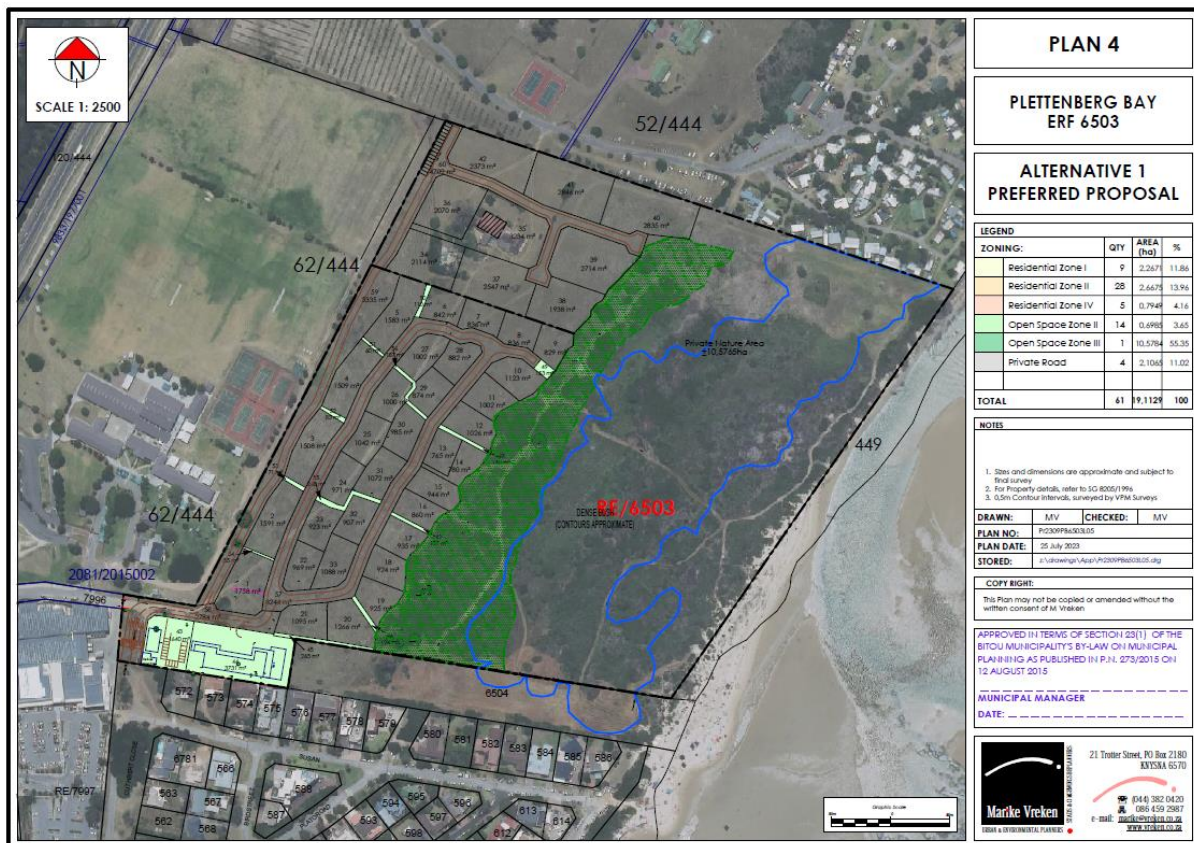


Figure 2. Proposed Site Development Plan for RE/6503, Plettenberg Bay.

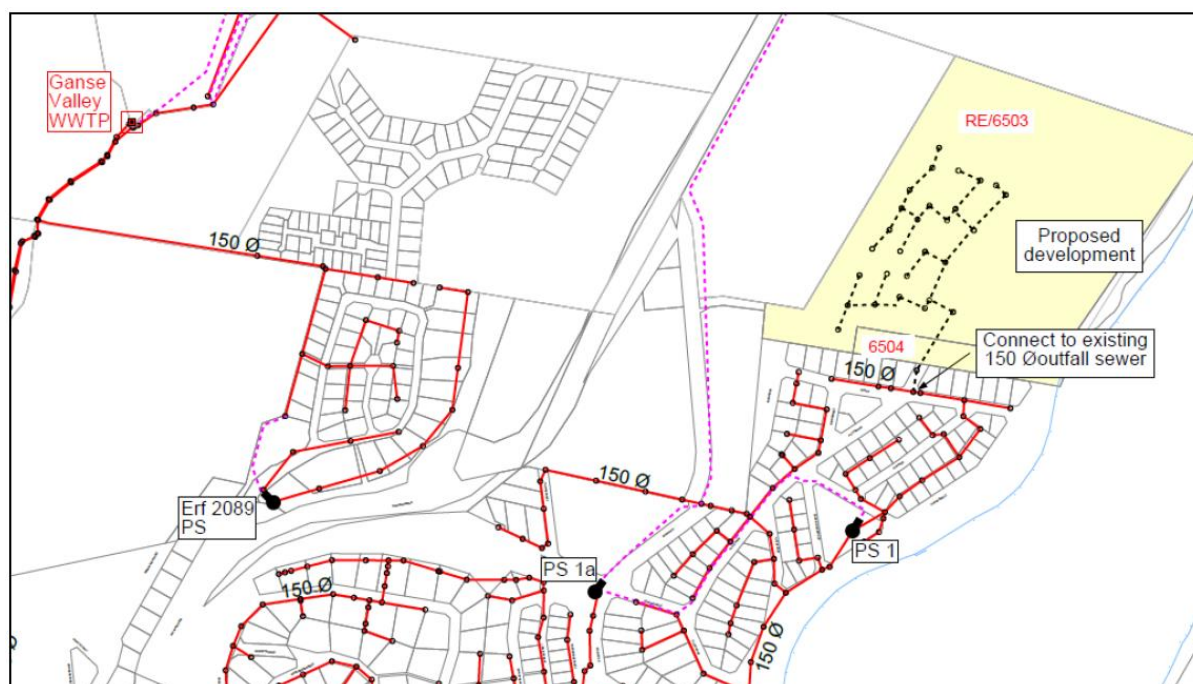


Figure 3. External sewer masterplan extracted from GLS Consulting (Feb, 2023).

Sanitation

The plan compiled by GLS Consulting followed the analysis of the bulk municipal sewer infrastructure capacity, and the impact of the proposed development on the existing infrastructure. The plan concludes that the proposed development can be accommodated within the existing Plettenberg Bay Pump Station 1 drainage area. Further, there is sufficient capacity in the existing Plettenberg Bay sewer system to accommodate the proposed development. The report recommends that the sewer connection be to the existing 150 mm diameter outfall sewer on Susan Street as indicated in Figure 3. Proposed internal sewerlines will be 169 mm diameter uPVC class 34 gravity pipe network.

1.2 DFFE Screening Tool Results

According to the Department of Environment, Forestry and Fisheries (DFFE) screening tool, aquatic biodiversity at the site has a **Very High** sensitivity (Figure 4). The sensitivity features identified are:

- Critical Biodiversity Area 1 – Aquatic
- Keurbooms Estuary
- FEPA Sub-catchment
- Wetlands (Estuary)

As both an estuary and freshwater wetland are located at the site, the scope of work for this report is guided by the legislative requirements of the National Environmental Management Act (NEMA) and the National Water Act (NWA; Act No 36 of 1998).



Figure 4. Results of the DFFE Screening Tool which indicate Very High Sensitivity of the Aquatic Biodiversity theme.

1.3 Scope of work

According to the protocols specified in GN 320 (Protocol for the specialist assessment and minimum report content requirements for environmental impacts on aquatic biodiversity) of the National Environmental Management Act (NEMA; Act No. 107 of 1998), assessment and reporting requirements for aquatic biodiversity are associated with a level of environmental sensitivity identified by the national web-based environmental screening tool (screening tool). An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of:

- **Very High** sensitivity for aquatic biodiversity, must submit an Aquatic Biodiversity Specialist Assessment; or
- **Low** sensitivity for aquatic biodiversity, must submit an Aquatic Biodiversity Compliance Statement.

The objectives of this assessment included the following:

- To undertake a Site Sensitivity Verification for aquatic biodiversity using desktop analysis and a site inspection. Sensitivity will be verified as either **Very High** or **Low**; and,
- Compile an Aquatic Biodiversity Compliance Statement or Aquatic Biodiversity Specialist Assessment based on the sensitivity verification for the site. This includes assessment of the following:

Interrogation of available desktop resources including:

- DWS spatial layers (1:50 000 rivers)
- National Freshwater Ecosystem Priority Areas (NFEPA) spatial layers (Nel *et al.*, 2011)
- National Wetland Map 5 and Confidence Map (CSIR, 2018)

- Western Cape Biodiversity Spatial Plan (WCBSP, 2017).

Conduct a site visit to determine the site sensitivity:

- Identification and classification of watercourses within and adjacent to the site according to methods detailed by Ollis *et al.* (2013);
- Determine the watercourse Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) using an appropriate method (if watercourses are present).
- Delineate wetland / riparian areas following methods prescribed by DWAF (2015).
- Determine an appropriate buffer for wetland areas using the site-specific buffer tool developed by Macfarlane and Bredin (2016).

This report will also meet the requirements for a Water Use License Application (WULA) which will be required given installation and connection to sewage pipelines will be necessary within the regulated area of a wetland (defined as 500 m from a wetland). The relevant water uses will be:

Section 21 c) impeding or diverting the flow of water in a watercourse;

Section 21 i) altering the bed, banks, course or characteristics of a watercourse; and,

Section 21 g) disposing of waste in a manner which may detrimentally impact on a water resource.

1.4 Assumptions and Exclusions

The site visit was undertaken on 21 May 2023 which is considered Winter. It is possible that sensitive features such as rare or unique biota (e.g. amphibians), plants or habitat were not observed during the site visit, but are influenced by season, time of day, flow level or vegetation cover. However, recent good rainfall along with rainfall during the site visit meant that wetland features were quite evident and easily identified. In fact, this May was considered the 6th wettest May on record since the late 1800s (*pers. comm.* J. Crowther, local dairy farmer).

2. CATCHMENT CONTEXT

2.1 Catchment features

The development site is located at the lower extent of quaternary catchments K60E and K60G which drain the Keurbooms River to the east and the Piesang River to the west respectively. The property is located adjacent to the Keurbooms River. Rainfall is relatively high by South African standards with a Mean Annual Precipitation of 647 mm which can fall with a Very High intensity. Coupled with the High erodibility of soils in the area, erosion of soils and stormwater management are factors which must always be carefully considered when planning a development (Table 1 & Figure 5).

Table 1. Summary of relevant catchment features for the proposed development area.

Feature	Description
Quaternary catchment	K60E & K60G
Mean Annual Runoff	101 mm
Mean Annual Precipitation	647 mm (weather station No. 0014633W)
Inherent erosion potential of soils (K-factor)	0.56, High
Rainfall intensity	Very High
Ecoregion Level II	20.02, Southeastern coastal belt
Geomorphological Zone	Floodplain / Estuary
NFEPA area	Sub-quaternary reach 9188, Fish FEPA
Mapped Vegetation Type	FFg5: Garden Route Shale Fynbos (Endangered; FFh9) and Goukamma Dune Thicket (Least Concern; AT36)
Soils	Soils with limited pedological development
Conservation	Critical Biodiversity Area 1 and 2 (Terrestrial & Aquatic; WCBSP, 2017)

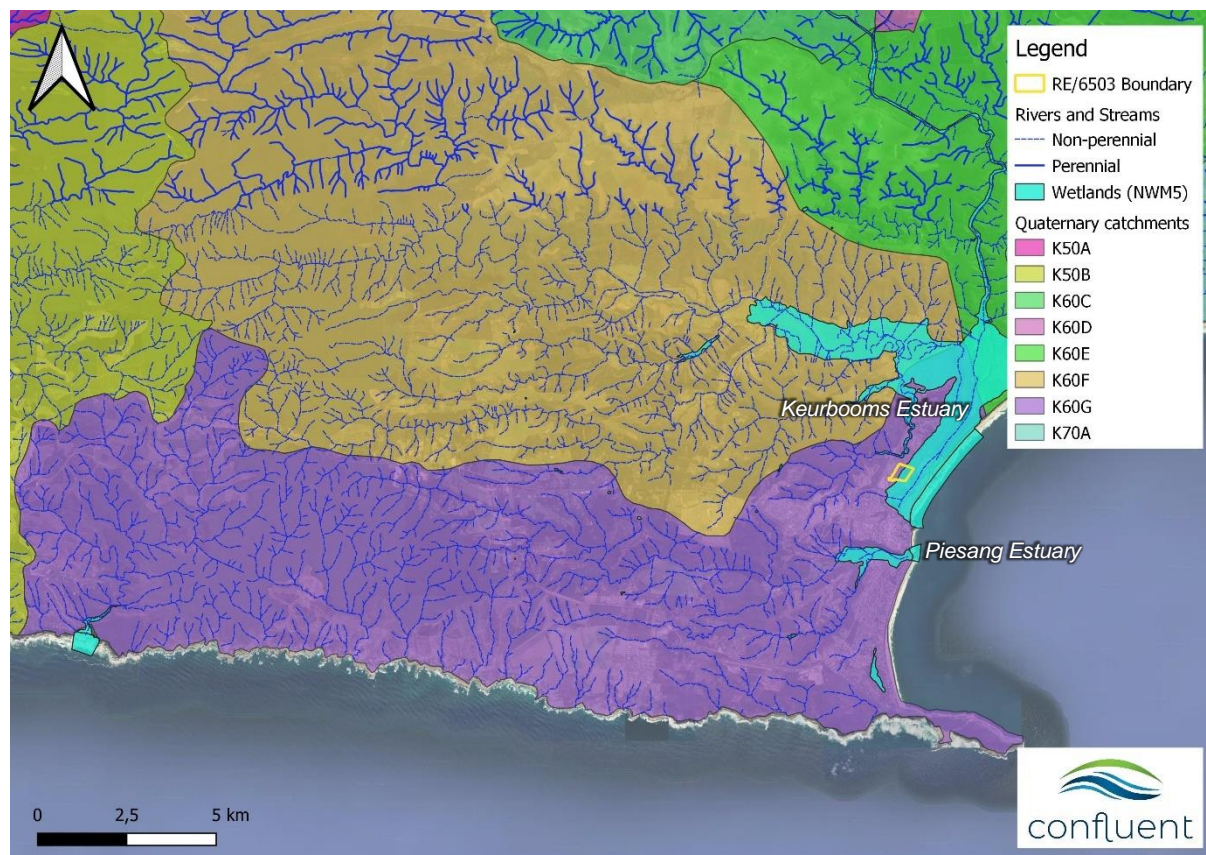


Figure 5. Location of the property at the boundary of quaternary catchments K60E and K60G.

Rainfall occurs year-round with seasonal peaks in spring and autumn (Figure 6).

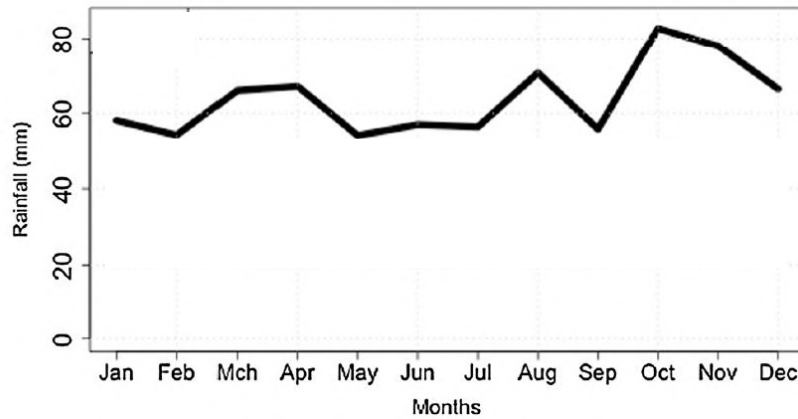


Figure 6. Area-averaged monthly rainfall for the coastal Southern Cape indicating peaks in Mar-Apr, Aug, and Oct. Data averaged between 1979 and 2011 (Engelbrecht *et al.*, 2015).

The project area is located within the southeastern coastal belt (Ecoregion Level 2:20.02). The terrain is described as closed hills of moderate and high relief and moderately undulating plains. Altitude ranges between 0 – 1 300 m.a.m.s.l.

2.2 Vegetation

The mapped vegetation type on the western half of the property Garden Route Shale Fynbos which is categorised as Endangered (FFh9; NVM, 2018), while the eastern half of the property is Goukamma Dune Thicket which is classed as Least Concern (AT36; Figure 7). Vegetation in the Keurbooms Estuary is mapped as non-terrestrial, which is correct as most of the vegetation is considered aquatic.

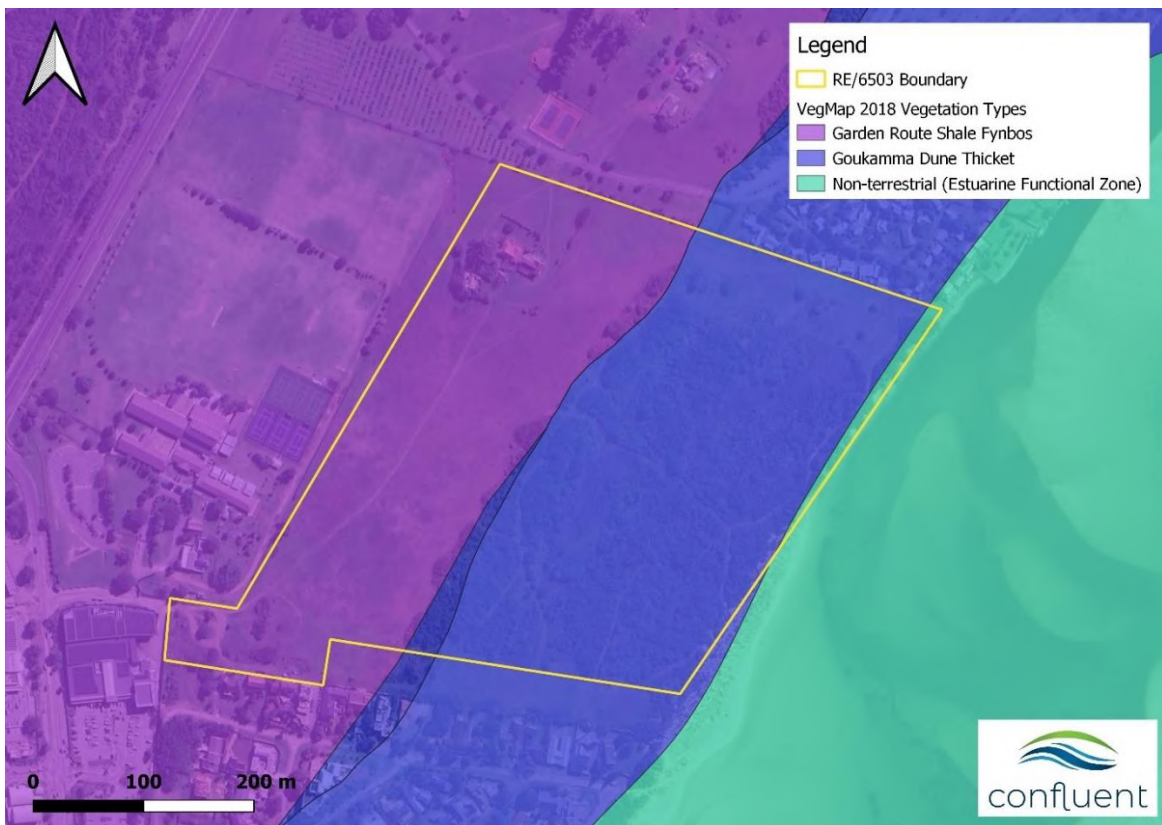


Figure 7. Mapped vegetation at the site according to VegMap (2018).

2.3 Conservation and catchment management

2.3.1 WCBSP

The Western Cape Biodiversity Spatial Plan (WCBSP; 2017) indicates the western half of the site as a Critical Biodiversity Area 2, which corresponds with the higher-lying area (Figure 8). The eastern half of the site and Keurbooms Estuary are mapped as a Critical Biodiversity Area 1, mostly consisting of Aquatic habitat. The definition and management objectives of each of these classes are described in Table 2.

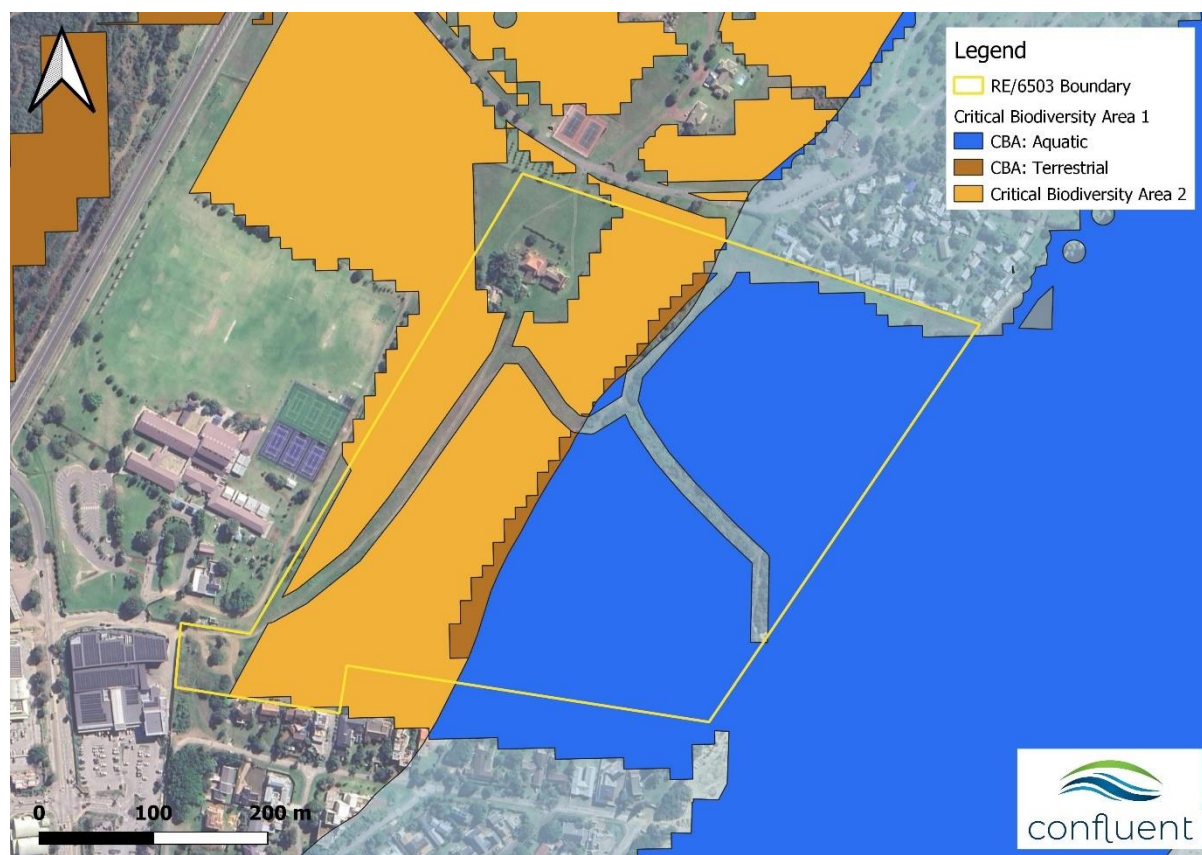


Figure 8. Mapped conservation features of the Western Cape Biodiversity Spatial Plan (2017).

Necessary actions in relation to the WCBSP are to ensure that development on the site does not result in negative impacts to ecological structure and function of watercourses adjacent to the site.

Table 2. Definitions and objectives for conservation categories identified in the Western Cape Biodiversity Spatial Plan (WCBSP, 2017).

WCBSP Category	Definition	Management Objective
Critical Biodiversity Area 1 (CBA1)	Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.	Maintain in a natural or near-natural state, with no further loss of natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.

Critical Biodiversity Area 2 (CBA2)	Areas in a degraded or secondary condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.	Maintain in a natural or near-natural state, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land-uses are appropriate.
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2.3.2 NFEPA

According to the National Freshwater Ecosystem Priority Atlas (NFEPA; Nel *et al.*, 2011) the sub-quaternary reach (SQR 9188) is classified as a FishFEPA, which is a Fish Support Area.

Fish Support Areas were identified in river systems in a good ecological state (PES A or B) and that have been identified as FEPAs (Freshwater Ecosystem Priority Areas). These rivers contribute to national biodiversity goals and support sustainable use of water resources. Fish Support Areas also include sub-quaternary catchments that are important for the migration of threatened or near threatened species.

This is due to the presence of Endangered or Critically Endangered fish in the quinary catchment of the Keurbooms River. Fish recorded in the system include the extremely range restricted *Pseudobarbus* sp. nov. 'Keurbooms' (previously *Pseudobarbus tenuis*), *Pseudobarbus afer* (Endangered, Eastern Cape Redfin), and *Sandelia capensis* (Data Deficient, Cape Kurper).

Generally, *Pseudobarbus tenuis* occurs in the headwater streams while *Psuedobarbus afer* occurs in the forested peat-stained water. The main threat to these fishes is through the introduction of predatory alien fish species of bass and trout. Impacts related to forestry and agriculture are also known to affect populations.

2.3.3 Strategic Water Source Area

Aquatic biodiversity within the site has been identified as Very High. One of the reasons is that the site falls within the Outeniqua Strategic Water Source Area for surface water (SWSA-sw). SWSAs are defined as areas of land that supply a disproportionate (ie. Relatively large) quantity of mean annual runoff in relation to their size and are therefore considered nationally relevant (Le Maitre *et al.*, 2018). A key objective in the management of SWSAs is to ensure the quantity and quality of water within and flowing from SWSAs is protected from developments that cause unacceptable and irreparable impacts.

2.4 Mapped Watercourses

The only mapped aquatic feature proximal to the site is the Keurbooms Estuary which is indicated as the area below the 5 m.a.m.s.l. contour (Figure 1 and Figure 9). The 0.5 m contours are shown for this area as they provide a more detailed picture of the micro-topography.

2.4.1 Keurbooms-Bitou Estuary

The estuary feeds what is known as the Keurbooms Lagoon. The Present Ecological State of the estuary is classified as A/B, and the same category is applicable for the Recommended

Ecological Category. The estuary has a high conservation value, supporting one of only three known populations of the iconic Knysna Seahorse occurring in *Zostera* (segrass) beds. In terms of management objectives, the Keurbooms-Bitou Estuarine Management Plan (K-BEMP) states that formal protection mechanisms to obtain conservation status for land parcels within or spanning the EFZ must be investigated. In terms of land-use and infrastructure, the following relevant guidelines are provided in the K-BEMP:

- Planning should allow for the maintenance of a riparian zone along the length of the estuary where sensitive habitats (e.g. wetlands, supratidal saltmarsh and indigenous vegetation) occur. The implementation of the CML, CPZ, floodlines and inclusion of Critical Biodiversity Areas within all planning schemes should allow for this.
- Development and land use in the catchment and estuarine area should not lower water quality or interfere with normal hydrodynamic or sedimentary processes and cycles;

These management guidelines will be considered in view of the proposed development of the Plett Lagoon Estate.

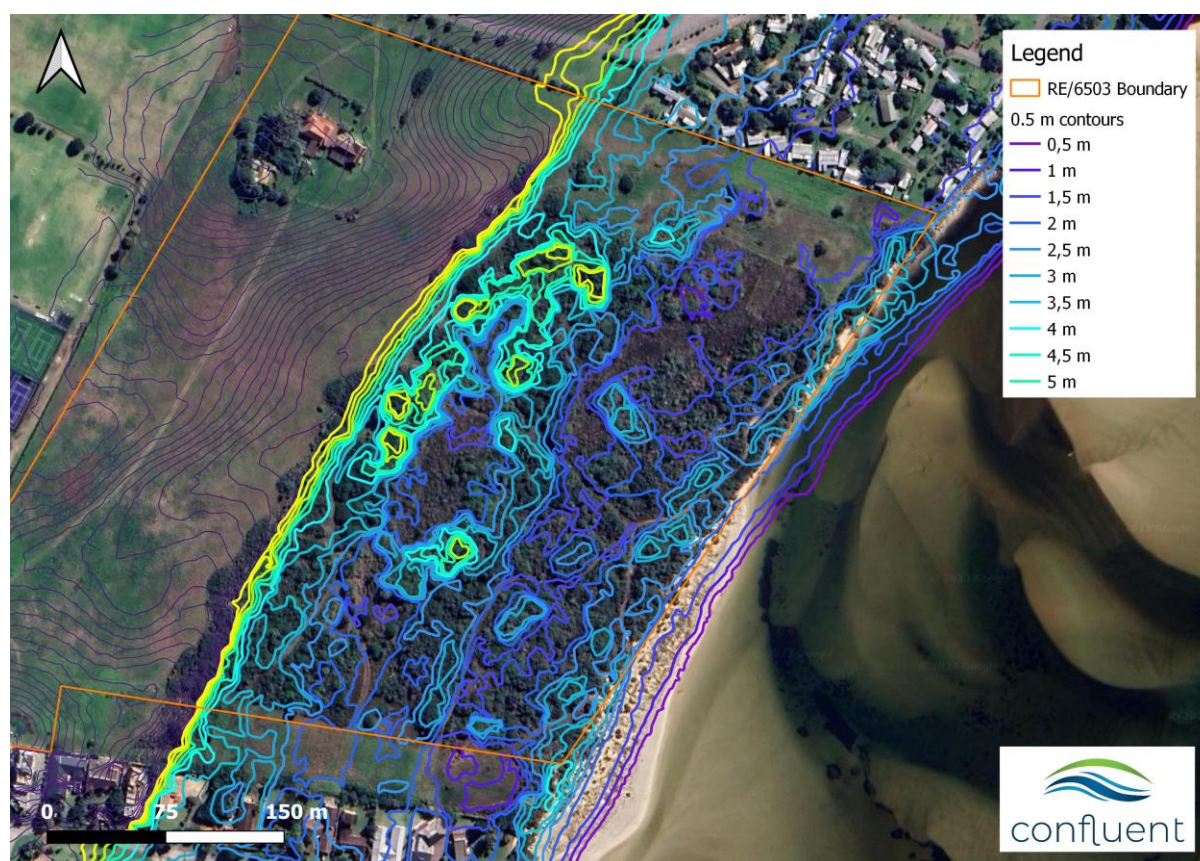


Figure 9. RE/6503 site contours at 0.5m intervals highlighted below the 5m contour which defines the Estuarine Functional Zone (EFZ).

2.5 Historical assessment

Historical aerial and satellite photos were examined of the site over a period of approximately 8 decades (Figure 10). In the earliest photo from 1936, very little development had occurred either on the property itself or in the neighbouring properties. The difference between the more

grassy, open vegetation to the west of the site, compared to the more densely vegetated eastern portion is evident throughout the site's history. Dense vegetation along the lagoon on the neighbouring properties was cleared for construction of housing developments around the 1970s. The residence located on RE/6503 in the northern corner was evident as a small settlement in 1936 and has always been the site of a residence to the present day. Footpaths through the wetland were evident from 2011, although they were probably present for a while before then, but overgrown.

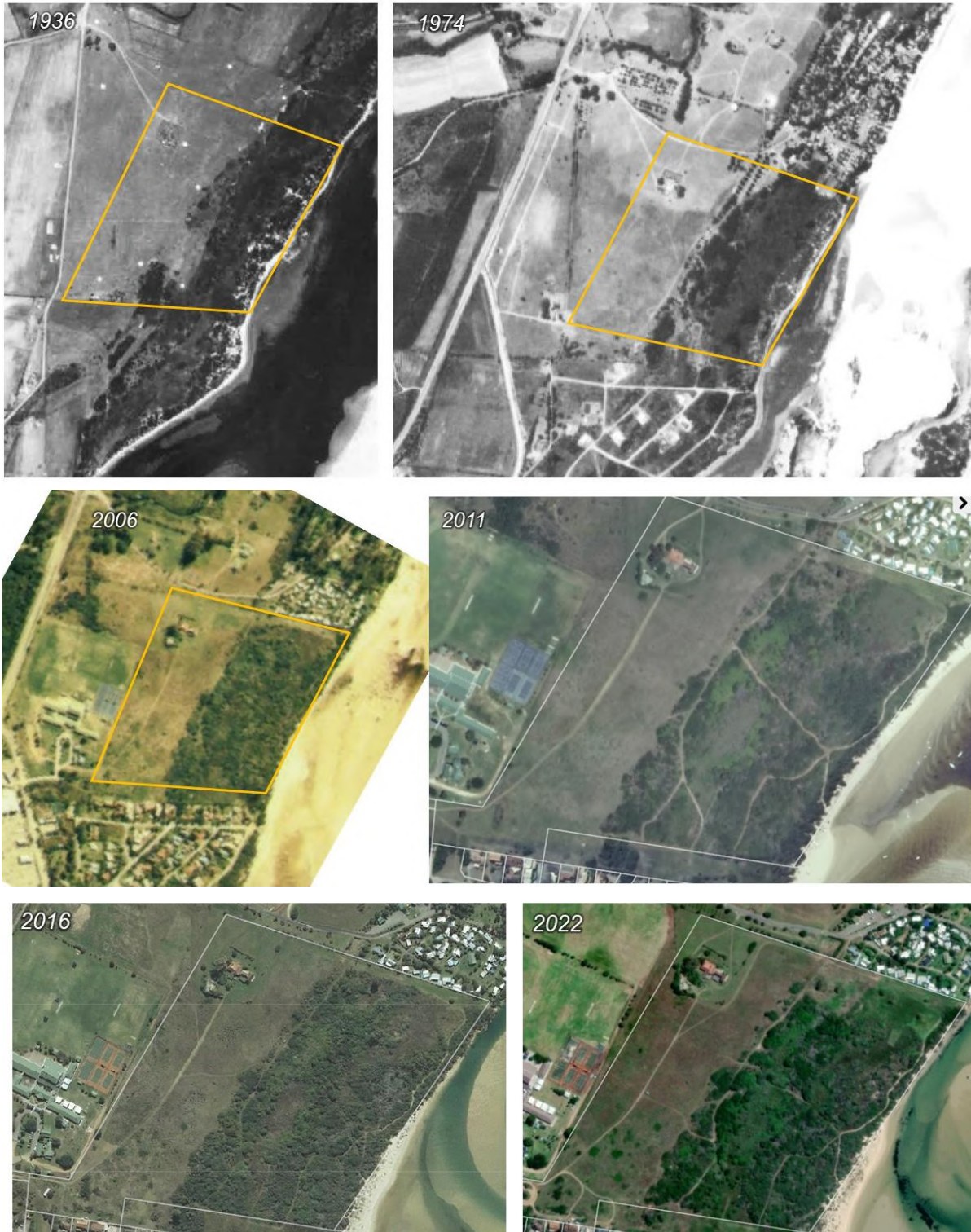


Figure 10. Historical photos showing the approximate property boundary for a period of 86 years (CD:NGI & Google Earth imagery).

3. SITE ASSESSMENT

3.1 Site visit

The site was visited on 21 May 2023. Above average rainfall had been experienced in the Garden Route in May and it rained periodically during the site assessment. An extensive area of 5.2 km was walked to assess aquatic features where accessible (Figure 11).



Figure 11. GPS track of route walked during the site assessment on 21 May 2023.

3.2 Wetland Delineation

Wetlands were delineated using a combination of hydrophilic plant species, soils with redoximorphic features (e.g. mottling and/or gleying; Figure 12), and topographical location (Figure 13).

A wide variety of wetland plant species were observed throughout the wetland area. These were dominated by freshwater species but included a few species typically located in the supratidal zone of estuaries. Species considered to be obligate as well as facultative wetland plants were recorded (Table 3).

Table 3. Wetland plant species identified in the depression on RE/6503.

Common name	Species name
Fluitjiesriet	<i>Phragmites australis</i>
Vleibiesie / knobby club-rush	<i>Ficinia nodosa</i>
Impepho / fume everlasting	<i>Helichrysum cymosum</i>
Arum lily	<i>Zantedeschia aethiopica</i>
White carpet	<i>Falkia repens</i>
Brak rush	<i>Juncus krausii</i>
Oak waxberry	<i>Morella quercifolia</i>
Cogon grass	<i>Imperata cylindrica</i>
Manyspike flatsedge	<i>Cyperus polystachyus</i>
Slender knotweed	<i>Persicaria decipiens</i>
Water pimpernel	<i>Samolus porosus</i>
Black bog-rush	<i>Schoenus nigricans</i>
Brook weed	<i>Samolus valerandi</i>

Hydric soils display indicators which are predominantly formed by the accumulation or loss of iron, manganese, sulfur or carbon under permanent or periodic saturated and anaerobic conditions. Sandy soils such as those on the RE/6503 seldom show the same degree of mottling and gleying as saturated or seasonally saturated soils with a higher clay content. Nonetheless, soils from multiple points showed degrees of mottling and gleying in permanent and seasonal zones of the wetland, and standing water was often present from 30 cm depth (Figure 12).

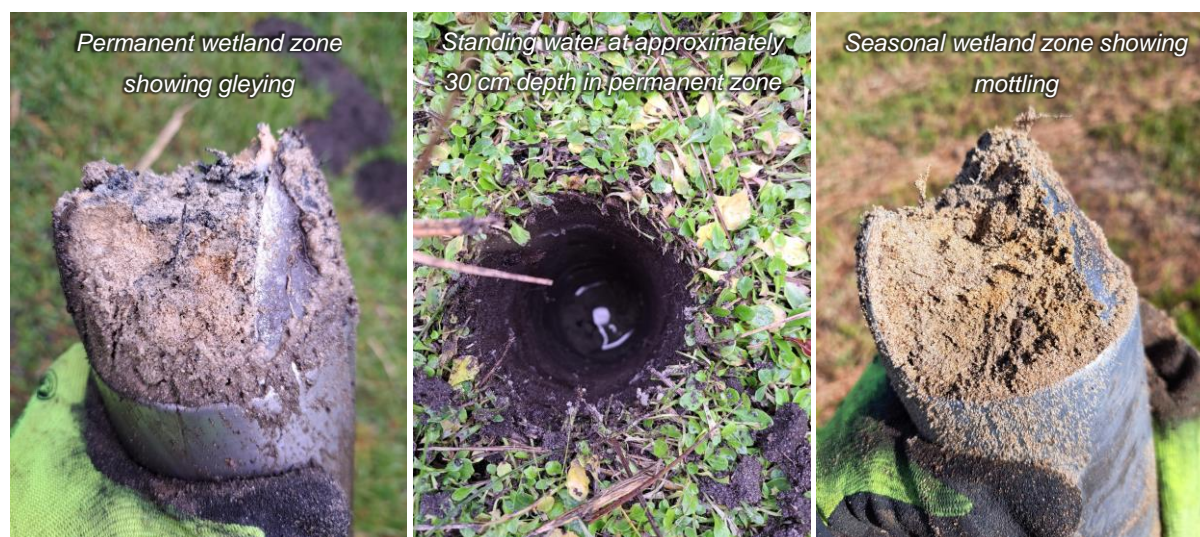


Figure 12. Wetland soil indicators observed at the site.

Wetland vegetation and soil auger results observations were combined with the fine-scale site topography to delineate the depression wetland as indicated in Figure 13. The wetland is mostly located below the 2.5 m to 3 m.a.m.s.l. contours at the site.

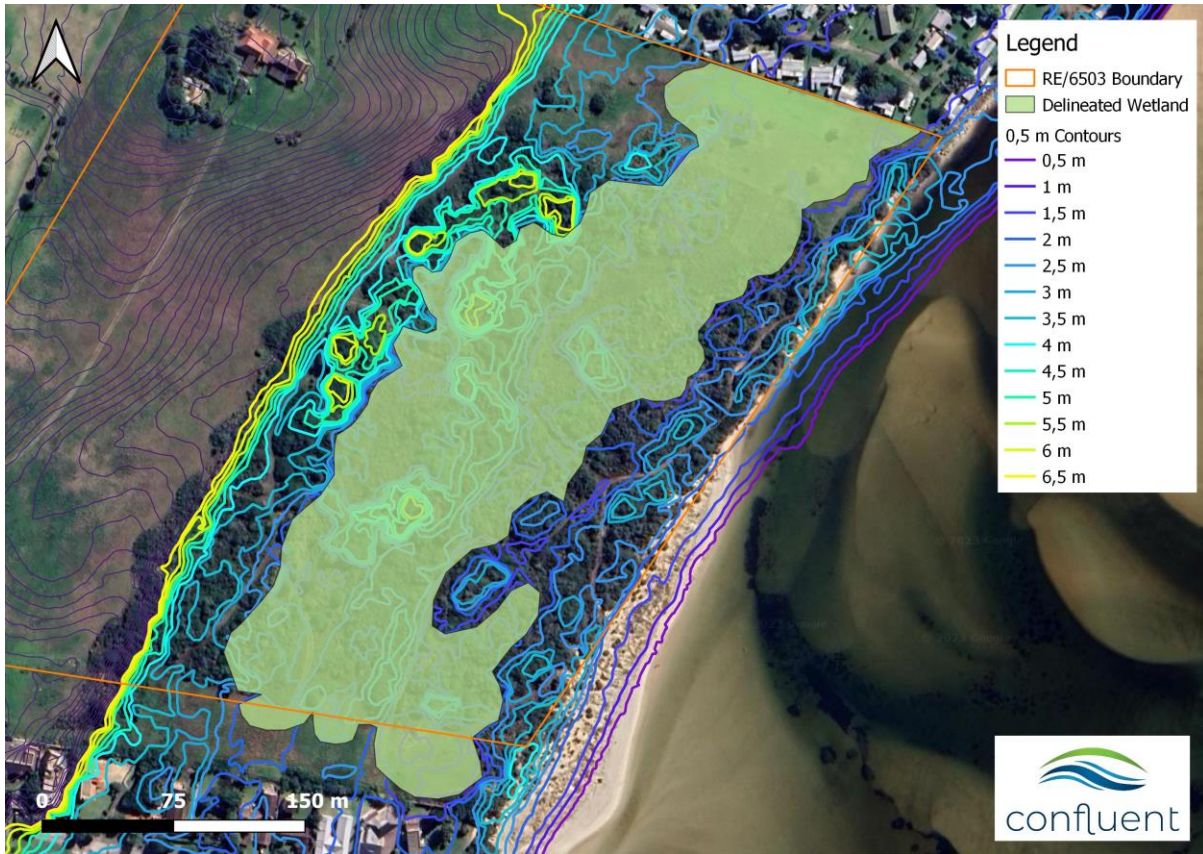


Figure 13. Wetland delineation based on soil, vegetation, and topography of the site.

3.3 Wetland Classification

The interdunal water-filled depression is classified as a depression wetland (Ollis *et al.*, 2013; Figure 14). No channelled flow into or out of the depression is present and the wetland is inward draining (endorheic).

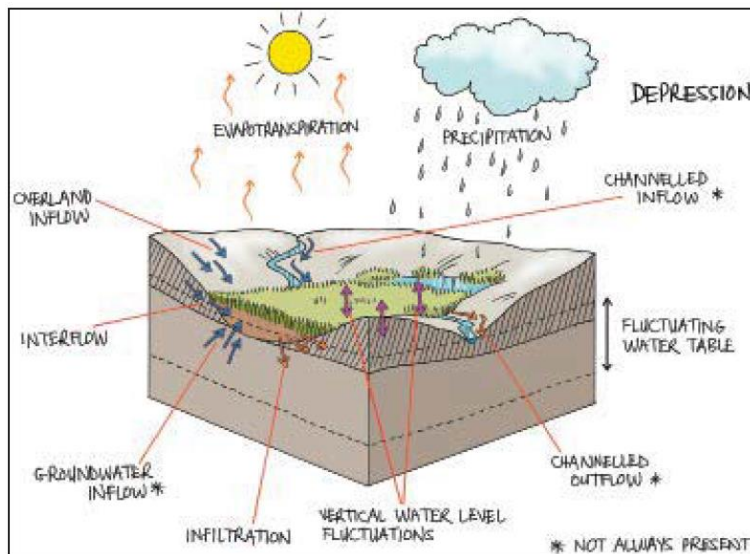


Figure 14. Conceptual illustration of the interdunal depression wetland (from Ollis *et al.*, 2013).



Figure 15. Photos of various wetland and estuarine features on RE/6503.

3.4 Wetland Buffer

Buffers are located where the land meets a delineated watercourse, and refer to the zone where these two habitats interface. Buffer areas are linear zones adjacent to watercourses managed with the intention of protecting water resources from diffuse pollution associated with adjacent land uses. In addition, they provide habitat for wildlife within, and act as corridors for movement, feeding and breeding through fragmented landscapes. In this case the buffer performs an important function for the maintenance of connectivity between the lagoon and the wetland. It buffers not only the lagoon from the development, but also the wetland from the

development. The width of the aquatic impact buffer zone was determined to be **30 m** through use of the site-based wetland buffer tool developed by Macfarlane & Bredin (2017).



Figure 16. Delineated wetlands and 30 m wetland buffer in relation to the remainder of the site.

4. ECO-CLASSIFICATION

4.1 Present Ecological State (PES)

The PES of the wetland was determined using the updated WET-Health Version 2 method described by Macfarlane *et al.* (2020). Methods for the assessment are provided in Appendix 1. The result of the assessment was an overall **PES of A, Natural**, although the score was close to the boundary with B, Largely Natural. Minor impacts have occurred which have slightly reduced the state of the wetland from its natural reference condition (Figure 17). These are summarised as follows:

- Natural wetland and thicket vegetation has been invaded in isolated areas by alien invasive plants.
- An area of approximately 0.7 ha of wetland vegetation to the north is mowed on a regular basis. There are areas of alien invasion within the mowed area.
- Existing roads and walking paths are established through the wetland and surrounding area. These are maintained by vegetation trimming and are infrequently travelled by vehicle.

Most impacts affect vegetation which is reflected in the score of B, Largely Natural, determined in the PES assessment. Minimal impacts were observed to affect the wetland's hydrology water quality or geomorphology.

Table 4. Summarised Present Ecological State determined for the depression wetland using WET-Health.

Final (adjusted) Scores				
PES Assessment	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	1,2	0,3	1,2	1,9
PES Score (%)	91%	97%	90%	81%
Ecological Category	A	A	A	B
Trajectory of change	↓	↓	→	→
Confidence (revised results)	High	High	Medium	High
Combined Impact Score	1,1			
Combined PES Score (%)	91%			
Combined Ecological Category	A			
Hectare Equivalents	5,2 Ha			



Figure 17. Photos of various impacts affecting vegetation of the wetland.

4.2 Ecological Importance and Sensitivity

The Ecological Importance and Sensitivity (EIS) was determined using methods provided in Appendix 2 which was developed by Rountree *et al.* (2013). The EIS of the wetland was determined to be 'Very High' (Table 5). The definition of wetlands in this category is as follows:

“Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these floodplains is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.”

An important aspect of this wetland type’s sensitivity is that it is inward draining (endorheic) and therefore any water, sediment or material inputs cannot be ‘flushed out’ of the system.

Table 5. Summarised Ecological Importance and Sensitivity of East and West Wetland.

Ecological importance and sensitivity	Score 0-4	Confidence 1-5	Motivation
Biodiversity support	3.6		
Presence of Red Data species	3	3	None observed in wetland, but Plett lagoon is home to Knysna seahorses and the wetland plays a supportive role.
Populations of unique species	4	3	Diverse and abundant population of wetland plants creating unique habitat which usually supports unique vertebrate and invertebrate species.
Migration/feeding/breeding sites	4	4	Habitat for amphibians, reptiles, small mammals, birds etc. Good connectivity between the wetland and lagoon.
Landscape scale	3.4		
Protection status of wetland	3	4	Identified as CBA1 on WCBSP and ownership is private (not public open space).
Protection status of vegetation type	3	4	Located at ecotone between disturbed fynbos (mapped CR) and thicket / wetland / estuarine vegetation (LC).
Regional context of the ecological integrity	4	4	In good condition for peri-urban wetland but will be increasingly pressured if proposed development go ahead.
Size and rarity of the wetland types present	4	4	Moderate to large size and one of the last remaining interdunal depression wetlands along the Keurbooms Lagoon.
Diversity of habitat types	3	4	Areas of seasonal, temporary and permanent wetland interspersed with thicket ‘islands’. Relatively diverse habitats.
Sensitivity of the wetland	3		
Sensitivity to changes in floods	3	3	Erosion of slopes to the west would result in sediment deposition and vegetation smothering in the wetland. Thicket areas would be inundated leading to vegetation transition.
Sensitivity to changes in low flows	2	3	Loss of permanent wetland vegetation, but water levels already fluctuate to an extent.

Sensitivity to changes in water quality	4	4	High nutrients can transform vegetation to a greater dominance by reeds such as <i>Typha capensis</i> and <i>Phragmites australis</i> .
Hydrofunctional Importance	2	3	
Direct human benefits	1.8	3	
ECOLOGICAL IMPORTANCE AND SENSITIVITY	3.6	VERY HIGH	

5. LEGISLATIVE IMPLICATIONS

5.1 Site Sensitivity Verification

The Site Sensitivity in terms of Aquatic Biodiversity for Option C is **confirmed as Very High** as indicated by the DFFE Screening Tool because significant wetland habitat is present on the site.

5.2 Water Use Authorisation

The presence of a wetland on the property means that the construction and operation of the proposed housing development would be taking place in the Regulated Area of a Watercourse as defined in GN509 of the National Water Act. For wetlands this is defined as the area within a 500m radius of the wetland. The installation of new sewerage pipelines for the development is an activity which is currently excluded from the General Authorisation, meaning it would be necessary to apply for a Water Use License.

A specialist impact assessment for all phases of the proposed development will be compiled in order to meet the requirements for both the NEMA and the NWA.

6. IMPACT ASSESSMENT

Methods used for the impact assessment are provided in Appendix 3. The impact assessment follows the mitigation hierarchy of avoidance, minimisation of impacts, restoration of damaged ecosystems and offsets for residual damage, prioritised in that order.

6.1 Design and Layout Phase

6.1.1 Stormwater management

The stormwater management plan compiled by Vita Consulting Engineers proposes SuDS-type design features for the management of stormwater which are fully supported. The report acknowledges the high erodibility of soils on the site. Being downslope of the proposed development the wetland is vulnerable to smothering by transported sediment from eroded slopes, and being inward draining, this material would eventually form terrestrialised islands with different vegetation, most likely being colonised by alien plant species. Avoidance of erosion is therefore the primary aim of managing stormwater on the site. The following additional mitigation measures are recommended to further reduce impacts:

- Wherever possible driveways and parking areas must use open paver / permeable paving systems such as grass blocks or sudpave-type products. This will utilise the highly permeable nature of soils at the site to reduce runoff to roads in > 1:5 year rainfall events.

- Stormwater outlets leading towards the wetland will need to consider the steep slope between the development level and wetland. On average there is a drop of approximately 4 m over which stormwater must be delivered to the wetland without causing erosion. It is recommended that stormwater outlets:
 - a) Follow existing roads and pathways where vegetation is regularly trimmed to navigate the slope between the higher ground and wetland area (Figure 18). This will have the added benefit that residents will see any erosion, slippage or litter accumulated in the stormwater outflows, and report it to the Homeowners Association for attention.
 - b) The stormwater outflow point use a series of stepped gabions protected by reno mattress to break the fall of water to navigate the slope. This should end in a stilling basin which would act as a sump.
 - c) A gabion walled stilling basin with no concentrated outflow at the lower ground level be constructed to break the final fall of water and to allow water to seep out of gabions in multiple directions to the wetland beyond. The base of the stilling basin should be slightly below ground level on reno mattress to reduce subsidence, and all reno or gabion structures must be protected with geotextile to prevent malformation due to slumping in the sandy soil.



Figure 18. Proposed stormwater outlet points utilising existing tracks to and through the wetland.

6.1.2 Fenceline

As the wetland area is the last remaining area of significant wetland and natural vegetation remaining along the western shoreline of the Keurbooms Lagoon, it is important to protect the function as an ecological corridor. Wildlife currently move between the wetland and lagoon area, and an important function of the wetland is the provision of shelter and habitat for feeding, breeding and movement. The following mitigation measures are recommended:

- The fenceline should enclose the residential area only, and not the wetland area. The final location is yet to be determined but should minimise the disturbance of natural vegetation on the slope as far as possible. This is very important for the ongoing stability of the slope which is protected by established vegetation.
- Install code-operated pedestrian gates along the fenceline aligned to existing pathways and roads to allow joggers and walkers access to the wetland and lagoon.
- Use alternative security measures to monitor the wetland such as guarding or cctv cameras.

- IT is assumed that typical Clearvu-type fencing would be preferred, however this seriously restricts the movement of any animals. Install larger grid sections along the base of the fenceline in a few sections, to allow smaller-bodied vertebrates to move in and out of the residential area.
- Do not use any electric strands along the base of the fenceline.

6.2 Construction Phase Impact Assessment

6.2.1 Pre-construction wetland rehabilitation

The wetland is in a very good ecological state, apart from a few impacts which are discussed in the PES section. It is recommended that prior to commencement of construction, these impacts be dealt with to improve the wetland's condition and ensure that best practice management of the wetland commences early on. Mitigation of existing impacts will result in a positive outcome if all mitigation measures are implemented (Table 6).

Table 6. Construction phase: pre-construction wetland rehabilitation.

Project phase	Construction			
Impact	Pre-construction wetland rehabilitation			
Description of impact	Habitat degradation by alien vegetation and through mowing			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	<ul style="list-style-type: none"> • Control alien vegetation in isolated stands where it occurs. No herbicide to be used in the wetland. Large trees must be fully ring-barked, while smaller plants can be hand-pulled or removed using a tree popper. Shrubs of bramble and Lantana must be cut back with clippers until the stump is visible, which must then be removed. • All vegetation biomass must be removed from the wetland and disposed of at a green waste dump. No vegetation must be dumped in the wetland. • Follow up alien must be conducted every 6 months following initial clearing to ensure emergent seedlings are consistently removed. • Cease mowing the northern area of the wetland barring one path that can be maintained for access to the lagoon and a strip large enough for a single vehicle along the boundary fenceline. 			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Positive	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Very low	Natural and/ or social functions and/ or processes are slightly altered	Very high	Natural and/ or social functions and/ or processes are majorly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	Minor - negative		Minor - positive	
Comment on significance				
Cumulative impacts				

6.2.2 Unnecessary disturbance to sensitive areas

The wetland and buffer are no-go zones for any workers, equipment, vehicles, or materials for the duration of the development. Access is only permitted for specific work to construct

stormwater outlets for instance. As the slope is also sensitive to erosion and disturbance of vegetation, it is recommended that temporary fencing be established along the edge of the slope identifying it as a No-go area. Sensitive areas must be established using temporary fencing and signage before commencement of construction and all personnel involved in the project must be briefed about no-go areas. Impacts are likely to be a negligible negative if all mitigation measures are fully implemented (Table 7).

Table 7. Construction phase: Unnecessary disturbance to sensitive areas.

Project phase	Construction			
Impact	Disturbance to wetland and buffer areas			
Description of impact	Vehicles, workers and materials active in wetland and buffer areas			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	<ul style="list-style-type: none"> • Pre-construction, temporary fencing must be erected along No-Go areas with the top of the slope leading to the wetland indicated as the sensitive feature. • Signage indicating No-go areas must be placed on fencing. • All contractors must attend a site induction and be briefed that vehicles, workers, equipment and materials may not encroach into No-Go areas around wetlands. • Consider the termination of contracts or fines for encroachment into the no-go area. 			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Short term	Impact will last between 1 and 5 years	Immediate	Impact will self-remedy immediately
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Unlikely	Has not happened yet but could happen once in the lifetime of the
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	Minor - negative		Negligible - negative	
Comment on significance	The impact of unnecessarily increasing the footprint of disturbance by entering no-go areas can be mitigated to a large extent by full implementation of these mitigation measures.			
Cumulative impacts	Not applicable			

6.2.3 Stormwater runoff during construction

Effective management of stormwater during construction can have a significant impact on the state of the wetland and buffer in the long term. Management interventions need to consider proactive and reactive measures to mitigate the impacts of stormwater runoff as the site topography evolves during the construction phase. Mitigation measures are recommended, and if fully monitored and implemented the impacts could be minimised to a negligible negative level (Table 8).

Table 8. Construction phase: stormwater runoff from the site

Project phase	Construction			
Impact	Stormwater runoff from the site			
Description of impact	Sedimentation in the wetland and creation of preferential flow paths			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	<ul style="list-style-type: none"> • The objective of stormwater management during the construction phase is to eliminate the risk as far as possible of discharging sediment-laden water downslope into the wetland. • Daily and weekly site meetings must consider forecasted rainfall to avoid working during such periods, and to plan accordingly for predicted high rainfall events. Work on the site must cease altogether during rainfall. • The site office must have a store of materials suitable for rapid response to erosion control such as shade-cloth (silt-fencing), haybales (check-dams), wooden droppers, hessian fabric, and fencing wire. <ul style="list-style-type: none"> • All material stores should be kept on flat areas and bunded to prevent material loss during rainfall. • When construction commences in the residential area, create a compacted, low soil berm along the perimeter of the site approximately 400 mm high to retain stormwater on site and reduce runoff to surrounding areas. • Monitor the site during / following periods of rainfall, and install haybale check dams at points where runoff collects and could overtop / breach the soil berm. • Following rainfall, any water that must be pumped out of pools in excavated areas must not be directed to the wetland. The soil berm system or a temporary haybale check dam can be constructed to contain water until it seeps into the ground or slowly disperses through the haybales which act as a filter. 			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Unlikely	Has not happened yet but could happen once in the lifetime of the
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	Minor - negative		Negligible - negative	
Comment on significance	Risk reduction is dependent on proactive and reactive mitigation measures as construction progresses across the site.			
Cumulative impacts	Not applicable			

6.2.4 Construction phase: Excessive disturbance for construction of stormwater outflows

Construction of the stormwater outflows will need to be undertaken down the slope towards the wetland area. Care must be taken during this exercise to ensure this doesn't result in an excessive footprint of disturbance which could result in serious erosion associated with the outflow channels. Mitigation measures are provided in Table 9.

Table 9. Construction phase: Disturbance during construction of stormwater outflows

Project phase	Construction			
Impact	Excessive disturbance for construction of stormwater outflows			
Description of impact	Loss of stabilising vegetation leading to erosion and sedimentation in the wetland			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	<ul style="list-style-type: none"> • A maximum 2 m footprint of disturbance either side of each stormwater outlet to the wetland is acceptable. This area must be fenced off with temporary fencing or pegged, so that workers know the maximum limit of disturbance to soil or vegetation. <ul style="list-style-type: none"> • Where vegetation is in the way of works, it should be trimmed or cut, and the roots and soil must not be disturbed. • Where gabions / reno mattresses must be installed, excavations and installation should be undertaken by hand wherever possible, and work should preferably be done from the road / pathway-side as the primary access point. • All excavated soil and / or cut and removed vegetation must be disposed of via the residential area and not dumped in the wetland. No materials used in the construction of the stormwater outflow can be dumped in the wetland. • Works should commence in the direction from bottom to top, so that the stilling basin is created first and can catch any sedimentation that occurs upslope during construction of the outflow. 			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	Minor - negative		Negligible - negative	
Comment on significance				
Cumulative impacts	Despite there being multiple (3 or 4) outlets, these should be aligned with existing pathways and roads, limiting the cumulative impacts.			

6.2.5 Construction phase: installation of fence

In many instances, the construction of fencelines in residential estates can have a significant impact on the natural environment. Fencelines can cross watercourses and migration corridors, and their construction can involve significant earth-moving and vegetation clearance. This is not considered necessary for the development, and measures to mitigate impacts associated with an anticipated fenceline are provided in Table 10.

Table 10. Construction phase: Installation of fenceline

Project phase	Construction			
Impact	Greater than necessary footprint for fenceline installation			
Description of impact	Loss of stabilising vegetation habitat disturbance			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	<ul style="list-style-type: none"> • The limit of disturbance along the fenceline area is 2 m on the residential side of the development. • The fenceline can be installed with the help of a small machine such as a bobcat, but should otherwise be installed by hand. • Vegetation obstructing work on the fenceline should be cut or trimmed, and not uprooted. As this could lead to soil erosion. • Disturbed soil along the fenceline on the side of the residential development should be revegetated with low growing indigenous grass such as <i>Cynodon dactylon</i> (kweek) and / or <i>Stenotaphrum secundatum</i> (buffalo grass). This can create a relatively open area along the fenceline which can be monitored or patrolled. 			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Likely	The impact may occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	Minor - negative		Negligible - negative	
Comment on significance				

6.3 Operational Phase Impact Assessment

6.3.1 Stormwater Management

Sloped areas leading to the wetland where stormwater outflows are located are very sensitive to high velocity, concentrated inflows of water, which could cause erosion. Even a single severe event can result in creation of an erosion gully, depositing sediment in the wetland and destabilising the slope. This impact should be avoided at all costs. Mitigation measures have been recommended in Table 11 which should reduce the risk to a negligible negative level. However, it is emphasised that monitoring is required to ensure that despite all the SuDS-type interventions aimed at attenuating stormwater and other flows emanating from the site, proactive stormwater management and erosion-control must be implemented.

Table 11. Operational Phase: Stormwater management

Project phase	Operation			
Impact	Damage caused by stormwater runoff			
Description of impact	Slope erosion and sedimentation of the wetland			
Mitigability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	<ul style="list-style-type: none"> • The site should be assessed by an aquatic specialist 6 months following conclusion of construction to confirm that stormwater management infrastructure is functional and not causing any impacts to the wetland. • Stormwater management infrastructure such as swales, drains and culverts must be routinely monitored and maintained to ensure they are free of blockages and functional. This includes a regular inspection of all stormwater outflows to identify any emerging erosion issues, and keep the structures clear of excessive siltation and litter. • Where erosion is occurring, immediately identify and control the origin of the flow path, and protect the site of erosion by replacing soil with soil from the site, and stabilising with indigenous vegetation found on the site. Where more serious interventions are required spot installations of gabions may be suitable for stabilisation provided they are not in the wetland buffer or in the wetland itself. As far as possible, flows must be attenuated, and the source of erosion controlled upslope within the residential area. • Eroded areas of the steep banks must be refilled with topsoil (from the site), reseeded with indigenous vegetation, covered with a light mulch and protected with soil saver mats. The use of silt fencing can be extended to problem areas to provide further protection. 			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Likely	The impact may occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	Minor - negative		Negligible - negative	
Comment on significance				
Cumulative impacts	Not applicable			

6.3.2 Operational phase: Alien Vegetation

Every effort must be made to ensure the area disturbed during construction is kept free of alien vegetation. This includes not only the residential area, but the wetland and buffer too. Follow up alien vegetation control must take place on a routine basis bi-annually in perpetuity. Provided the recommended mitigation measures are followed the impacts are predicted to be a Negligible Positive (Table 12).

Table 12. Operational Phase Impact: Alien vegetation establishment

Project phase	Operation			
Impact	Alien vegetation establishment			
Description of impact	Establishment of aliens in disturbed areas post-construction resulting in habitat degradation			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	<ul style="list-style-type: none"> • Follow up inspection and control of alien vegetation in the residential development and the wetland on a 6-monthly basis. • No herbicides to be used in the wetland or wetland buffer. Sprays and / or cut-stump treatments may be used in the residential areas. • Ensure bare areas of vegetation are replanted with indigenous vegetation that occurs naturally on the site. • Under no circumstances may removed alien plants be discarded in the wetland. The HOA must inform the landscaping / gardening team that no dumping of vegetation or discarding of waste material may happen in the wetland or buffer area. 			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Positive	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Very limited	Limited to specific isolated parts of the site
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	Minor - negative		Negligible - positive	
Comment on significance				
Cumulative impacts	Not applicable			

6.3.3 Operational phase: Landscaping and pathways maintenance

Project phase	Operation			
Impact	Landscaping and recreational pathways maintenance			
Description of impact	Inappropriate mowing, planting or trimming of vegetation leading to habitat degradation			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	<ul style="list-style-type: none"> • Mowing of the wetland area to the north of the site must cease altogether. The only areas that can be mowed are the existing pathways and a 2 m strip along the residential side of the fenceline. One pathway can be maintained through the northern area of the wetland which is currently mowed. • Only existing pathways through the wetland and buffer may be maintained. Maintenance involves removal of alien vegetation (previously discussed), trimming and weed eating of pathways. No disturbance to plant roots or soil is permitted. <ul style="list-style-type: none"> • No herbicides can be used to maintain pathways in the wetland area or buffer. <ul style="list-style-type: none"> • The existing footprint of the pathways may not be enlarged. • Do not plant any exotic plants that do not occur naturally at the site in any area of the wetland or buffer. ie. under no circumstances may kikuyu grass be planted in any part of the wetland or buffer. 			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Positive	
Duration	Short term	Impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Unlikely	Has not happened yet but could happen once in the lifetime of the
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	Minor - negative		Negligible - positive	
Comment on significance				
Cumulative impacts	No applicable.			

Table 13. Operational phase: Leaking sewage infrastructure

While significant efforts have been made to ensure sewage pump stations and infrastructure are well planned, positioned and maintained within the development, experience has shown that even well-intentioned developments can have periodic problems with leaking, blocked or overflowing sewerage pipes or pump stations. Maintenance and regular inspections are key to ensuring that any issues are detected and dealt with early. Mitigation measures are provided in Table 14.

Table 14. Operational phase impact: leaking, blocked or overflowing sewerage infrastructure.

Project phase	Operation			
Impact	Leaking, blocked or overflowing sewerage infrastructure			
Description of impact	Pollution and eutrophication of the wetland leading to habitat degradation and impacts to biota			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	<ul style="list-style-type: none"> • All sewerage infrastructure must be well maintained and kept free of obscuring vegetation. Manholes, sewerlines, and the pump stations must be accessible, easily observed, and routinely inspected for leaks or blockages. • Emergency response measures to sewage spillages should be maintained on site, including lime to treat sewage and sand bags to contain spill and limit their dispersal. An emergency response protocol must be established by management of the HOA. • Residents should be provided with information of what can / cannot be flushed into toilets. This knowledge is often assumed, but is frequently over-estimated. Even educated people treat a toilet like a rubbish bin. • Ensure sufficient backup power systems are available for the operation of pump stations during load shedding and at peak times (e.g. December). 			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Short term	Impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	Minor - negative		Negligible - negative	
Comment on significance				
Cumulative impacts	Not applicable			

7. CONCLUSIONS

The proposed residential development known as Plett Lagoon Estate initially included housing which extended into the wetland area. Since biodiversity specialist inputs have been provided, the proposed development has been significantly reduced to the current Site Development Plan which excludes any development from the wetland and buffer area entirely.

Mitigation measures proposed to manage both stormwater and sewage on site have been carefully considered in the report provided by Vita Consulting Engineers. The SuDS-type interventions proposed in this report provide confidence that stormwater can be effectively managed on site, with minimal risk to the wetland's habitat and water quality. A few additional mitigation measures in terms of the design and layout of stormwater outflows were recommended in this report.

The wetland was classified as a depression with a PES of A (Natural) and an EIS of 'Very High'. As the last remaining natural wetland habitat on the western bank of Keurbooms Lagoon, the wetland has great significance. A wetland buffer of 30 m was recommended and not only protects the wetland from the residential development upslope, but provides a level

of connectivity between the terrestrial and wetland areas with the lagoon. The impact assessment determined most of the construction and operational phase impacts to be a Negligible negative with some impacts being a negligible positive.

Development of the Plett Lagoon Estate is supported provided the residential areas are planned outside of the wetland and buffer area, and the wetland is conserved and well maintained.

8. APPENDICES

8.1 Present Ecological State Methods

The wetland area was assessed using the Level 2 WET-Health assessment tool developed by Macfarlane *et al.* (2020). The tool aims to assess the integrity of a wetland which is defined as a measure of the deviation of wetland structure and function from the wetland's natural reference condition. The reference condition is inferred from conceptual models of the selected hydrogeomorphic wetland type. The method combines an assessment of hydrological, geomorphological, water quality and vegetation health four modules.

Data collection involved a desktop review of the extent and intensity of catchment land use impacts and was undertaken using historical and recent aerial imagery of the site (Chief Directorate: National Geo-spatial Information and satellites). Fieldwork onsite involved the identification and recording of observable impacts to the wetland at the site of relevant activities as well as at reference points upstream and downstream of the activities, and in the catchment area of the wetland. The magnitude of observed impacts to the hydrological, geomorphological and vegetation components of the wetland were calculated and combined as per the tool to provide a measure of the overall wetland condition of the wetland. Resultant scores were then used to assign the wetland into one of six PES categories as shown in Table 15.

Table 15. Wetland Present Ecological State categories and impact descriptions.

Ecological Category	Description	PES Score
A	Unmodified, natural.	90-100%
B	Largely natural with few modifications / in good health. A small change in natural habitats and biota may have taken place but the ecosystem functions are still predominantly unchanged.	80-89%
C	Moderately modified / fair condition. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	60-79%
D	Largely modified / poor condition. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40-59%
E	Seriously modified / very poor condition. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39%
F	Critically modified / totally transformed. Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota.	0-19%

8.2 Ecological Importance and Sensitivity Methods

The revised method for the determination of the EIS of a wetland considers the three following ecological aspects (Rountree *et al.*, 2013):

- **Ecological importance and sensitivity**
 - Biodiversity support including rare species and feeding/breeding/migration;
 - Protection status, size and rarity in the landscape context;
 - Sensitivity of the wetland to floods, droughts and water quality fluctuations.
- **Hydro-functional importance**
 - Flood attenuation;
 - Streamflow regulation;
 - Water quality enhancement through sediment trapping and nutrient assimilation;
 - Carbon storage
- **Direct human benefits**
 - Water for human use and harvestable resources;
 - Cultivated foods;
 - Cultural heritage;
 - Tourism, recreation, education and research.

Each criterion is scored between 0 and 4, and the average of each subset of scores is used to derive a score for each of the three components listed above. The highest score is used to determine the overall Importance and Sensitivity category of the wetland system (Table 16).

Table 16. Ecological importance and sensitivity categories for wetlands. Interpretation of average scores for biotic and habitat determinants.

Ecological Importance and Sensitivity Category (EIS)	Range of Median	Recommended Ecological Management Class
<u>Very high:</u> Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these floodplains is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	>3 and ≤4	A
<u>High:</u> Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	>2 and ≤3	B
<u>Moderate:</u> Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	>1 and ≤2	C
<u>Low/marginal:</u> Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these floodplains is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	>0 and ≤1	D

8.3 Impact Assessment Methods

Criteria are ascribed for each predicted impact. These include the intensity (size or degree scale), which also includes the type of impact, being either a positive or negative impact; the duration (temporal scale); and the extent (spatial scale), as well as the probability (likelihood). The methodology is quantitative, whereby professional judgement is used to identify a rating for each criterion based on a seven-point scale (Table 17) and the significance is auto-generated using a spreadsheet through application of the calculations.

For each predicted impact, certain criteria are applied to establish the likely **significance** of the impact, firstly in the case of no mitigation being applied and then with the most effective mitigation measure(s) in place.

These criteria include the **intensity** (size or degree scale), which also includes the **nature** of impact, being either a positive or negative impact; the **duration** (temporal scale); and the **extent** (spatial scale). These numerical ratings are used in an equation whereby the **consequence** of the impact can be calculated. Consequence is calculated as follows:

$$\text{Consequence} = \text{type} \times (\text{intensity} + \text{duration} + \text{extent})$$

To calculate the significance of an impact, the **probability** (or likelihood) of that impact occurring is applied to the consequence.

$$\text{Significance} = \text{consequence} \times \text{probability}$$

Depending on the numerical result, the impact would fall into a significance category as negligible, minor, moderate or major, and the type would be either positive or negative.

Table 17. Assessment criteria for the evaluation of impacts

Criteria	Numeric Rating	Category	Description
Duration	1	Immediate	Impact will self-remedy immediately
	2	Brief	Impact will not last longer than 1 year
	3	Short term	Impact will last between 1 and 5 years
	4	Medium term	Impact will last between 5 and 10 years
	5	Long term	Impact will last between 10 and 15 years
	6	On-going	Impact will last between 15 and 20 years
	7	Permanent	Impact may be permanent, or in excess of 20 years
Extent	1	Very limited	Limited to specific isolated parts of the site
	2	Limited	Limited to the site and its immediate surroundings
	3	Local	Extending across the site and to nearby settlements
	4	Municipal area	Impacts felt at a municipal level
	5	Regional	Impacts felt at a regional level
	6	National	Impacts felt at a national level
	7	International	Impacts felt at an international level
Intensity	1	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
	2	Very low	Natural and/ or social functions and/ or processes are slightly altered
	3	Low	Natural and/ or social functions and/ or processes are somewhat altered
	4	Moderate	Natural and/ or social functions and/ or processes are moderately altered

Criteria	Numeric Rating	Category	Description
	5	High	Natural and/ or social functions and/ or processes are notably altered
	6	Very high	Natural and/ or social functions and/ or processes are majorly altered
	7	Extremely high	Natural and/ or social functions and/ or processes are severely altered
Probability	1	Highly unlikely / None	Expected never to happen
	2	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
	3	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
	4	Probable	Has occurred here or elsewhere and could therefore occur
	5	Likely	The impact may occur
	6	Almost certain / Highly probable	It is most likely that the impact will occur
	7	Certain / Definite	There are sound scientific reasons to expect that the impact will definitely occur

When assessing impacts, broader considerations are also considered. These include the level of confidence in the assessment rating; the reversibility of the impact; and the irreplaceability of the resource as set out in (Table 18, Table 19, & Table 20), respectively.

Table 18. Definition of confidence ratings.

Category	Description
Low	Judgement is based on intuition
Medium	Determination is based on common sense and general knowledge
High	Substantive supportive data exists to verify the assessment

Table 19. Definition of reversibility ratings.

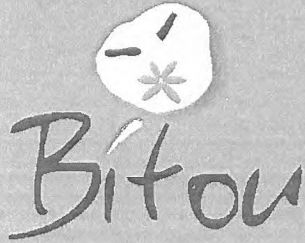
Category	Description
Low	The affected environment will not be able to recover from the impact - permanently modified
Medium	The affected environment will only recover from the impact with significant intervention
High	The affected environmental will be able to recover from the impact

Table 20. Definition of irreplaceability ratings.

Category	Description
Low	The resource is not damaged irreparably or is not scarce
Medium	The resource is damaged irreparably but is represented elsewhere

9. REFERENCES

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Our Ref.

Erven 6504 & RE/6503

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05 OCTOBER 2023

VITA CONSULTING ENGINEERS

**51 Lourensford Estate
Somerset West
7130**

Attention: Riaan van Dyk

Dear Sir

CONFIRMATION OF BULK SERVICES: ERVEN 6504 & RE/6503

We confirm that Bitou Municipality has bulk infrastructure capacity in its networks and can accommodate the proposed development, subject to the following conditions.

1. That the developer enters and sign a Service Level Agreement with Bitou Municipality,
2. That the developer implements the upgrade of services as detailed and required in the GLS network analysis report, dated 27 February 2023.

Please contact the official dealing with this project for any further information in this regard.

Yours faithfully

MR. VW. FELTON
DIRECTOR: ENGINEERING SERVICES

Official dealing with this;

Miss Asiphe Mgoqi: Engineering Services: Project Manager: Planning & Development

Draft report

27 February 2023

The Director: Engineering Services
Bitou Municipality
Private Bag X1002
Plettenberg Bay
6600

Attention: Ms Asiphe Mgoqi

Dear Madam,

PROPOSED RESIDENTIAL DEVELOPMENT ON ERF 6504 AND THE REMAINDER OF ERF 6503, PLETTENBERG BAY: CAPACITY ANALYSIS OF THE BULK WATER & SEWER SERVICES

The request by Mr Riaan van Dyk of Vita Consulting Engineers for GLS Consulting to investigate and comment on the bulk water supply and sewer discharge of the proposed development (retirement village development on portion 53 of Farm 444, Plettenberg Bay), refers.

This document should inter alia be read in conjunction with the Water Master Plan (performed for the Bitou Municipality) dated June 2020 and the Sewer Master Plan dated June 2020.

The proposed development was not taken into consideration for the master plans for the water and sewer networks.

1 WATER DISTRIBUTION SYSTEM

1.1 Distribution zone

For this re-analysis of the water master plan it is proposed that the development area should be accommodated in the existing Goose Valley reservoir zone. The proposed connection to the existing water system is to the existing 250 mm diameter supply pipeline from the Goose Valley reservoir in Beacon Way, as shown on Figure 1 attached.

The proposed development is situated inside the water priority area.

1.2 Water demand

No provision was made in the original water analysis for the master plan for development on Erf 6504 and the remainder of Erf 6503 in Plettenberg Bay .

For this re-analysis, the total annual average daily demand (AADD) and fire flow for the proposed development were calculated and classified as follows:

- 40 x retirement units @ 0,6 kL/d/unit = 24,0 kL/d
- 31 x Single residential units @ 1,0 kL/d/unit = 31,0 kL/d
- TOTAL = 55,0 kL/d *

* As per Table J.2 from Section J – Water Supply of “The Neighbourhood Planning and Design Guide” (so called “Red book”).

- Fire flow criteria (Low risk) = 15 L/s @ 10 m

1.3 Present situation

1.3.1 Reticulation network

It is recommended that the proposed development is accommodated within the existing Goose Valley reservoir water distribution zone and not within the Town PRV no. 3 zone.

The Goose Valley water distribution zone is supplied with water from the Goose Valley reservoir (Top Water Level (TWL) of 89.7 m above mean sea level (m a.s.l.)) through a 250 mm Ø main supply pipe under gravity. The existing water reticulation system also supplies bulk water to the Wittedrift and Matjiesfontein reservoirs (through the reticulation network, see section 1.3.3 further on in the report) and has consequently insufficient capacity to accommodate the domestic water demand of the proposed development in order to comply with the pressure and fire flow criteria as set out in the master plan.

Link services items BPW14.1 will be required to connect the internal reticulation network of the proposed development to the existing municipal water network.

Link services

- BPW14.1 : 70 m x 200 mm Ø new pipe = R 284 000 *

(* Including P & G, Contingencies and Fees, but excluding VAT - Year 2022/23 Rand Value. This is a rough estimate, which does not include major unforeseen costs).

The route of link services item BPW14.1 is schematically shown on Figure 1, but has to be finalised subsequent to a detailed pipeline route investigation.

1.3.2 Reservoir capacity

Bulk water is currently supplied from the Goose Valley reservoir to the Matjiesfontein and Wittedrift reservoirs, which has a negative effect on the available reservoir storage capacity available for the Goose Valley reservoir supply area (this is discussed in section 1.3.3 of this report further on).

The Matjiesfontein reservoir is the main supply reservoir for the areas east of the Keurbooms River and the Wittedrift reservoir is the main supply reservoir for Wittedrift and Green Valley.

The Goose Valley reservoir has consequently insufficient spare capacity to accommodate any additional developments.

Note: The Goose Valley reservoir will have sufficient spare capacity available to accommodate the development if the Wittedrift and Matjiesfontein reservoirs are supplied with water directly from the Town reservoirs through a dedicated bulk system, as discussed in paragraph 1.4.1 further on in the report.

1.3.3 Bulk supply

The Plettenberg Bay bulk water system was designed to supply the Wittedrift and Matjiesfontein reservoirs with bulk water from the Town reservoirs, located on the Plettenberg Bay Water Treatment Plant (WTP) site, and the Goose Valley reservoir with bulk water through the Goose Valley PS, also located at the Plettenberg Bay WTP site.

The Matjiesfontein reservoir was supplied with water through a 150 mm diameter dedicated pipeline between the Town reservoirs and the Matjiesfontein reservoir, and the Wittedrift reservoir through a 90 mm diameter pipe that connects to the Town/Matjiesfontein pipeline.

The 150 mm supply pipe to the Matjiesfontein and Wittedrift reservoirs is however at capacity (capacity of pipeline is $\pm 1,0$ ML/d and peak demand of the supply system is currently $\pm 2,3$ ML/d) and bulk supply to the Matjiesfontein and Wittedrift reservoirs is therefore currently supplied from the Goose Valley reservoir through the network of the Goose Valley water distribution zone. The Goose Valley reticulation network connects to the Matjiesfontein bulk pipeline before the bridge over the Keurbooms River.

The system is therefore currently not operated as it was designed for. The current operation consequently puts pressure on the available spare capacity of the Goose Valley system and is also not economically the best solution for the longer term (water that could have gravitated to the Matjiesfontein reservoir is currently pumped via the Goose Valley system).

The Goose Valley reservoir is supplied with water through a 200 mm diameter dedicated pipe between the Goose Valley PS and reservoir.

The capacity of the existing Goose Valley PS and accompanying 200 mm supply pipeline is 40 L/s (3,4 ML/d if pumped 24 hours a day). Peak demand from the Plettenberg Bay WTP to the Goose Valley reservoir is calculated at 2,7 ML/d (based on bulk water readings of the Goose Valley PS supplied by Bitou Municipality from July 2020 to March 2022). This implies that during peak demand conditions (December holiday) the Goose Valley PS should be operational 19 hours a day in order to supply the demand.

Bitou Municipality has indicated that their Goose Valley bulk system is under pressure during peak demand conditions and that the larger bulk system (supply to Matjiesfontein reservoir) should be upgraded according to the master plan before additional developments can be accommodated within the existing Goose Valley reservoir supply area.

1.4 Implementation of the master plan

1.4.1 Bulk supply

In the water master plan the following upgrades are proposed in order to augment the existing bulk supply system between the Town reservoirs at the WTP site and the Matjiesfontein reservoir on the eastern side of the Keurbooms River:

Bulk supply augmentation

• BPW.B39	: 930 m x 400 mm Ø new bulk pipe (replace 150 mm Ø)	= R	6 108 000 *
• BPW.B67	: 2 670 m x 355 mm Ø new bulk pipe (replace 150 mm Ø)	= R	13 813 000 *
• Item 1	: Close existing isolating valve	= R	No cost
		Total = R	19 921 000 *

In the Water Master Plan item DPW.B40 was proposed to connect an existing 300 mm Ø pipeline from the Town reservoir zone to the existing 150 mm Ø Matjiesfontein bulk pipeline (at the intersection of the N2 National Road and the service road towards the Goose Valley reservoir), in order to augment bulk water supply to the Matjiesfontein and Wittedrift reservoirs.

Bitou Municipality has however indicated that this 300 mm Ø pipeline (3,6 km asbestos cement pipeline from the Town reservoirs) is in a poor condition, has been abandoned and can not be utilised to augment the bulk water supply system. The master plan should therefore be amended to reflect this.

It is therefore proposed that the following master plan item is included in the water master plan in the place of the existing 300 mm Ø AC pipeline.

- Item 2 : 3 600 m x 400 mm Ø new bulk pipe (replace 300 mm Ø) = R 22 631 000 *

These upgrades will solve the existing backlog of bulk supply to the Matjiesfontein reservoir as well as provide spare capacity for potential future development areas, as documented in the water master plan.

(* Including P & G, Contingencies and Fees, but excluding VAT - Year 2022/23 Rand Value. This is a rough estimate, which does not include major unforeseen costs).

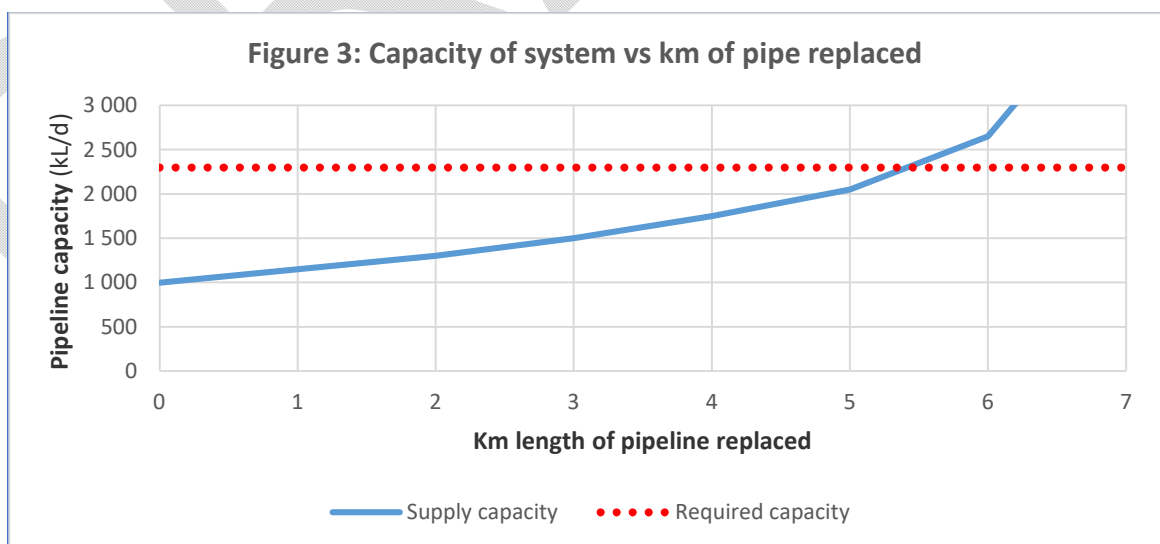
Take note that the routes of the proposed pipelines are schematically shown on Figure 2 attached, but have to be finalised subsequent to detail pipeline route investigations.

1.5 Minimum upgrades required to bulk system

The capacity of the existing bulk supply system from the Town reservoirs to the Matjiesfontein reservoir is calculated at 1,0 ML/d. The required supply to the Matjiesfontein reservoir during peak holiday periods is calculated at 2,3 ML/d (refer to paragraph 1.3.3).

It is therefore proposed that the existing 150 mm Ø pipeline between the Town reservoirs and the bridge over the Keurbooms River is replaced and isolated from the existing Goose Valley network as proposed in the water master plan in order to augment supply to the Matjiesfontein reservoir. This will then alleviate pressure that currently exist on the supply to the Goose Valley reservoir in order to accommodate future developments within the reservoir supply area.

Figure 3 below shows how supply to the Matjiesfontein reservoir will improve as sections of master plan items 2, BPW.B39 and BPW.B67 are implemented (from the Town reservoir towards the Keurbooms River):



Roughly 5,5 km of the existing 7,7 km x 150 mm Ø bulk pipeline between the Town reservoirs and the Keurbooms River should be upgraded in order to supply the Matjiesfontein reservoir from the Town reservoirs under gravity (no augmentation of bulk supply from the Goose Valley reservoir will then be required).

The minimum upgrades required to improve the existing bulk supply system in order to accommodate the proposed development in the existing system are:

- Master plan item 2 (3,6 km x 400 mm Ø replace existing 300 mm Ø abandoned AC pipe).
- Master plan item BPW.B39 (0,9 km x 400 mm Ø replace existing 150 mm Ø bulk pipe).
- Portion of master plan item BPW.B67 (1,0 km x 355 mm Ø replace existing 150 mm Ø bulk pipe).

1.6 *Additional development planned in the short-term for Goose Valley reservoir zone*

Although GLS Consulting cannot comment on the implementation timeframes of proposed developments, it should be noted that capacity analyses for the following developments (that should be supplied with water from the Goose Valley/Matjiesfontein/Wittedrift bulk supply system) have been performed in the last 3 years:

- Portion 32 of Farm 304 (Final report dated 15 September 2022, estimated water demand of 9,6 kL/d).
- Portion 38 of Farm 444 (Final report dated 3 October 2022, estimated water demand of 10,2 kL/d).
- Erf 155, Keurboomstrand (Final report dated 7 December 2022, estimated water demand of 3,0 kL/d).
- Portions 19 & 27 of Farm 444 (Final report dated 7 December 2022, estimated water demand of 234,9 kL/d).
- Portion 53 of Farm 444 (Final report dated 7 December 2022, estimated water demand of 101,9 kL/d).
- Portion 7 of Farm 306, Wittedrift (Final report dated 9 December 2022, estimated water demand of 60,0 kL/d).
- Erven 103 & 104, Wittedrift (Final report dated 9 December 2022, estimated water demand of 36,0 kL/d).
- Erf 342, Wittedrift (Final report dated 9 December 2022, estimated water demand of 4,7 kL/d).
- Portion 91 of Farm 304 (Draft report dated 27 February 2023, estimated water demand of 43,8 kL/d).

The scope of the report does not cover the cumulative effect of the proposed developments. However, it should be noted that the simultaneous development of the proposed developments will accelerate the need for the master plan to be implemented.

2 SEWER NETWORK

2.1 *Drainage area*

It is proposed that sewage from the proposed development is accommodated within the existing Plettenberg Bay Pumping Station (PS) 1 drainage area.

The proposed connection point for the internal sewer reticulation network of the development to the existing municipal sewer system is to the existing 150 mm diameter outfall sewer in Susan Street, as shown on Figure 4 attached.

From PS no. 1 sewage is pumped through a 160 mm diameter rising main directly towards the Plettenberg Bay PS no. 1a.

Sewage is pumped from the Plettenberg Bay PS 1a through a 355 mm diameter dedicated rising main to the Ganse Valley Wastewater Treatment Plant (WWTP).

The proposed development is situated inside the sewer priority area.

2.2 *Sewer flow*

No provision was made in the original sewer master plan for development on Erf 6504 and the remainder of Erf 6503.

For this re-analysis, the peak daily dry weather flow (PDDWF) for the proposed development was calculated at 38,5 kL/d.

2.3 *Present situation*

The existing gravity sewer system between the proposed development gravitating towards the Plettenberg Bay PS 1 and the pumping system from the Plettenberg PS 1 to Plettenberg Bay PS1a have sufficient capacity to accommodate the proposed development.

The Plettenberg Bay PS 1a and accompanying 355 mm diameter rising main also have sufficient spare capacity to accommodate the proposed development.

3 CONCLUSION

The developer of Erf 6504 and the remainder of Erf 6503 in Plettenberg Bay may be liable for the payment of a Development Contribution (as calculated by Bitou Municipality) for bulk water and sewer infrastructure as per Council Policy.

The master plan indicated that the proposed development area should be accommodated in the existing Goose Valley reservoir zone. The proposed connection to the existing water system is to the existing 250 mm diameter supply pipeline from the Goose Valley reservoir in Beacon Way, as shown on Figure 1. Link services items BPW14.1 is required to connect the internal reticulation network of the proposed development to the existing municipal water network.

The bulk water system to the Goose Valley, Wittedrift and Matjiesfontein reservoirs is at capacity and should be upgraded according to the master plan before additional developments within the reservoir supply areas can be accommodated.

The minimum upgrades required to improve the existing bulk supply system (in order to accommodate the proposed development together with other potential development areas within the existing supply areas of the Goose Valley, Wittedrift and Matjiesfontein reservoirs), are:

- Master plan item 2 (3,6 km x 400 mm Ø replace existing 300 mm Ø abandoned AC pipe).
- Master plan item BPW.B39 (0,9 km x 400 mm Ø replace existing 150 mm Ø bulk pipe).
- Portion of master plan item BPW.B67 (1,0 km x 355 mm Ø replace existing 150 mm Ø bulk pipe).

There is sufficient capacity in the existing Plettenberg Bay sewer reticulation system to accommodate the proposed development. The recommended position for the sewer connection for the proposed development is to the existing 150 mm diameter outfall sewer in Susan Street, as shown on Figure 4 attached.

Also, find attached hereto Appendix A which includes general notes from Bitou Local Municipality regarding development approvals and conditions.

We trust that you find this of value.

Yours sincerely,

GLS CONSULTING (PTY) LTD
REG. NO.: 2007/003039/07



Per: PC DU PLESSIS

cc. Vita Consulting Engineers
51 Lourensford Estate
Somerset West
7130

Attention: Mr Riaan van Dyk

GENERAL NOTES FROM BITOU LOCAL MUNICIPALITY ATTACHED TO GLS BULK WATER AND SEWER SERVICES CAPACITY REPORT

1. The GLS report is a services capacity report and the costs estimated in this report are only approximate values applicable at the time of the study.
2. Should the development be approved by Council the approval will be linked to certain development conditions. These conditions will be the official conditions applicable to the project and will take precedence over this report. Once approval is granted, Council will enter into a formal services agreement with the developer.
3. Costs for network upgrades, etc. As mentioned in the GLS report could change from time to time due to escalation, new tariff structures, additional requirements etc.
4. The Developer may be liable to pay a Development Contribution as per Council policy. The value payable will be calculated using Bitou Local Municipality's Development Contribution Calculator.
5. The Development Contribution monies are calculated according to the approved Council Policy at the time of payment.
6. The Development Contribution monies are payable before the approval of the building plan certificate or final approval of the subdivision for the transfer of units will be issued, as applicable for the type of development.
7. Where servitudes are required, all the costs and arrangements therefore will be for the developer's account.
8. The developer will be solely responsible for the cost of the link services as identified in the GLS report. The developer will also be responsible for the costs of upgrading to the minimum requirements of the services as identified in the GLS report. These costs may however be offset against the Development Contribution monies payable.
9. The above conditions are subject to any approved Council policies, which may be amended from time to time.

Plett Lagoon Estate

Erf 6503, Plettenberg Bay, Western Cape



Civil Engineering Services Report

Revision: B (July 2023)

Prepared for: Plett Lagoon Estate (Pty) Ltd 70 Sandown Road Rondebosch Cape Town 7700	Prepared by: VITA Consulting Engineers Riaan van Dyk riaan@vitaeng.co.za 51 Lourensford Estate Somerset West, 7130
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1. Executive Summary

VITA Consulting Engineers has been appointed by Plett Lagoon Estate (Pty) Ltd as the Civil Engineering Consultants for the proposed development on Erf 6503, Plettenberg Bay.

The proposed rezoning is for a split-zoning, consisting of the following:

- Residential Zone I: 2.27ha
- Residential Zone II: 2.67ha
- Residential Zone IV: 0.79ha
- Open Space Zone II: 0.70ha
- Open Space Zone III: 10.57ha

The proposed development is classified as a Greenfields Development, consisting of the following amenities:

- Single Residential: 37 Erven
- General Apartments: 40 Units
- Guardhouse, refuse room, etc.

The objective of this report is to address all civil engineering issues generated by the proposed development and to provide sufficient information to the local and provincial authorities in terms of the required roads- and civil engineering infrastructure for the proposed residential development.

The following documents and guidelines have been used in the civil services infrastructure design and management implementation of this development:

- The Topographical Survey compiled by VPM Surveys (*7 February 2023*)
- TIA completed by UDS (*25 May 2023*)
- The Site Development plan compiled by BAC Architects (*June 2022*)
- Municipal Services Capacity Analysis Report compiled by GLS Consulting (*27 February 2023*)
- Guidelines for Human Settlement Planning and Design (*CSIR "Red Book"*)
- The South African National Roads Agency Limited: Drainage Manual

2. Locality

The development site is situated on Erf 6503, Plettenberg Bay. The site is approximately 19.11 hectares in extent and is situated on the north-eastern outskirts of Plettenberg Bay, approximately 1.5km from the CBD. The development is located within the Bitou Municipal district.

The site has an irregular polygonal shape and is bordered by Portion 52 of Farm 444 (*northern boundary*), the Keurbooms river estuary (*eastern boundary*), undeveloped Erf 6504 (*southern boundary*) and Plettenberg Bay Primary School (*western boundary*). Access to the site is gained via Beacon Way, off the School/Checkers access road (Erf 7996) on the south-western corner of the site.



Figure 2-1: Locality - Portion 38 of Farm 444, Plettenberg Bay (*Cape Farm Mapper*)

3. Pre-Development Conditions

The pre-development site is mostly undeveloped, with an existing residential dwelling and outbuildings located near the northern corner of the site.

3.1 Site Topography

The topographical survey indicates that the property has a varying topography with fairly flat slopes along the north-western boundary to steep slopes situated along a north/south axis through the centre of the property. The highest portion of the property is situated near the south-western corner of the site with an approximate level of 18 msl. The lowest portion of the site is situated on the eastern boundary (estuary) of the site, with an approximate level of 1 msl.

The residential portion of the development will be situated on the fairly flat portion of the property, along the western boundary up to the north/south ridge. The steep slopes for this portion of the property vary between 6% (maximum) and 2.5% (minimum).

The Open Space III portion has fairly flat slopes towards the Keurbooms estuary and is situated below the 5m contour.

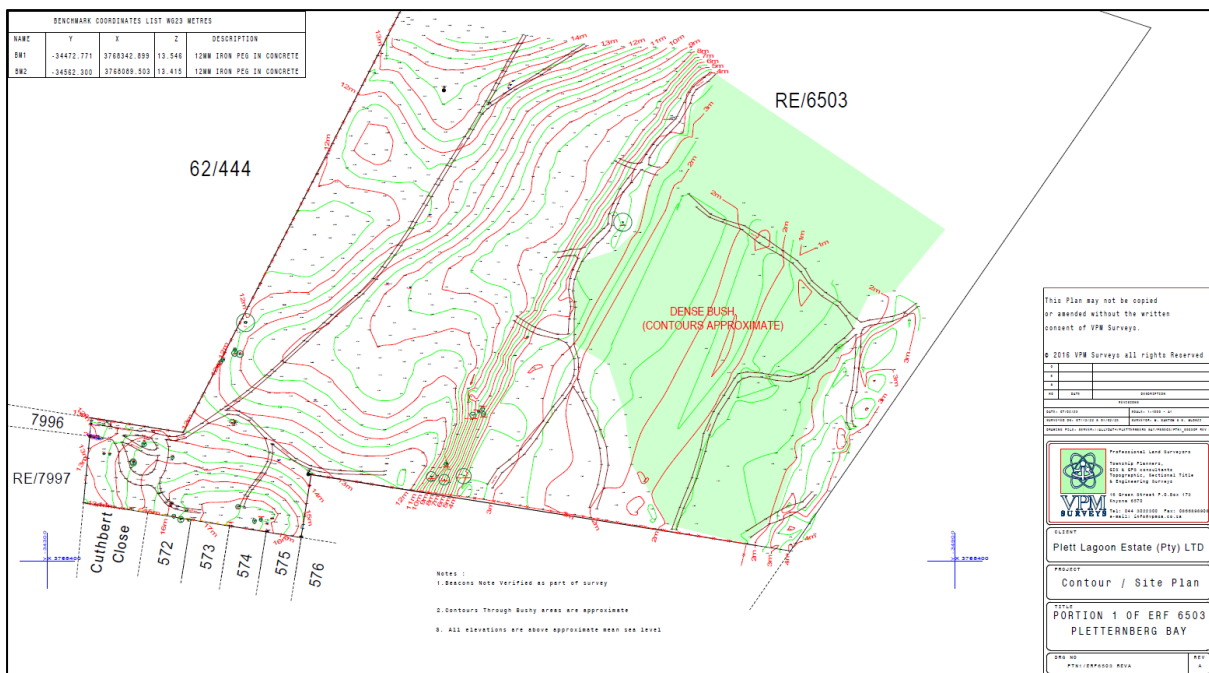


Figure 3-1: Topographical Contours (VPM Surveys - February 2023) - Appendix A

3.2 Site Vegetation

The western portion of the site is covered by short grass and weeds, while the eastern portion of the site is covered by dense vegetation/thicket, including indigenous fynbos, milkwoods and shrubs. A biodiversity investigation was compiled to determine the extent of the environmental sensitive areas on site. The biodiversity sensitivity map was used to determine the proposed cadastral layout to ensure that the erven and roads/civil services infrastructure do not encroach into environmentally sensitive areas.



Figure 2-2: Environmental Sensitive Areas (east of green line)



Figure 3-3: Environmental Sensitive Vegetation towards Keurbooms River

3.3 Site Geology

The site is situated on the Kirkwood Formation (*Uitenhage Group*). The insitu materials on site is characterized by a relatively consistent soils profile. The site is underlain by Quaternary aeolian sands of several meters thick. These aeolion sands are overlain by medium dense, fine silty sand. A dense root-bed with organic rich topsoil of approximately 0mm-300mm thickness make up the top portion of the natural soil profile.

The soils on site are classified as "Soft Excavation" in terms of the SABS 1200 DM specifications. The sands are classified as non-plastic, with an estimated friction angle of approximately 30°, with no apparent cohesion.

The sands have an expected bearing capacity of approximately 100-125kPA, which will/must be confirmed by a suitable structural engineer for each individual units' foundations.

The sands have a very high permeability, which is estimated to be 10^{-3} mm/s or 86mm/day.

4. Description of the Proposed Development

The proposed development will consist of Residential Zone I (9 x *single residential erven*), Residential Zone II (28 x *single residential erven*), Residential Zone IV (40 x *apartments*), Open Space Zone II (*amenities*) and Open Space Zone III (*private nature reserve*).

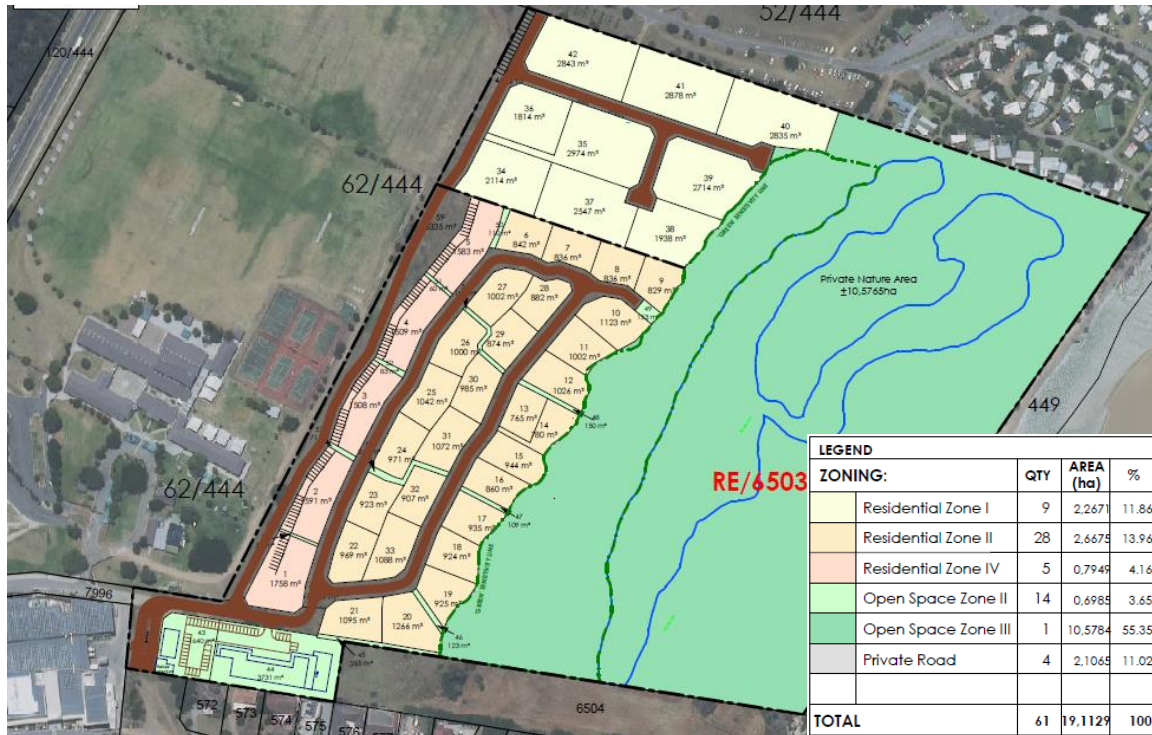


Figure 4-1: Proposed Zoning Layout (Marike Vreken Urban and Environmental Planners) - Appendix B

The “Open Space III” (10.58ha) portion of the development will serve as a “private nature reserve” which will be managed and owned by the development’s Body Corporate.



Figure 4-2: Proposed SDP Layout (BAC Architects)

5. Site Clearance

All road reserves and services corridors (*situated outside the environmentally sensitive areas*) will be cleared of vegetation and the top 0 - 300mm of organic rich topsoil will be stripped and stockpiled for re-use as part of the landscaping.

All existing structures which do not form part of the new development (*i.e. residential dwelling and outbuildings*) will be demolished and rubble will be removed from site.

Due to the environmentally sensitive natural vegetation on site, care will/must be taken to not disturb any areas outside of the required civil works footprint.

6. Roads and Parking Areas

6.1 External Roads

UDS (Pty) Ltd was commissioned to compile a traffic impact statement for the proposed development and their findings were included in a report (*refer to Appendix B*). The Traffic Statement, along with the findings and recommendations were submitted to- and discussed with Bitou Municipality (*20 June 2023*).

The UDS Traffic Statement originally proposed that the access to the development should be off the existing School & Checkers Yard Access Road (*Erf 7996*).



Figure 6-1: Beacon Way/School & Checkers Yard Access Road Intersection

Bitou municipality stated that although they would consider the findings of the traffic statement, they would prefer that access to the development be provided through the southern boundary onto the Susan Road reserve. The reasoning behind this request was the congestion caused at the Beacon Way/School road intersection by the school traffic.

Three alternative access points were identified (*refer Fig 6-2*) at the 20 June 2023 meeting with Bitou Municipality. The preferred access was identified to be the western access (*alternate access 1 - Fig 6-2*) as the other two accesses would encroach upon high sensitivity areas as identified in the NEMA Planning Report.

Traffic will therefore travel via Susan-, Plato- and Zenon Street to reach Beacon Way where vehicles will have access to the wider road network.

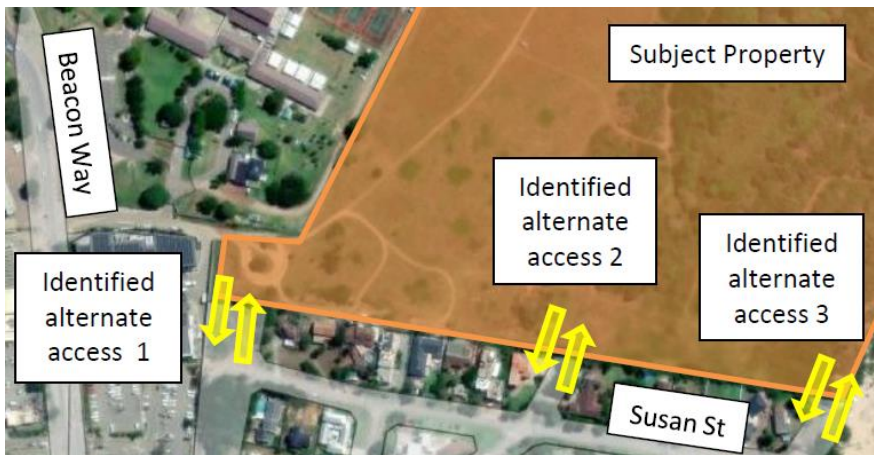


Figure 6-2: Access through the southern boundary onto Susan Street

The UDS Traffic Statement concluded that the development should be endorsed on the following conditions:

- Sufficient stacking space (*at least 23-metres*) must be provided at the entrance
- A minimum entry lane width of 4 metres must be provided at the entrance.
- Sufficient sight distance must be allowed for in the placement of trees (*internal roads*)
- Sufficient space must be provided for vehicles reversing out of driveways
- Traffic calming measures must be implemented along roads within the development longer than 100-metres.
- Traffic calming be considered along Plato Road (*with appropriate spacing*)
- A pedestrian gate be considered on the western boundary of the development, providing access to the school and retail areas.

6.2 Internal Roads and Parking Areas

The design philosophy for the proposed internal road network will be similar to that of a typical urban road network, which includes a minimum 2.0% crossfall and 0.5% longitudinal slope. This road network will consist out of 5.5m wide brick paved roads with formal kerbs/edgings, roadside channels and a stormwater drainage network.

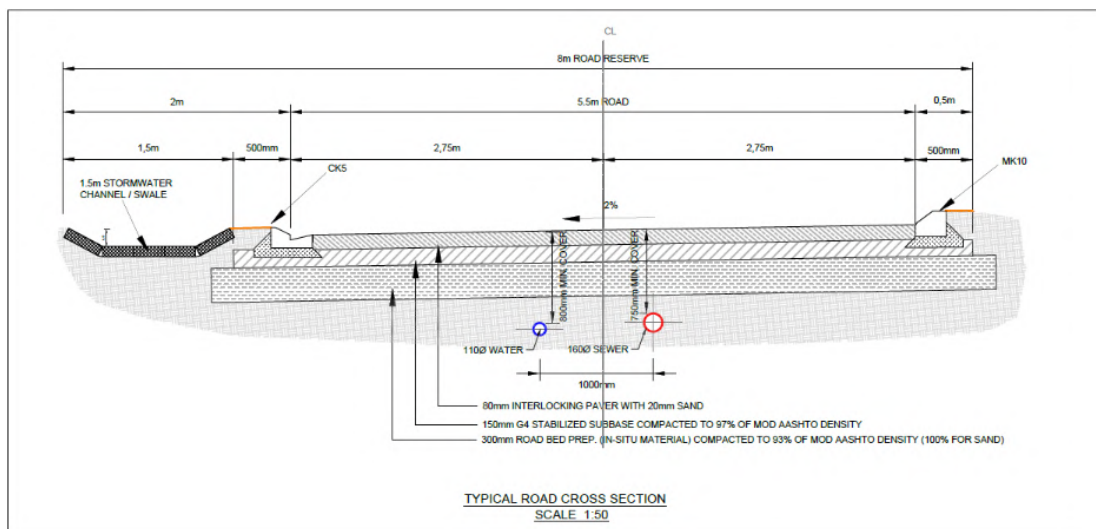


Figure 6-3: Road Cross Section

The internal roads/parking areas have been designed for low heavy vehicle traffic (*construction vehicles, furniture removal and refuse trucks*) and makes allowance for the insitu subgrade conditions.

- Road Category C/D (TRH4) or UC (UTG)
- Pavement Class ES 0.1 (TRH4).
- Structural design period 20 years
- Surface finish: Concrete Paving

Each single residential unit will have a double garage and two additional parking bays in front of the garage. Allowance will be made for at least 1.5 parking bays for each retirement village unit.

7. Stormwater Drainage

7.1 Existing Municipal Stormwater Network

The pre-development site drains from the higher laying western boundary towards the lower laying eastern boundary.



Figure 7-1: Overland drainage patterns

There is no formal bulk municipal stormwater infrastructure in the vicinity of the site. The high permeability of the insitu sands ensures that all stormwater run-off permeates into the subsoil layers and a formalised bulk stormwater connection for the development is not required.

The residential dwellings, roads- and civil infrastructure has been positioned to fall above the pre-scribed 5m contour.

7.2 Hydrological Data

The nearest SAWB weather station to the development site is Plettenberg Bay (POL).

Weather Service Station		Plettenberg Bay (POL)				
Weather Station Number		0014633W				
Mean Annual Precipitation		647mm				
Coordinates (<i>Longitude and Latitude</i>)		Long: 34°3' Lat: 23°22'				
Return Period	1:2yr	1:5yr	1:10yr	1:20yr	1:50yr	1:100yr
1 Day	56mm	83mm	104mm	128mm	163mm	194mm

Table 1: SAWB 0014633W: Plettenberg Bay (*Lat: 34° 3' Long: 23° 22'*)

The hydrological rainfall data of rainfall station, Plettenberg Bay (POL), was used for all stormwater run-off calculations.

7.3 Run-off Factors

The pre-development topography, soil conditions and undergrowth were used to calculate the following pre-development run-off factors:

$$C_{pre} = (C_s + C_p + C_v) \times D_F \times F_t$$

Return Period	1:2yr	1:5yr	1:10yr	1:20yr	1:50yr	1:100yr
Run-off factor C	0.111	0.122	0.133	0.149	0.184	0.222

Table 2: Pre-development Run-off Coefficient

The development will not add substantial hard/impermeable surfaces to the catchment area (*less than 10%*) and will therefore have little impact on the run-off coefficients. The post-development run-off coefficients were calculated to be:

$$C_{post} = (C_{lawn} + C_{Residential} + C_{industry} + C_{business}) \times F_t$$

Return Period	1:2yr	1:5yr	1:10yr	1:20yr	1:50yr	1:100yr
Run-off factor C	0.134	0.147	0.161	0.179	0.222	0.268

Table 3: Post-development Run-off Coefficients

7.4 Peak Flows

The pre- and post-development peak flows were calculated to be:

$$Q = \frac{C \times I \times A}{3600}$$

Return Period	1:2yr	1:5yr	1:10yr	1:20yr	1:50yr	1:100yr
Pre-development (19.11ha)	0.284	0.528	0.753	1.039	1.611	2.236
Post-development (19.11ha)	0.343	0.636	0.908	1.253	1.943	2.697

Table 4: Peak Flow rates in m³/s

7.5 Internal Stormwater Network

The standard stormwater design principle, as set out in section 1 will be implemented in the planning and design of the internal stormwater system.

The following minimum design specifications will be implemented:

- Minimum pipe specification: Class 75 D Concrete spigot & socket pipes
- Minimum pipe diameter: 375mm Nominal diameter
- Minimum design flow: 1.0m/s inside a half-full pipe
- Maximum spacing between manholes/inlets: 80m

An open swale stormwater network will be designed to have sufficient capacity to adequately manage and convey up to a 1:5year rainfall event. The open swales network will follow the road network and will have inlet structures and pipe culverts at road crossings. For rainfall events with a return period larger than 1:5 year, the internal roadways will act as overland flow routes which will convey stormwater run-off towards the lower lying eastern portion of the site, where it will follow the existing natural drainage routes and permeate through the insitu soils in to the subsurface water reserves.

The cohesion of the dune sands is very poor and will therefore be very susceptible to erosion. The following erosion preventative measures will be incorporated in the detail stormwater design:

- Concentration of stormwater will be minimised to prevent high volume/flow rates
- Hard surface run-off (*driveways*) will be routed into swales via the internal roadways
- Sheetflow into open swales will be promoted to maximise contact time with permeable dune sands
- All channels with an internal velocity higher than 1m/s will be formalised (*armorflex*)
- All unlined channels will be landscaped with appropriate vegetation
- Energy dissipation structures will be installed at high energy discharge points

Due to the likely occurrence of a seasonal perched ground water table, provision will be made for a subsoil drainage network beneath the roads. The subsoil drainage network will consist of a 110mm diameter perforated pipe network installed 800mm below the final road level.

7.6 Attenuation and Treatment

The secondary purpose of the open swale network will be to attenuate peak flows to pre-development rates and treat stormwater run-off.

The attenuation requirement, reducing the post-development peak flows to pre-development flow rates, were calculated using the ABT & GRIGG formula:

$$V_{st} = 60 \left(\frac{1+m}{2} \right) q_p a t_{ca} (1-a)^2$$

	1:2yr	1:5yr	1:10yr	1:20yr	1:50yr
Attenuation Required	9.01	16.72	23.87	32.93	51.07

Table 5: Attenuation Requirement in m³

The internal stormwater network makes allowance for the required attenuation volumes through the detention capacity and percolation rate of the stormwater swales. The gradient inside the swales will be less than the pre-development crossfalls, allowing stormwater run-off to accumulate inside the swales, providing more contact time with the permeable insitu dune sands. The percolation rate of the insitu dune sands is estimated at 10⁻³ mm/s or 86mm/day.

$$A_{fb} = \frac{WQ_v \times d_{fb}}{k \times (h_{fb} + d_{fb})t_{fb}}$$

	Wetted Perimeter	Catchment Area	1:50yr Attenuation Volume	Drainage Time
Western/ Central Roadside Swale	1,380m ²	31,485m ²	8.41m ³	55 minutes
Eastern Swale parallel to estuary	620m ²	24,530m ²	6.56m ³	1h 36min
Swale: Northern Erven	410m ²	27,840m ²	7.44m ³	2h 45min

Table 6: Attenuation and Treatment Potential of Internal Stormwater Swales in m³

8. Sanitation

8.1 Existing Municipal Foul Sewer

GLS Consulting was commissioned to undertake a re-analysis of the bulk municipal sewer infrastructure capacity and the impact of the proposed development in the existing network. GLS formalised their findings in a report (27 February 2023) which was presented to Bitou Municipality for approval.

The GLS report concluded the following:

- The master plan indicated that the proposed development should be accommodated within the existing Plettenberg Bay Pumping Station (PS1) drainage area.
- There is sufficient capacity in the existing Plettenberg Bay sewer reticulation system to accommodate the proposed development.
- The recommended position for the sewer connection for the proposed development is to the existing 150 mm diameter outfall sewer in Susan Street, as shown on Figure 4.

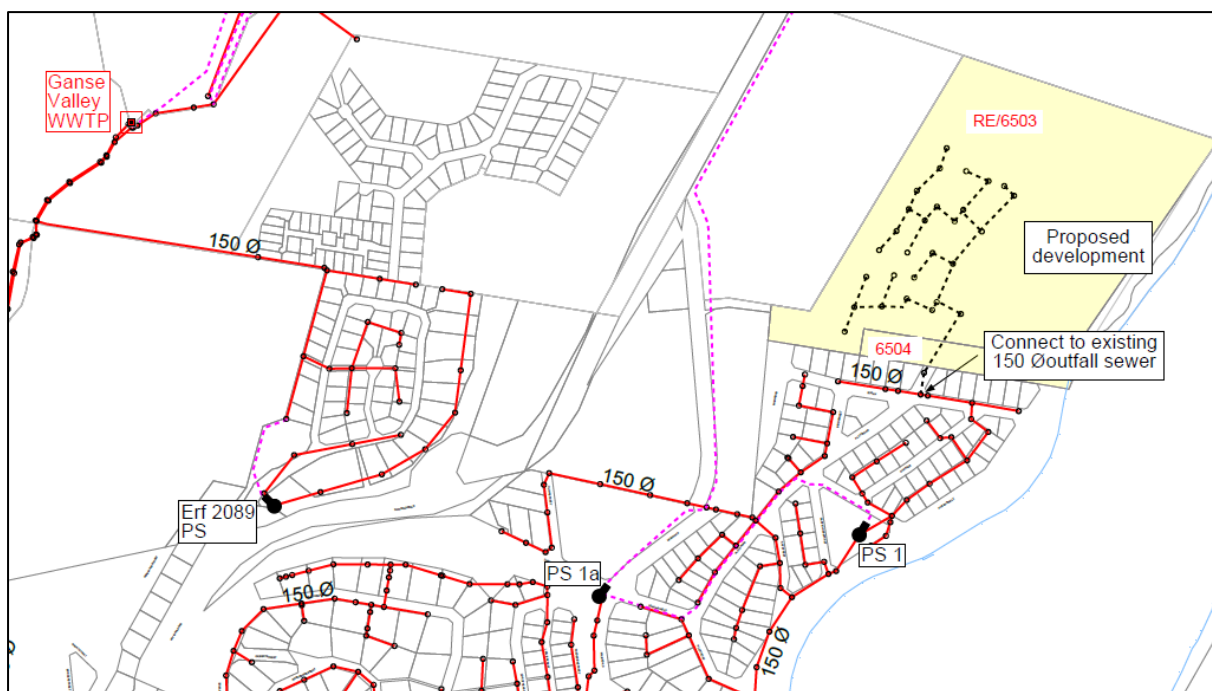


Figure 8-1: Extract from GLS Consulting (Feb 2023) Figure 4: External Sewer Masterplan

8.2 Internal Sewage Network

The estimated sewage yield generated from the proposed development will be:

- Annual Average Daily Sewage Yield: 38.5m³ per day
- Peak Daily Wet Weather Sewage Yield (Peak Factor - 3.5): 2.2 l/s

The internal sewage infrastructure will consist of a 160mm diameter uPVC Class 34 gravity pipe network and round precast concrete ring manholes in the road reserves. The internal

infrastructure will drain towards a new foul sewer pumpstation. The pumpstation will be situated inside the road reserve and will not encroach into the environmentally sensitive area.

The pumpstation will convey all sewage from the development via a 75mm rising main towards an existing 160mm underground pipe and manholes network inside the Susan Road reserves (*as per GLS Report*) on the southern boundary of the site.

The underground gravity network will adhere to the following requirements:

- Minimum self-cleansing velocity inside a half full pipe - 0.7m/s
- Maximum full-bore velocity - 3.5m/s
- Maximum spacing between manholes - 90m
- The bedding and blanket material for the internal sewage pipe trenches will adhere to SABS 1200 regulations for Class C bedding and blanket.

The underground pumpstation will have the following minimum requirements:

- The pumpstation will be equipped with duty- and standby pumpsets
- The pumpstation will have back-up power (*genset or inverter/batteries*)
- The pumpstation sump will have an emergency back-up volume equal to the 4-hour peak flow

9. Water Reticulation

9.1 Existing Bulk Municipal Network

The master planning analysis undertaken by GLS Consulting concluded the following:

- The master plan indicated that the proposed development should be accommodated within the existing Goose Valley reservoir zone.
- The proposed connection to the existing water system is to the existing 250 mm diameter supply pipeline from the Goose Valley reservoir in Beacon as shown on Figure 1.
- Link services items BPW14.1 is required to connect the internal reticulation network of the proposed development to the existing municipal water network.
- The bulk water system to the Goose Valley, Wittedrift and Matjiesfontein reservoirs is at capacity and should be upgraded according to the master plan before additional developments within the reservoir supply areas can be accommodated.
- The minimum upgrades required to improve the existing bulk supply system (in order to accommodate the proposed development in the existing system), are:
 - Master plan item 2 (3,6 km x 400 mm Ø replace existing 300 mm Ø abandoned AC pipe)
 - Master plan item BPW.B39 (0,9 km x 400 mm Ø replace existing 150 mm Ø bulk pipe).
 - Portion of master plan item BPW.B67 (1,0 km x 355 mm Ø replace existing 150 mm Ø bulk pipe).

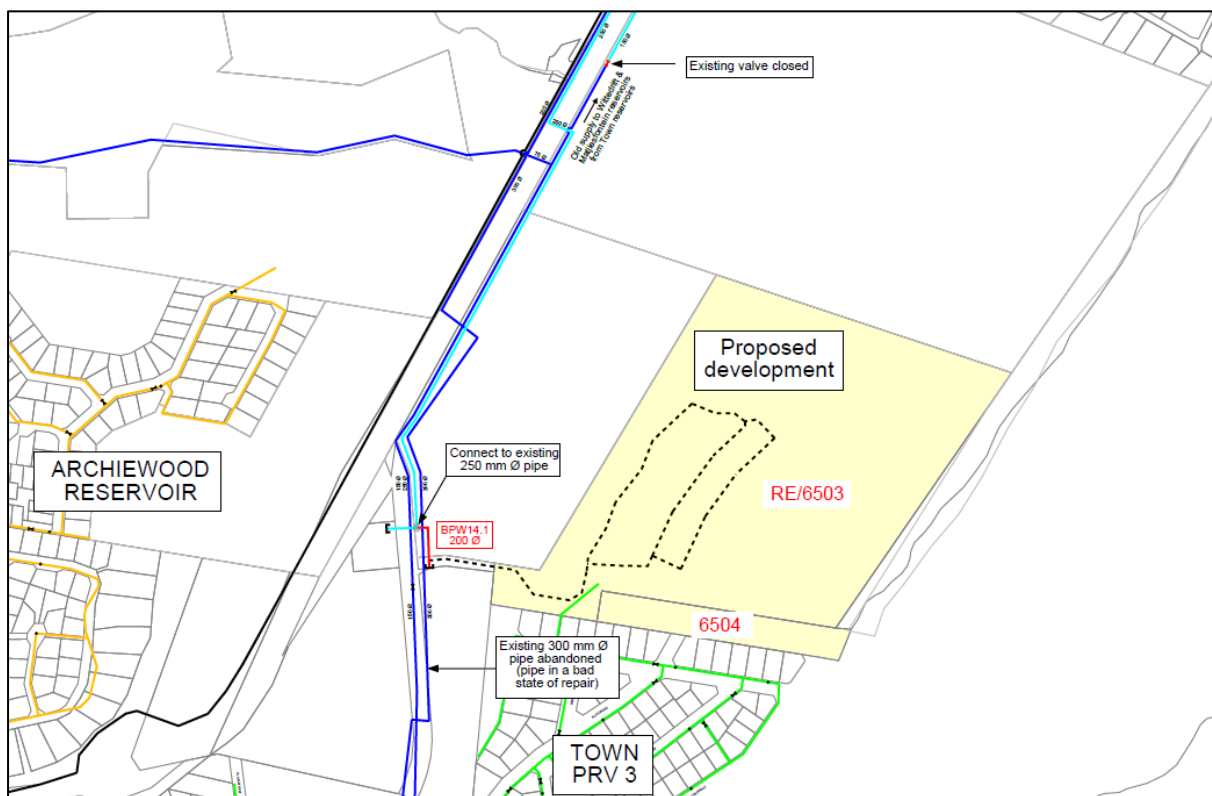


Figure 9-1: Extract from GLS Consulting (February 2023) Figure 1: External Watermain Link Upgrades

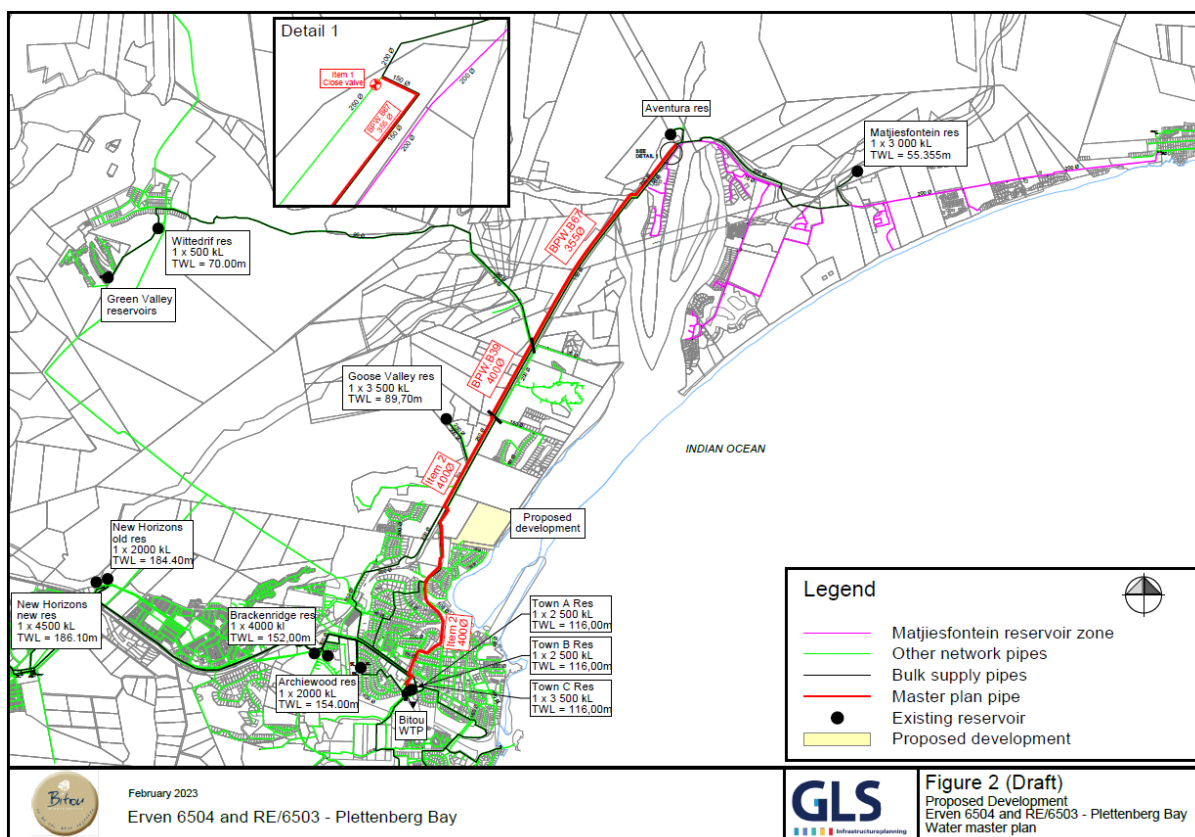


Figure 9-2: External Bulk Supply Upgrades – GLS Consulting (February 2023)

GLS estimated the costs for the design and installation of Item 2, BPW.B39 and BPW.B67 to be R42 million.

Various meetings with GLS and Bitou Municipality was held to discuss a proposed interim solution to increase the bulk supply to the Goose Valley Reservoir. GLS provided the following temporary solution:

- Installation of an additional 160mm bulk main off the existing 160mm distribution main in the N2 road reserve (*refer figure 5*) which will free up an additional 860kl/day.
- There is sufficient capacity in the 860kl/day to accommodate the developments on Farm 444/38, Farm 304/32 and erf 6503.

This temporary solution was discussed with Bitou Municipality on 9 March 2023, who stated that they will except the temporary solution on the following conditions:

- Design, installation, etc. costs for the temporary solution will be the responsibility of the developer/developers and will not be deductible from the Augmentation Levee's
- The temporary solution is not a permanent solution and Augmentation Levee's for Water and Sewage will be used towards the permanent solution.
- The proposed pro-rata contribution towards the temporary solution must be resolved between the developers of the different properties.
- A Service Level Agreement must be drafted for the development.

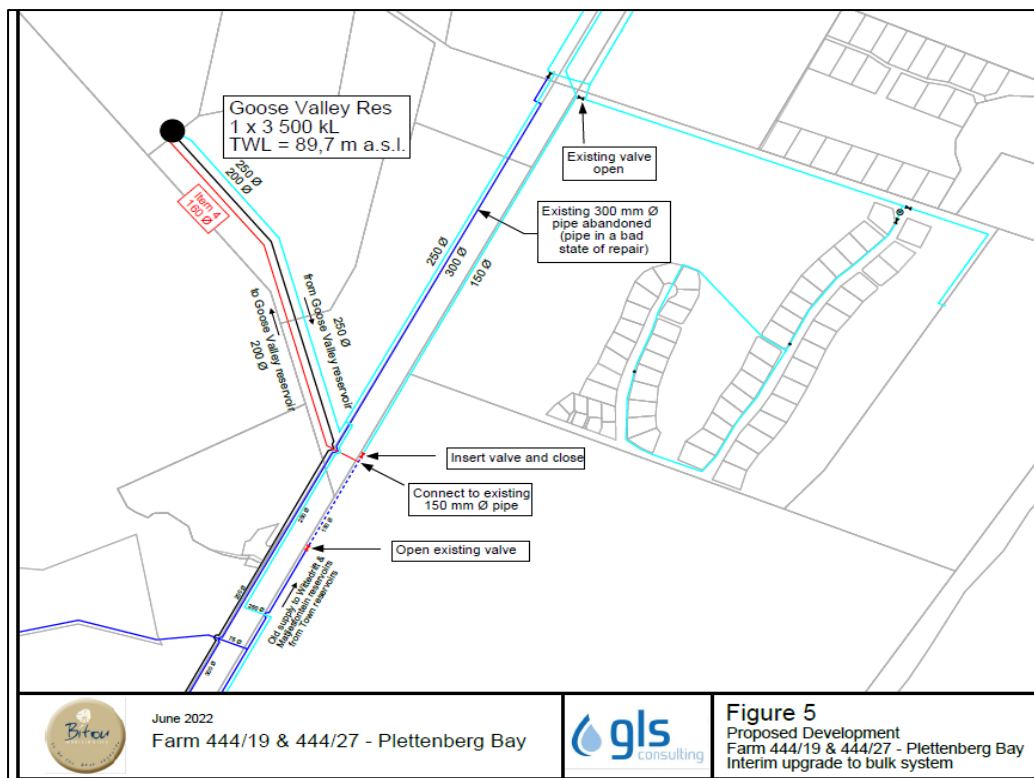


Figure 9-3: External Bulk Supply Interim Solution - GLS Consulting (October 2022)

The implementation of the temporary solution will be done by the developer of Portion 19 and 27 of Farm 444, as this development will be the first to have a civil contractor on site. The pro-rata contributions (*Farm 444/38, Farm 304/32 and Erf 6503*) for the installation of the pipe will be paid directly to the developer of Portion 19 and 27 of Farm 444.

9.2 Internal Water Reticulation

The potable water demand for the development will be:

- Gross Annual Average Daily Demand: 61m³ per day
- Instantaneous Peak Demand (*Peak Factor - 10*): 7.06 l/s
- Fire flow criteria (*low risk*): 15l/s @ 10m

The proposed internal metered water reticulation network will consist of a combined domestic and fire water reticulation network consisting of a 75mm diameter uPVC Class 12 potable water main. Allowance will be made for individual water meters to be located 1m inside the erf boundaries for every property.

The water reticulation network will adhere to the following design requirements:

- Minimum pipe size - 75mm diameter
- Minimum pipe class - uPVC Class 12 / HDPE PE100 Class 12.5
- Specials & Fittings - As per Bitou Municipal Engineering Standards
- The bedding and blanket material will comply with SABS 1200 regulations for Class C bedding and blanket
- Fire hydrants will be spaced for low-risk areas

9.3 Irrigation Network

Each homeowner will be responsible for the irrigation of their own property. Irrigation to individual gardens and road verge landscaping will be done from the potable water network. The irrigation schedule will fall outside of the normal operating peak hours and will therefore not have an adverse effect on the water supply.

Rainwater harvesting tanks, which collect stormwater run-off from roofs and hardened surfaces, will be prescribed as part of the estates building guidelines and will be confirmed by the homeowners association.

10. Solid Waste

The minimum requirements for domestic waste collection (as per the *National Domestic Collection Standards, 2011*) will be applicable to this development. The proposed development will generate approximately 20kg of solid waste per household per week.

The development's homeowner's association will administrate the collection of the domestic waste from each individual property towards a communal refuse storage facility located at the entrance to the proposed development. The refuse storage area will be adequately sized to accommodate the correct amount of 240l refuse bins for organic waste as well as make allowance for waste separation bins for temporary storage of recycling. Recycled waste to be collected by a registered Bitou Municipality service provider. A minimum target of 50% diversion of organic waste to be implemented by the homeowner's association.

Allowance will be made for adequate turning space at the entrance to the proposed development to accommodate the turning movement of a standard refuse truck.

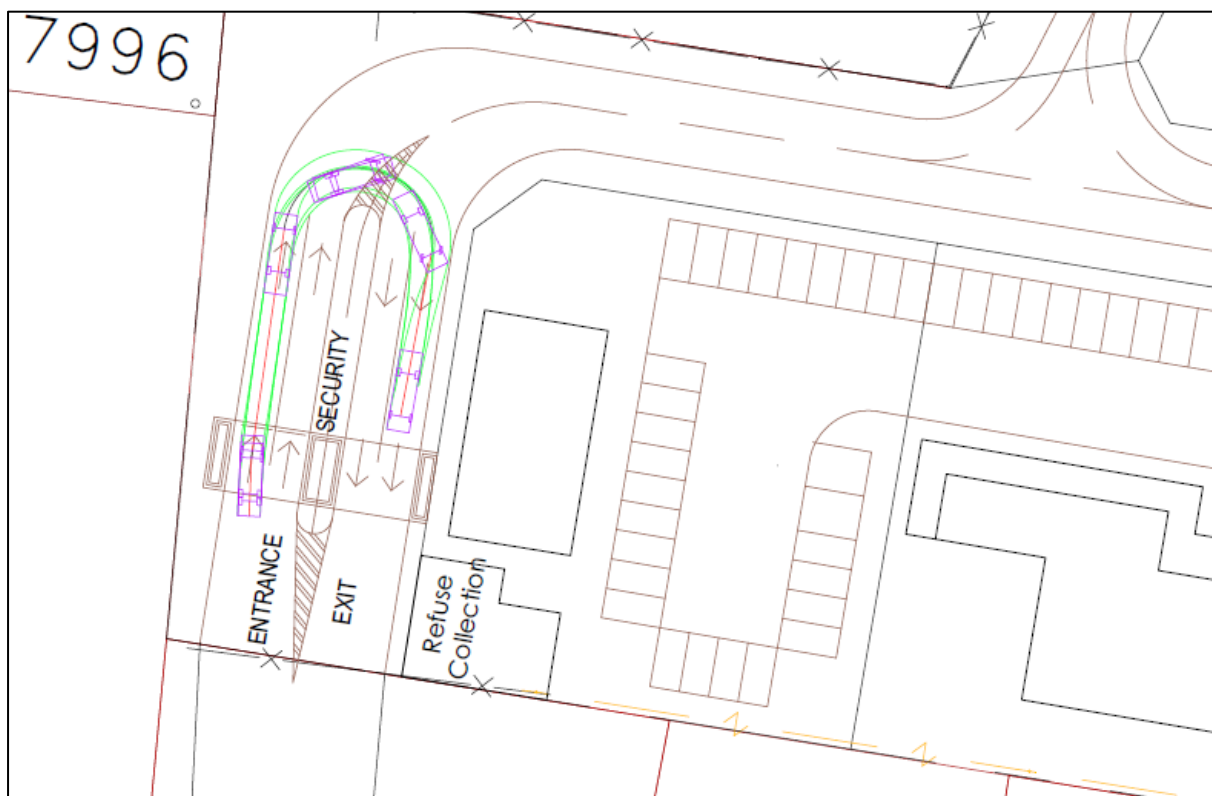


Figure 10-1: Refuse Vehicle Turning Circle at Entrance Facility

11. Maintenance for Roads and Civil Services Infrastructure

The completed development will be handed over to a Homeowner's Association/Body Corporate, who will except responsibility for the daily operations and maintenance of all civil infrastructure within the development.

The maintenance of the civil infrastructure will be explained to the HOA and they will be furnished with engineering maintenance manuals (*pumpstation*) and checklists (*weekly and monthly*).

It is advised that a professional engineer inspect and assess the civil services infrastructure on a yearly basis to ensure that the structural integrity and functionality of the civil amenities are intact.

Provision must be made for at least 2.5% of the total initial capital expenditure for the installation of the civil and roads infrastructure to be allocated for maintenance purposes.

All maintenance works must be carried out in accordance with all provisions of the Occupational Health and Safety Act (*Act 85 of 1993*). Maintenance staff must be well educated on the operation of the civil services network as a whole and potential safety hazards should be identified before any maintenance/remedial works are carried out. All maintenance personnel must always be equipped with the necessary protective gear (*PPE*).

12. Conclusion

The findings of this Civil Engineering Services Report provide sufficient evidence to **support** the application for

"The rezoning of Erf 6503 Plettenberg Bay to 'Residential Zone I' (2.27 ha) & 'Residential Zone II' (2.67 ha) & 'Residential Zone IV' (0.74 ha) & 'Open Space Zone II' (0.66 ha) & 'Open Space Zone III' (10.44 ha) & 'Private Road' (2.39 ha) in terms of Section 15(2)(a) of the Bitou Municipality Land Use Planning Bylaw, 2015"

A Services Level Agreement, between the Developer and Bitou Municipality, must be compiled to address the upgrading of the external engineering infrastructure (*i.e. potable water and sewer networks*) required for this development.

The Service Level Agreement must clearly stipulate the following:

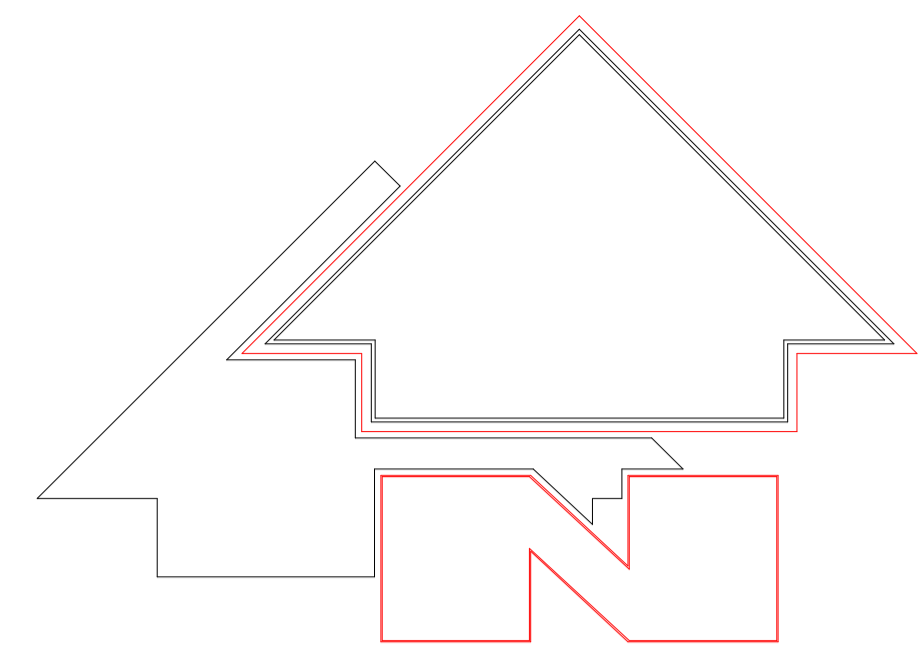
- The phasing of the proposed development
- The extent of the external upgrades required for each phase.
- Augmentation Levee's payable for each phase of the development
- Responsibility for external upgrades
- Application of Augmentation Levee's for external upgrades in lieu of direct payment to Bitou Municipality.



Riaan van Dyk (*Pr Eng 20150503*)
for Vita Consulting Engineers

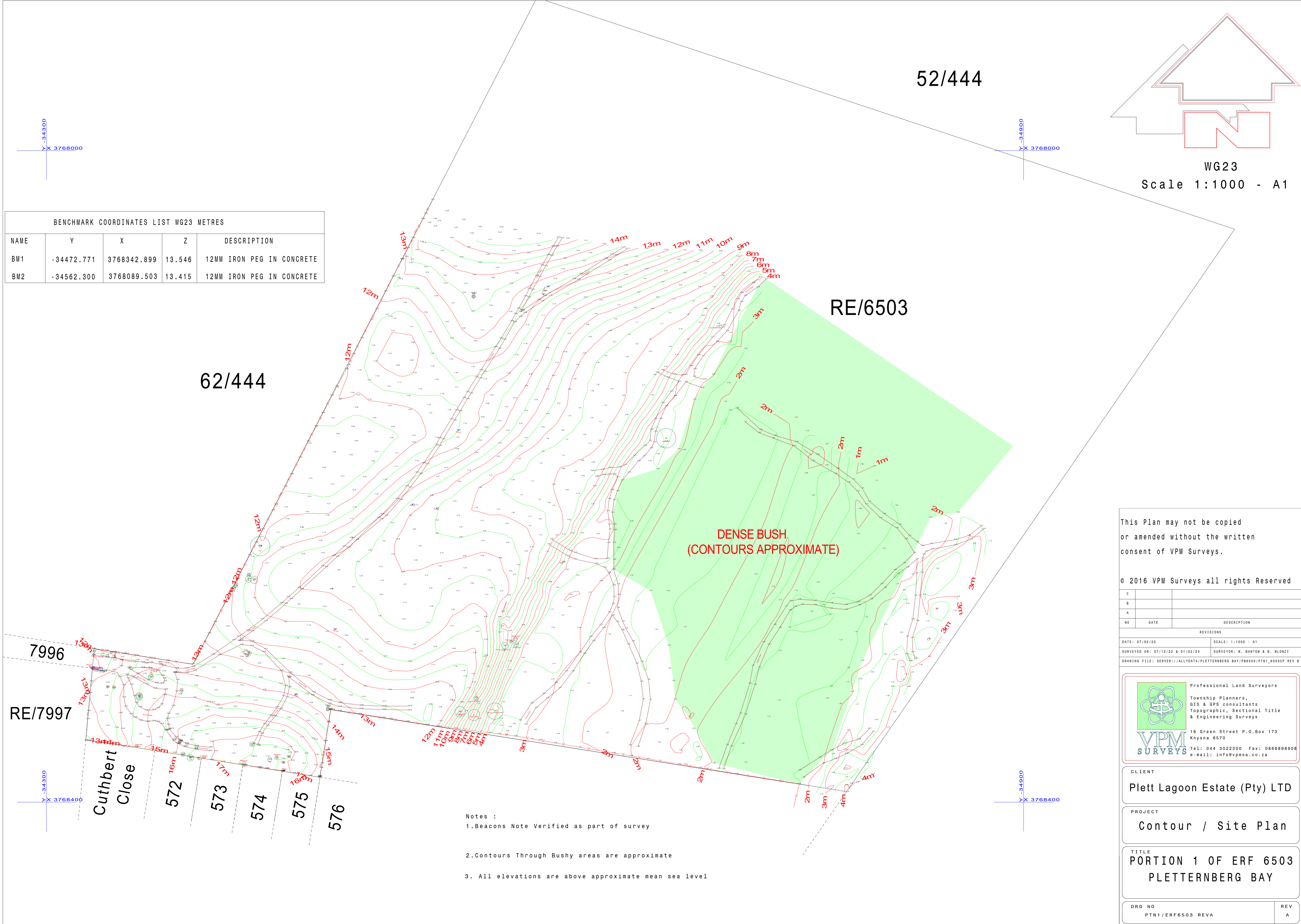
Appendix A: Topographical Survey

52/444



WG23
Scale 1:1000 - A1

BENCHMARK COORDINATES LIST WG23 METRES				
NAME	Y	X	Z	DESCRIPTION
BM1	-34472.771	3768342.899	13.546	12MM IRON PEG IN CONCRETE
BM2	-34562.300	3768089.503	13.415	12MM IRON PEG IN CONCRETE



62/444

RE/6503

DENSE BUSH
(CONTOURS APPROXIMATE)

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NO	DATE	DESCRIPTION
REVISIONS		
DATE:	07/02/23	SCALE: 1:1000 - A1
SURVEYED ON:	07/12/22 & 01/02/23	SURVEYOR: M. BANTOW & B. MLONZI
DRAWING FILE: SERVER://ALLOYDATA/PLETTERNBERG BAY/PR6503/PTN1_6503CP_REV.B		



Professional Land Surveyors
Township Planners,
GIS & GPS consultants
Topographic, Sectional Title
& Engineering Surveys

16 Green Street P.O.Box 173
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Tel: 044 3022300 Fax: 0866898908
e-mail: info@vpm.co.za

CLIENT
Plett Lagoon Estate (Pty) LTD

PROJECT
Contour / Site Plan

TITLE
PORTION 1 OF ERF 6503
PLETTERNBERG BAY

DRG NO PTN1/ERF6503 REVA	REV A
-----------------------------	----------

- Notes :
1. Beacons Note Verified as part of survey
 2. Contours Through Bushy areas are approximate
 3. All elevations are above approximate mean sea level

7996

RE/7997

Cuthbert
Close

572

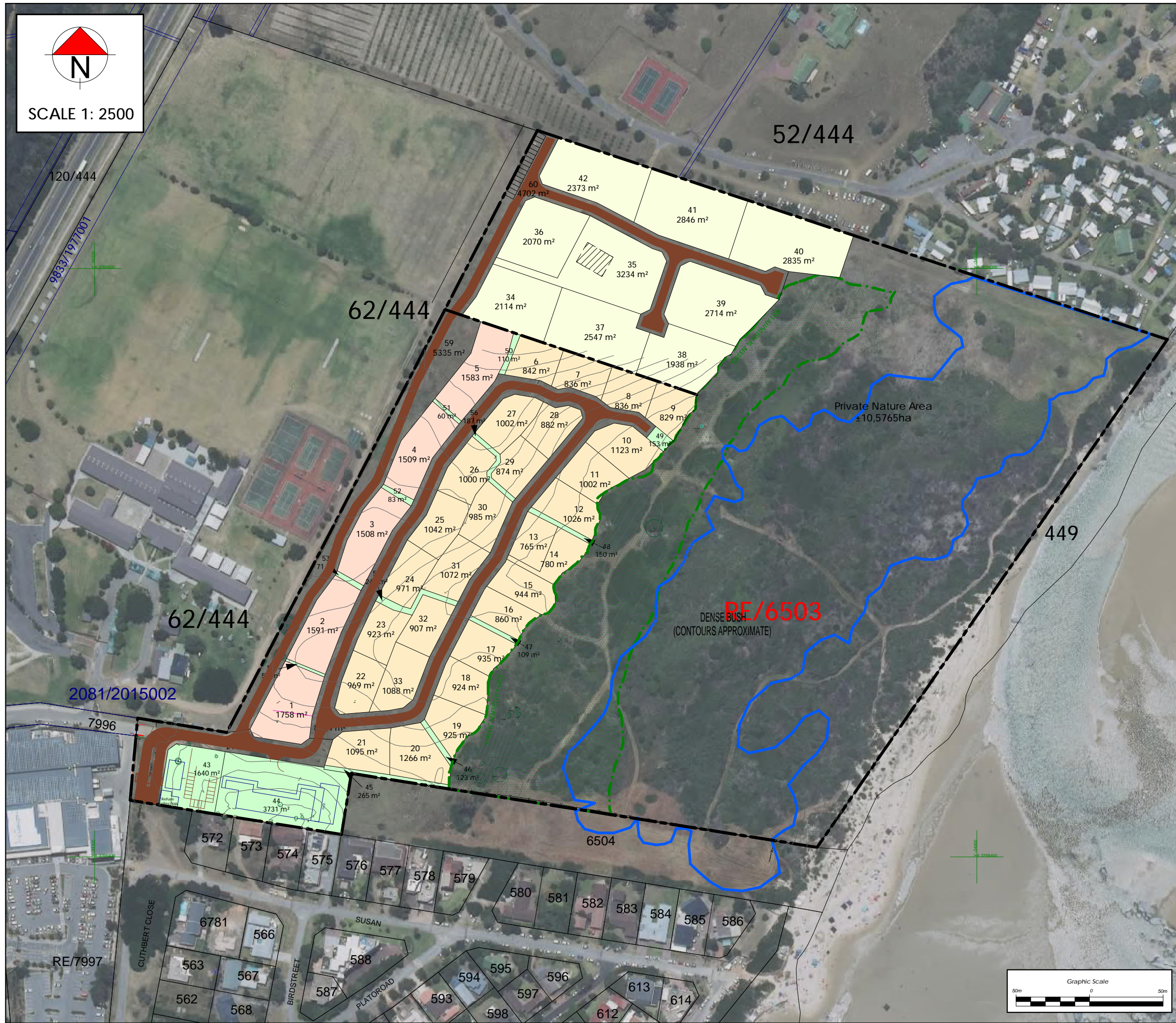
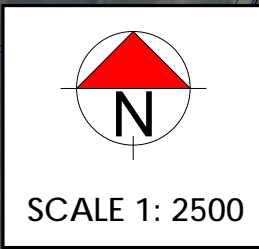
573

574

575

576

Appendix B: Sub-Division Layout



PLAN 4

PLETTENBERG BAY
ERF 6503

ALTERNATIVE 1 PREFERRED PROPOSAL

LEGEND				
ZONING:	QTY	AREA (ha)	%	
Residential Zone I	9	2,2671	11.86	
Residential Zone II	28	2,6675	13.96	
Residential Zone IV	5	0,7949	4.16	
Open Space Zone II	14	0,6985	3.65	
Open Space Zone III	1	10,5784	55.35	
Private Road	4	2,1065	11.02	
TOTAL	61	19,1129	100	

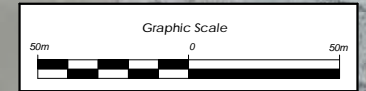
- NOTES**
- Sizes and dimensions are approximate and subject to final survey
 - For Property details, refer to SG 8205/1996
 - 0.5m Contour intervals, surveyed by VPM Surveys

DRAWN:	MV	CHECKED:	MV
PLAN NO:	Pr2309PB6503L05		
PLAN DATE:	25 July 2023		
STORED:	z:\drawings\App\Pr2309PB6503L05.dwg		

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APPROVED IN TERMS OF SECTION 23(1) OF THE BITOU MUNICIPALITY'S BY-LAW ON MUNICIPAL PLANNING AS PUBLISHED IN P.N. 273/2015 ON 12 AUGUST 2015

MUNICIPAL MANAGER
DATE: _____



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KNYSNA 6570

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www.vreken.co.za

Appendix C: Traffic Impact Statement (UDS)

Date: 28 July 2023

Our Ref: UDS627/Reports/

51 Lourensford Estate
Somerset West
7130

Attention: Mr. Riaan van Dyk

Dear Sir

**TRAFFIC IMPACT STATEMENT FOR THE PROPOSED DEVELOPMENT ON RE 6503 AND 6504,
PLETTENBERG BAY**

This company was appointed to prepare a Traffic Impact Statement (TIS) for a proposed development on RE 6503 and 6504 in Plettenberg Bay as part of the NEMA process.

1. LOCALITY AND BACKGROUND

The subject property is located in Plettenberg Bay east of the N2 (National Route 2) and is currently accessed via Beacon Way as shown in **Diagram 1** below and the attached **Locality Plan**.



Diagram 1: Location of Subject Property



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Unit 8, Time Square Building,
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Stellenbosch

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V&A Waterfront
8002

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associates
JW Wessels PrEng
P v Blerk PrEng
JN Louw PrCPM

offices
Clanwilliam, Stellenbosch,
Somerset West

Reg no. 2003/043709/23

urban development solutions



2. PROPOSED DEVELOPMENT

The development is proposed to have 77 residential units. Of the 77 units, 37 units are proposed to be single residential units and 40 units will be apartments with the possibility of being developed as retirement units. The proposed estate will be access-controlled with access via a new road constructed along the southern boundary of the property to Susan Street. This will be further discussed in *Section 4*.

Please see the proposed layout on the attached **Alternative 1 Preferred Proposal** prepared by *Marike Vreken Urban and Environmental Planners*.

3. TRAFFIC IMPACT

3.1 Existing Traffic

Traffic counts were performed on Monday, the 22nd May 2023 during the AM (06:00 – 09:00) and PM (15:30 – 18:30) at the following intersections which were agreed upon with the Bitou Municipality:

1. N2 / Beacon Way intersection
2. Beacon Way / School Access Road intersection
3. Beacon Way / Checkers / Market Square intersection
4. Beacon Way / Zenon Street

The 2023 peak hour traffic volumes are as indicated in the attached **Figure 1**. The peak hours were found to be 07:15 – 08:15 and 16:15 – 17:15, which coincides with the morning and evening commuter peak periods.

3.2 Traffic Generated

The South African Trip Data Manual TMH17 was used to estimate the trips expected to be generated by the proposed development. TMH17 suggests a trip generation rate of 1 trip per single residential unit and 0.35 trips per retirement unit. However, as there exists the possibility that the apartments will not be developed as retirement units, a trip generation rate of 0.65 was units for the 40 apartment units. The proposed development is thus expected to generate peak hour trips as indicated below.

Single Residential Units				
Number of Units	37			
Trip Generation Rate / Unit	Weekday AM		Weekday PM	
	1		1	
Trips Generated	37		37	
Directional Split & Vehicular Trips	Weekday AM		Weekday PM	
	IN	OUT	IN	OUT
	25%	75%	70%	30%
	9	28	26	11

Apartments				
Number of Units	40			
Trip Generation Rate / Unit	Weekday AM		Weekday PM	
	0.65		0.65	
Trips Generated	26		26	
Directional Split & Vehicular Trips	Weekday AM		Weekday PM	
	IN	OUT	IN	OUT
	25%	75%	70%	30%
	7	20	18	8
TOTAL	16	47	44	19

Therefore, 63 trips are expected during the peak hours with 16 IN / 47 OUT during the AM peak hour and in the 44 IN / 19 OUT.

3.3 Traffic Distribution and Growth

The South African Trip Data Manual (TMH17) suggests an annual growth rate of 0 – 3% for low growth areas and 3 – 4% for average growth areas. As the area around Beacon Way is mostly built up, low growth is expected, however, to err on the side of caution an annual growth rate of 3% was used. The existing traffic was projected to 2028 to evaluate a 5-year future scenario both with and without the proposed development in order to establish whether the road network can accommodate the projected growth. See **Figure 2** for the *Projected 2028 AM/PM Peak Hour Traffic Volumes*.

The expected trip distribution is as indicated in the attached **Figure 3**. As far as possible, the background traffic was used to model the trip distribution. It should be noted that the access from the property was modelled via the new proposed access on the southern boundary of the property, rather than the existing roadway which provides access to the adjacent school. This will be discussed further in *Section 4*.

Figure 4 shows the estimated 2028 AM/PM peak hour traffic volumes, including the traffic generated by the proposed development as well as a 3% annual growth rate.

3.3 Traffic Impact

The existing traffic was analysed using SIDRA Intersection Analysis 9.1. Service levels A to D (up to 35 seconds of delay) are considered acceptable, where a level of service (LOS) below D and a degree of saturation above 0.85 is considered unacceptable.

N2 / Beacon Way Intersection

The N2 / Beacon Way intersection is a priority-controlled T-junction with a stop control on Beacon Way. There are turning lanes on each approach as shown in **Diagram 2**. It should be noted that according to the local municipality, the intersection is planned to be upgraded to a roundabout in the near future.



Diagram 2: N2 / Beacon Way intersection

The existing 2023 traffic volumes along with the existing lane layout was analysed and the intersection is experiencing an overall delay of approximately 7.8 seconds in the AM peak hour and 211.2 seconds in the PM peak hour. The worst delay, in both peak hours, is experienced on the right-turning movement along Beacon Way which experiences a LOS E with a delay of 42.7 seconds in the AM peak hour and a LOS F with delays exceeding 1000 seconds in the PM peak hour.

In 2028, after applying a 3% growth rate p.a., the intersection is expected to experience an average delay of 27.2 seconds in the AM peak hour and 477.6 seconds in the PM peak hour. The worst delay, in both peak hours, is experienced on the right-turning movement along Beacon Way which experiences a LOS F with unacceptable delays in the AM and PM peak hour. However, according to the Bitou Municipality, the N2 / Beacon Way intersection will be upgraded to a roundabout in the near future. Using the proposed roundabout, an overall LOS A is expected to be experienced in the AM (5.8 second delay) and PM (6.8 second delay) peak hour. The worst delay is expected to be experienced on the right-turning movement along Beacon Way with 10.3 seconds delay in the AM peak hour and 10.4 seconds delay in the PM peak hour.

After the subject development's traffic is added to the network, the upgraded intersection is still expected to experience an overall delay of 5.8 seconds in the AM peak hour and 6.8 seconds in the PM peak hour. The worst delay is expected to be maintained with the right-turning movement along Beacon Way, which experiences a LOS B in both the AM (10.3 seconds). The worst delay in the PM peak hour is expected on the right-turning movement along the southern south-western approach of the N2 with a delay of 11.4 seconds.

No further upgrades above and beyond the aforementioned roundabout are required to accommodate the development.

Beacon Way / School Access Road / Filling Station Intersection

The Beacon Way / School Access Road / Filling Station intersection is currently priority-controlled with a stop control on the side streets as shown in **Diagram 3** below. There is one lane per direction on all approaches.

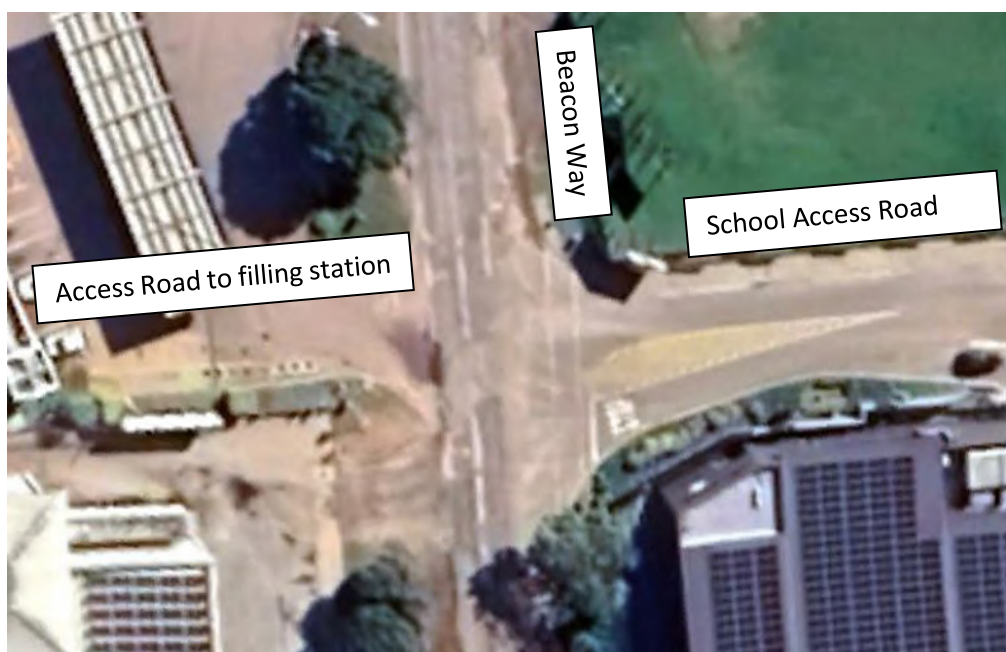


Diagram 3: Beacon Way / Filling Station / School Access Road intersection

The existing 2023 traffic volumes along with the existing lane layout were analysed and the intersection is expected to experience an overall average delay of approximately 6.6 seconds in the AM peak hour and 2.2 seconds in the PM peak hour. The worst delay, in both peak hours, is experienced on the right-turning movement along the school access road on the eastern approach which experiences a LOS C with a delay of 16.8 seconds in the AM peak hour and 20.7 seconds in the PM peak hour.

In 2028, after applying a 3% growth rate p.a., the intersection is expected to experience an average delay of 7.6 seconds in the AM peak hour and 2.2 seconds in the PM peak hour. The worst delay, in both peak hours, is experienced on the right-turning movement along the school access road on the eastern

approach which experiences a LOS C with a delay of 21.4 seconds in the AM peak hour and a LOS D in the PM peak hour with a delay of 26.5 seconds.

After the subject development's traffic is added to the network, the intersection is expected to experience an average delay of 7.6 seconds in the AM peak hour and 2.7 seconds in the PM peak hour. The worst delay is experienced on the right-turning movement along the school access road on the eastern approach which experiences a LOS C with a delay of 22.9 seconds in the AM peak hour. The worst movement in the PM peak hour is expected to be experienced on the right-turning movement from the western approach with a LOS D and a delay of 31.2 seconds. It is expected that in all the scenarios above, the early afternoon peak would experience congestion at the end of the school day.

It should be noted that it was initially proposed to allow access via this servitude, however, after the municipality expressed concerns, the access was relocated to the preferred access along the southern boundary as currently shown on the attached **Alternative 1 Preferred Proposal**. No upgrades are required at this intersection due to the development.

Beacon Way / Checkers / The Market Square Intersection

The Beacon Way / Checkers / The Market Square intersection is a full signalized intersection as shown below in **Diagram 4**. There are turning lanes on each approach.

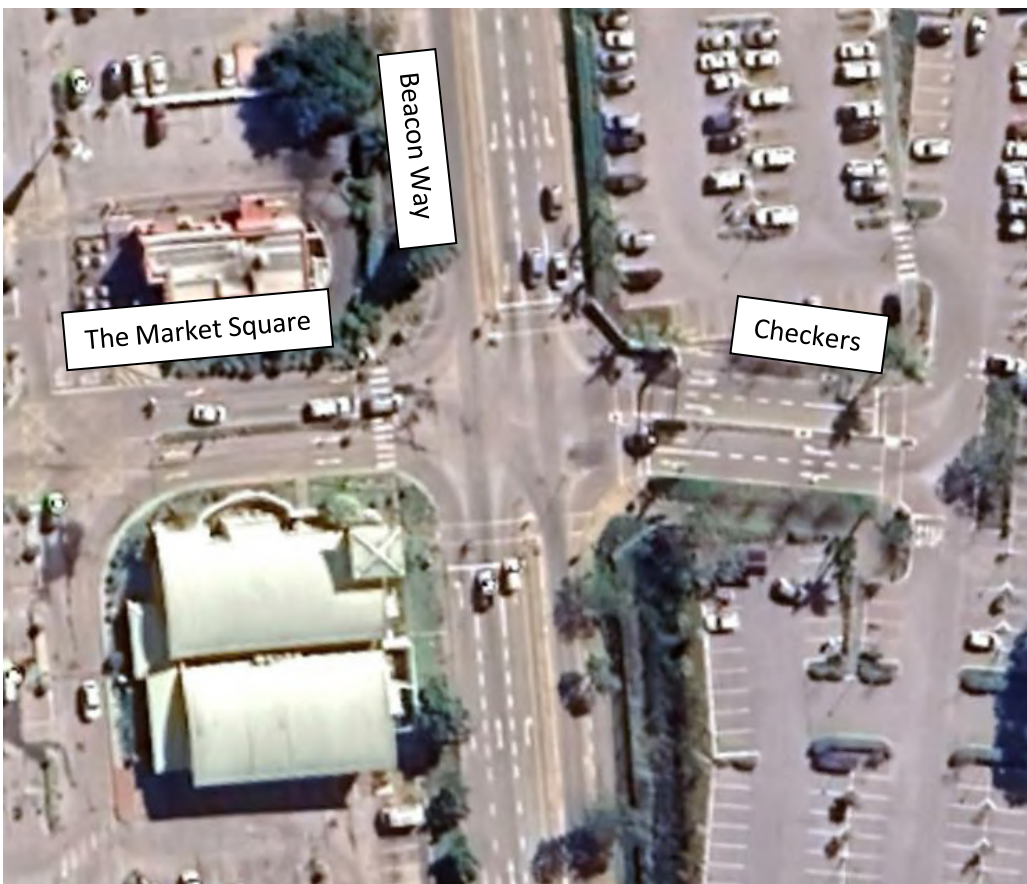


Diagram 4: Beacon Way / Checkers / The Market Square intersection

The existing 2023 traffic volumes along with the existing lane layout was analysed and the intersection is expected to experience an overall average delay of approximately 23.7 seconds in the AM peak hour and 29.3 seconds in the PM peak hour. The worst delay, in both peak hours, is experienced on the right-turning movement along Beacon Way northern approach which experiences a LOS D with a delay of 35.3 seconds in the AM peak hour and 36.1 seconds in the PM peak hour.

In 2028, after applying a 3% growth rate p.a., the intersection is expected to experience an average delay of 24.4 seconds in the AM peak hour and 32.3 seconds in the PM peak hour. The worst delay, in both peak hours, is experienced on the right-turning movement along Beacon Way northern approach which experiences a LOS D with a delay of 38.4 seconds in the AM and PM peak hour.

After the subject development's traffic is added to the network, the intersection is expected to experience an overall delay of 28.4 seconds in the AM peak hour and 36.1 seconds in the PM peak hour. The worst delay, in both peak hours, is expected to be experienced on the right-turning movement along Beacon Way northern approach which experiences a LOS D with a delay of 45.0 seconds in the AM peak hour and 49.6 seconds in the PM peak hour.

No upgrades are required due to the development.

Beacon Way / Zenon Street Intersection

The Beacon Way / Zenon Street intersection is a roundabout as shown below in **Diagram 5**. The intersection will provide access between the proposed development and the larger road network. This will be further discussed in *Section 4*.



Diagram 5: Beacon Way / Zenon Street intersection

The existing 2023 traffic volumes along with the existing lane layout was analysed and the intersection is expected to experience an overall average delay of approximately 5.0 seconds in the AM peak hour and 5.3 seconds in the PM peak hour. All movements experience a LOS A or B.

In 2028, after applying a 3% growth rate p.a., the intersection is expected to experience an average delay of 5.1 seconds in the AM peak hour and 5.3 seconds in the PM peak hour. All movements are still expected to experience a LOS A or B.

After the subject development's traffic is added to the network, the intersection is expected to experience an overall delay of 5.3 seconds in the AM peak hour and 5.6 seconds in the PM peak hour. As above, the intersection is expected to experience a LOS A or B on all movements.

No upgrades are required at this intersection due to the introduction of the development.

4. GEOMETRY

The proposed development is in a region accessed via the N2 / Beacon Way intersection. The N2 is a National Route (NR00208) and as previously mentioned, the intersection is planned to be upgraded to a roundabout in the near future.

Beacon Way is a two-lane road. The Beacon Way / Filling Station / School Access Road intersection is a priority-controlled intersection with no turning lanes. It should be noted that the School Access Road provides access to the adjacent school, Checkers' delivery yard and was initially proposed to provide access to the subject property.

The Bitou Municipality expressed a concern regarding increasing the number of vehicles travelling along the school access road due to the congestion caused by the school. After a meeting with the Bitou Municipality, three access alternatives were identified as indicated below in **Diagram 6**. The preferred access was identified to be the western access (Identified alternate access 1) as the other two accesses would encroach upon the "very high" sensitivity area as identified in the NEMA Planning Report. Traffic will travel via Susan Street, Plato Street and Zenon Street to reach Beacon Way where vehicles will have access to the wider road network.

It should be noted that it seems as though vehicles have travelled along the access road, past the school and delivery yard and informally used part of the subject property to turn around. This area will fall away as it would be developed as part of the gatehouse area.



Diagram 6: Access route for subject property

The Minimum Standards for Civil Engineering Services in Townships (2007) states that a minimum of 6-metres stacking distance is required for less than 15 residential units and 12-metres stacking distance is required for 40 units. There are no stipulated requirements for developments larger than 40-units, however, based on the data available and assuming a best fit trendline, the recommended stacking for 77 units should be between 18- and 23-metres. The layout of the gatehouse has not been confirmed, therefore, sufficient stacking distance should be provided during further design stages. Based on the available layout, 50+ metres are available for stacking in each lane, which equates to 100+ metres in the two entry lanes. This is considered sufficient.

In addition to this, it should be ensured that one of the entry lanes are at least 4.0 metres wide to accommodate emergency vehicles.

The internal roads are a minimum of 5.5-metres wide with road reserves ranging between 10- and 12-metres. It should be ensured that vehicles parked in driveways and garages have sufficient space to reverse. It is also recommended that sight-distance be considered in the placement of trees.

It is anticipated that refuse collection will be at the gatehouse.

Plato Road is approximately 525-metres long and it is suggested that it be considered that speed humps be provided along the straight lengths with appropriate spacing between them.

5. NON-MOTORISED AND PUBLIC TRANSPORT

A sidewalk exists along at least one side of Beacon Way. There are no formal sidewalks along Plato Road, however there is sufficient space for residents to walk on the unpaved sidewalk. As previously mentioned, it is suggested that traffic calming be considered along Plato Road to increase pedestrian safety. In addition to this, it is suggested that a pedestrian gate be considered along the western boundary allowing residents access to the school and retail areas.

It is not expected that additional public transport infrastructure would be required as result of the proposed development.

6. PARKING

The Bitou Municipality Zoning Scheme recommends 2 bays per unit for single residential units and 1.25 bays per apartment. However, as the client would like the option of developing retirement units, 2 bays per unit with an additional 0.25 bays per unit for visitors is required for the 40 apartments. Therefore, a total of 90 off-street parking bays (2.25 bays x 40 units) are required to accommodate the retirement units.

According to the civil engineer, each single residential unit has been designed to accommodate two parking bays and a garage. 80 bays will be provided in front of the retirement units with an additional 42 bays will be available for visitors at the clubhouse. While this is considered sufficient, it is recommended that a minimum of three parking bays are available for disabled users as per the Bitou Municipality Zoning Scheme.

Parking spaces should also be provided in accordance with normal parking standards, i.e. 2.5 by 5.0 metre bays and 3.7 by 5.0 metre bays for disabled users with 7.5 metre aisle widths as per the Bitou Municipality Zoning Scheme.

7. CONCLUSIONS

It can therefore be concluded that:

- This subject property (RE 6503 and 6504) is located to the east of the N2, currently accessed via Beacon Way.
- The municipality suggested alternate access be investigated due to possible congestion issues along Beacon Way.
- The proposed development will accommodate 77 units, of which 37 are proposed to be single residential units and 40 units will be retirement units.

- Traffic counts were performed on Monday, 22nd May 2023 at the N2/Beacon Way intersection, Beacon Way / Filling Station / School Access intersection, Beacon Way / Market Square / Checkers intersection, Beacon Way / Zenon Street.
- Using TMH17, 63 trips are expected during the peak hours with 16 IN / 47 OUT during the AM peak hour and 44 IN / 19 OUT during the PM peak hour.
- A 3% annual growth rate was used to project the traffic to 2028 to evaluate a 5-year future scenario.
- SIDRA 9.1 results were as follows:
 - N2 / Beacon Way Intersection:
 - Existing (2023 traffic): Average delay of 7.8 seconds (AM peak hour) and 211.2 seconds (PM peak hour). The worst delay is experienced on the right-turning movement along Beacon Way which experiences a LOS F and unacceptable delays.
 - Projected 2028 traffic: Average delay of 27.2 seconds (AM peak hour) and 477 seconds (PM peak hour). The worst delay is expected to be experienced on the right-turning movement along Beacon Way which experiences a LOS F and unacceptable delays.
 - The local municipality has confirmed that the N2/Beacon Way intersection will be upgraded to a roundabout. The Projected 2028 traffic was therefore analysed using the approved roundabout. An average delay of 5.8 seconds (AM peak hour) and 6.8 seconds (PM peak hour) is expected with the upgrade. The worst delay is expected to be experienced on the right-turning movement along Beacon Way which experiences a 10.4 second delay in the PM peak hour.
 - Estimated (2028 + Subject Development): Using the upgraded intersection, the average delays were maintained after the development traffic was added.
 - No further upgrades above and beyond the aforementioned roundabout is required.
 - Beacon Way / Filling Station / School Access Intersection:
 - Existing (2023 traffic): Average delay of 6.6 seconds (AM peak hour) and 2.2 seconds (PM peak hour). The worst delay is expected to be experienced on the right-turning movement along the school access which experiences a 20.7 second delay in the PM peak hour.
 - Projected 2028 traffic: Average delay of 7.6 seconds (AM peak hour) and 2.2 seconds (PM peak hour). The worst delay is expected to be experienced on the right-turning movement along the school access which experiences a 26.5 second delay in the PM peak hour.
 - Projected (2028 + Subject Development): Average delay of 7.6 seconds (AM peak hour) and 2.7 seconds (PM peak hour). The worst delay is expected to be experienced on the right-turning movement along the school access which experiences a 31.2 second delay in the PM peak hour.

- No additional lanes are required.
 - Beacon Way / The Market Square / Checkers Intersection
 - Existing (2023 traffic): Average delay of 23.7 seconds (AM peak hour) and 29.3 seconds (PM peak hour). The worst delay is expected to be experienced on the right-turning movement along Beacon Way which experiences a 36.1 second delay in the PM peak hour.
 - Projected 2028 traffic: Average delay of 24.4 seconds (AM peak hour) and 32.3 seconds (PM peak hour). The worst delay is expected to be experienced on the right-turning movement along Beacon Way which experiences a 38.4 second delay in the PM peak hour.
 - Projected (2028 + Subject Development): Average delay of 28.4 seconds (AM peak hour) and 36.1 seconds (PM peak hour). The worst delay is expected to be experienced on the right-turning movement along Beacon Way which experiences a 49.6 second delay in the PM peak hour.
 - No additional lanes are required.
 - Beacon Way / Zenon Street
 - Existing (2023 traffic): Average delay of 5.0 seconds (AM peak hour) and 5.3 seconds (PM peak hour). All movements are expected to experience a LOS A or B.
 - Projected 2028 traffic: Average delay of 5.1 seconds (AM peak hour) and 5.3 seconds (PM peak hour). All movements are expected to experience a LOS A or B.
 - Projected (2028 + Subject Development): Average delay of 5.3 seconds (AM peak hour) and 5.6 seconds (PM peak hour). All movements are expected to experience a LOS A or B.
 - The intersection was modelled as the main access to the wider road network and was able to accommodate all 63 trips. No upgrades are required.
- As mentioned, the N2 / Beacon Way intersection is planned to be upgraded to a roundabout in the near future.
- Access to the subject property is proposed to be gated, however the details for the guard house has not been confirmed. The Minimum Standards for Civil Engineering Services in Townships (2007) only stipulates specifications up to 40 units, however, using the ratios provided, stacking distance should be provided between 18- and 23-metres. Based on the available information, sufficient space is available.
- An entry lane of minimum 4.0 metres should be provided for emergency vehicles.
- Internal roads are 5.5-metres wide with road reserve widths ranging from 10.0- to 12.0-metres.
- It is anticipated that refuse collection will occur at the gatehouse.
- Each single residential unit will include a garage and space for 2 parked cars outside the garage. 80 bays are provided outside the retirement units with an additional 42 bays for visitors at the clubhouse.

8. RECOMMENDATIONS

The development be recommended on condition that:

- Sufficient stacking space exceeding 23-metres be provided.
- A minimum entry lane of 4.0-metres be provided.
- Sufficient sight distance be ensured in the placement of trees along the internal roads.
- It should be ensured that there is sufficient space for vehicles reversing out of driveways.
- Traffic calming be considered along roads within the development longer than 100-metres.
- Traffic calming be considered along Plato Road with appropriate spacing between them.
- A pedestrian gate be considered on the western boundary of the subject erf, providing access to the school and retail areas.

Trust the above is sufficient for the purpose of the investigation. More information can be provided upon request.

Yours faithfully,



Compiled by: **Shameez Patel Papathanasiou** (MScEng)

Approved by **Piet van Blerk** (PrEng)

UDS AFRICA



ATTACHMENTS

Locality Plan

Alternative 1 Preferred Proposal

Figure 1 - Existing AM/PM Peak Hour Traffic Volumes (22 May 2023)

Figure 2 - Projected 2028 AM/PM Peak Hour Traffic Volumes
(Using a 3% growth rate p.a.)

Figure 3 – Distribution of Traffic Generated by the Development

Figure 4 – Estimated 2028 AM/PM Peak Hour Traffic Volumes (Incl. Proposed Development
as well as a 3% growth rate p.a.)

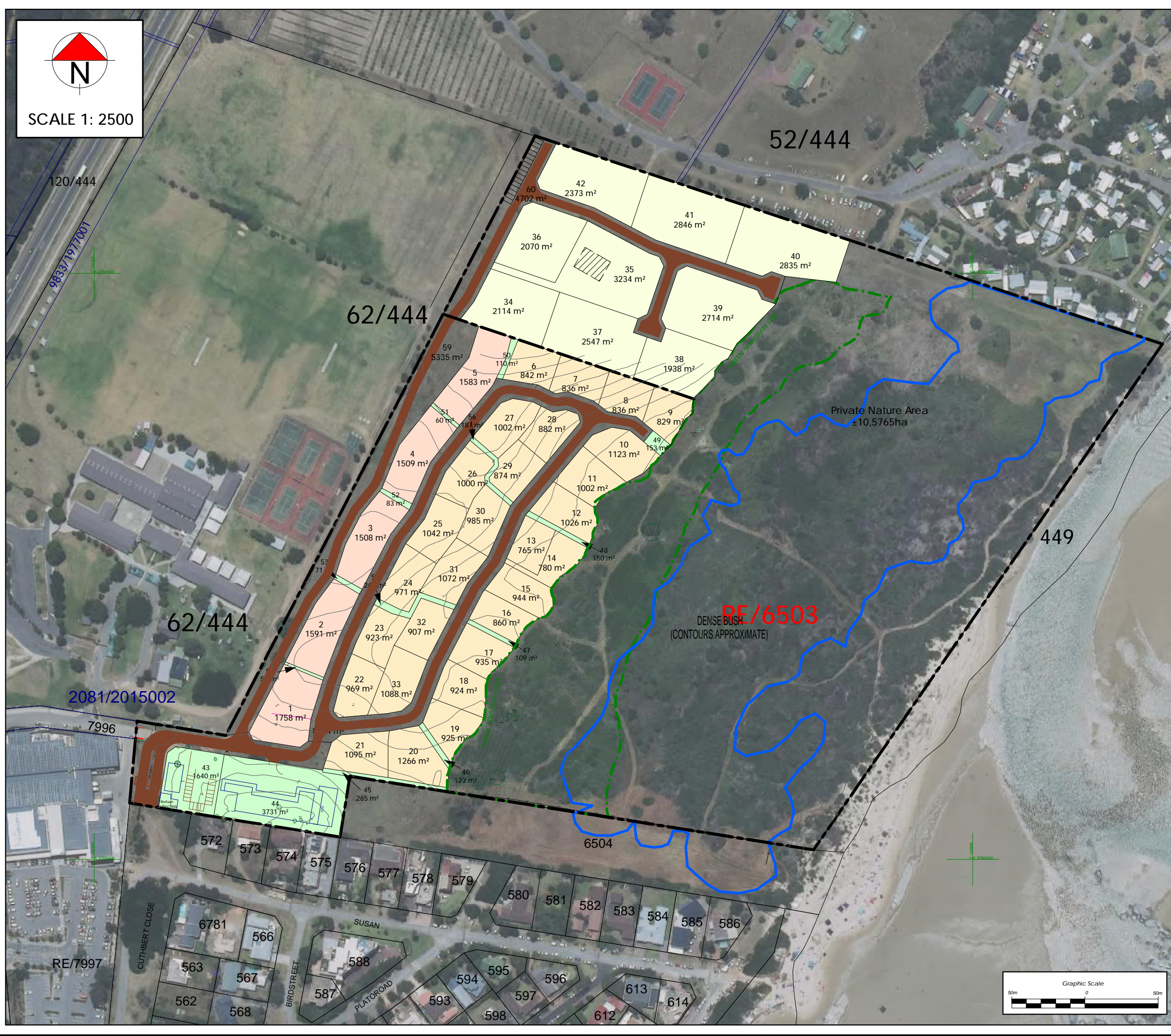
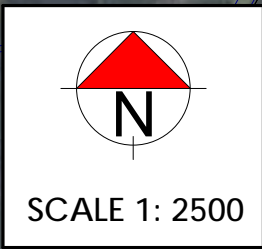


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Locality Plan



PLAN 4

PLETTENBERG BAY
ERF 6503

ALTERNATIVE 1 PREFERRED PROPOSAL

LEGEND				
ZONING:	QTY	AREA (ha)	%	
	Residential Zone I	9	2,2671	11.86
	Residential Zone II	28	2,6675	13.96
	Residential Zone IV	5	0,7949	4.16
	Open Space Zone II	14	0,6985	3.65
	Open Space Zone III	1	10,5784	55.35
	Private Road	4	2,1065	11.02
TOTAL		61	19,1129	100

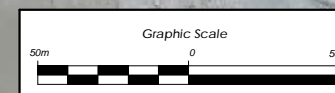
- NOTES**
- Sizes and dimensions are approximate and subject to final survey
 - For Property details, refer to SG 8205/1996
 - 0.5m Contour intervals, surveyed by VPM Surveys

DRAWN:	MV	CHECKED:	MV
PLAN NO:	Pr2309PB6503L05		
PLAN DATE:	25 July 2023		
STORED:	z:\drawings\App\Pr2309PB6503L05.dwg		

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This Plan may not be copied or amended without the written consent of M Vreken

APPROVED IN TERMS OF SECTION 23(1) OF THE BITOU MUNICIPALITY'S BY-LAW ON MUNICIPAL PLANNING AS PUBLISHED IN P.N. 273/2015 ON 12 AUGUST 2015

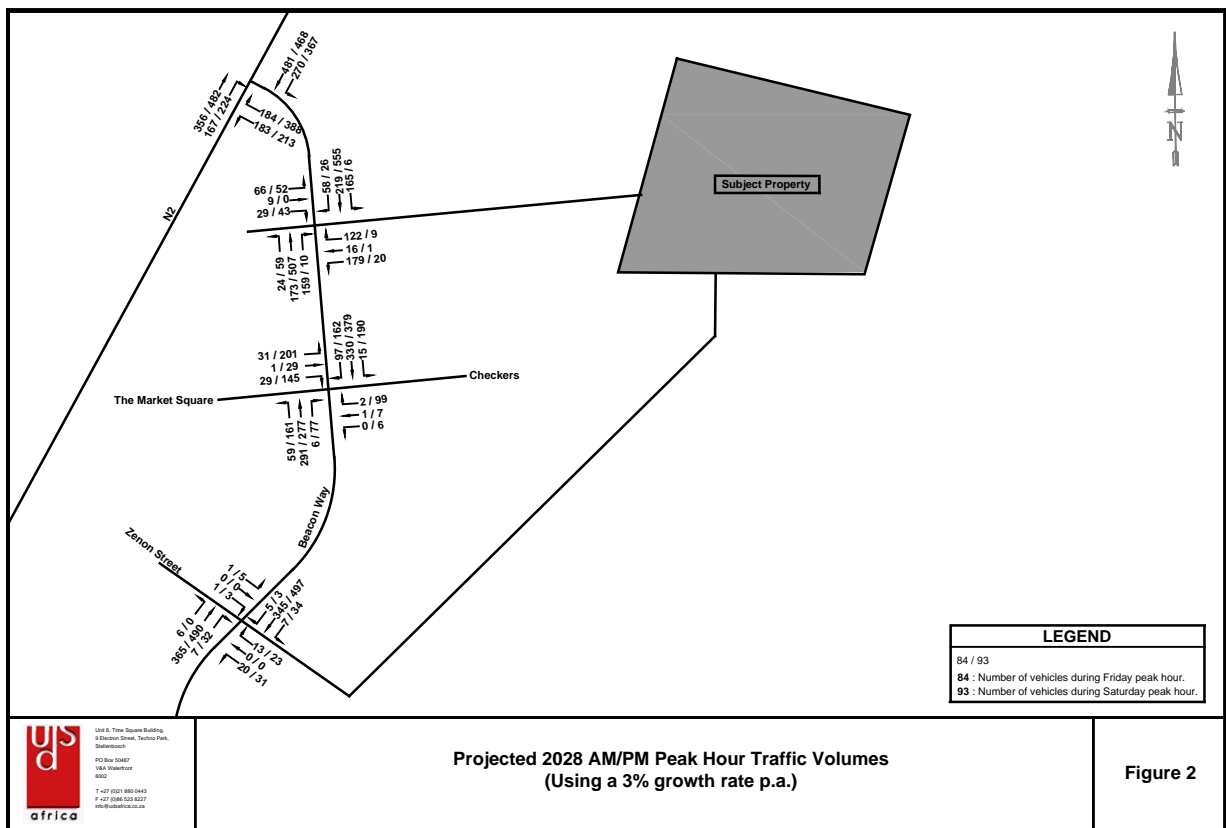
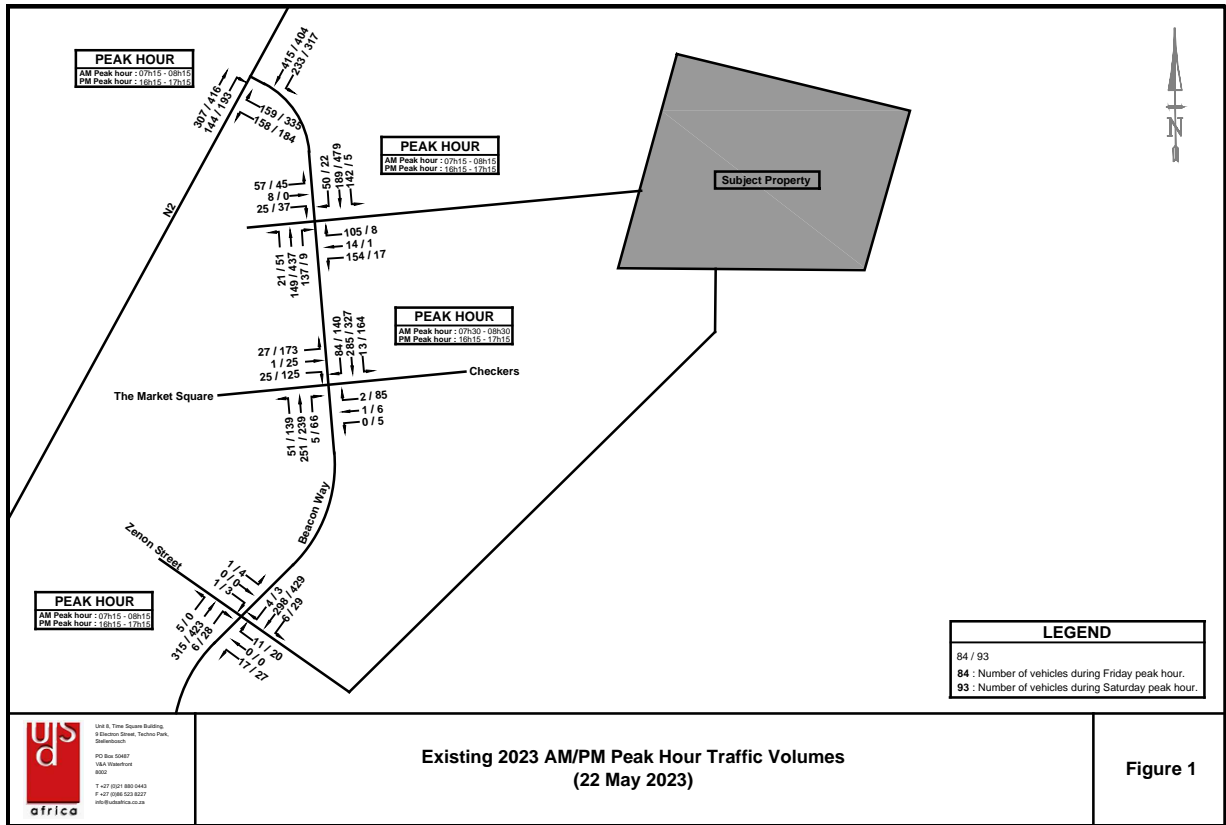
MUNICIPAL MANAGER
DATE: _____

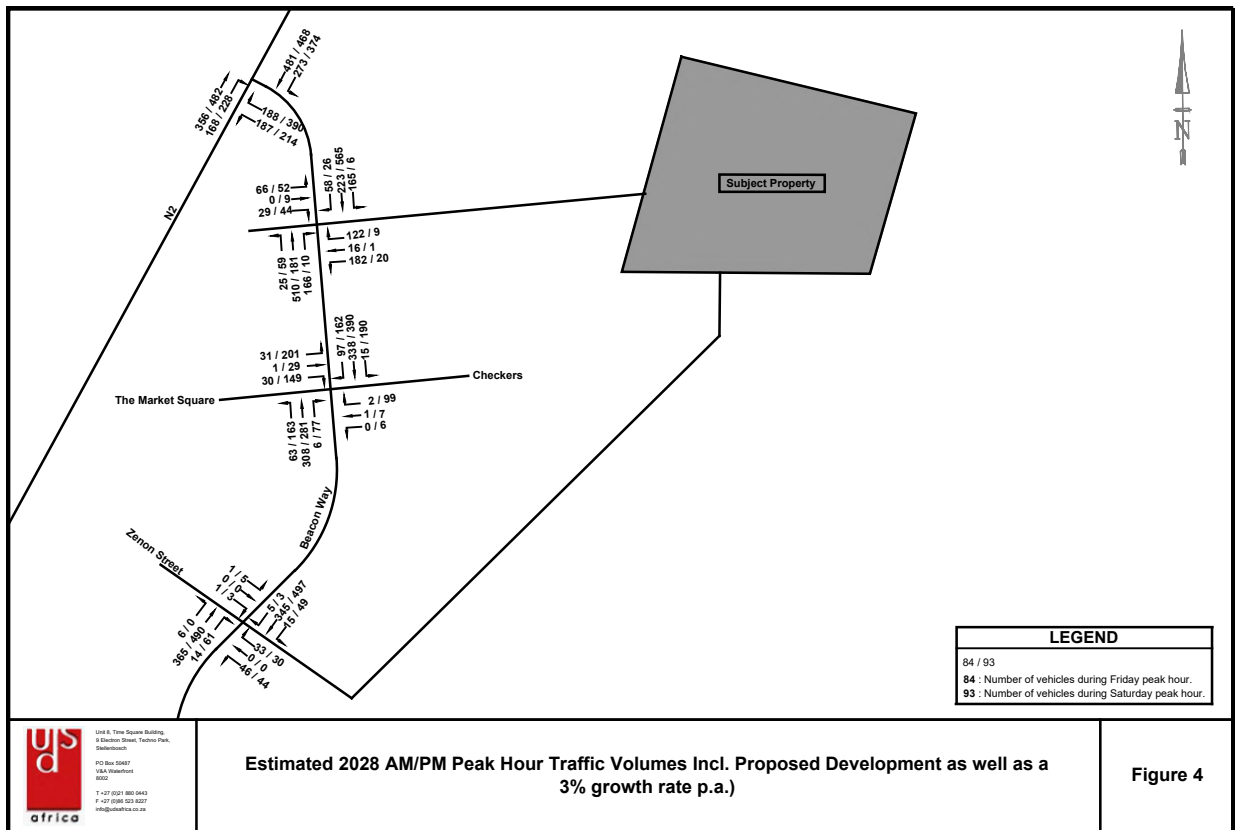
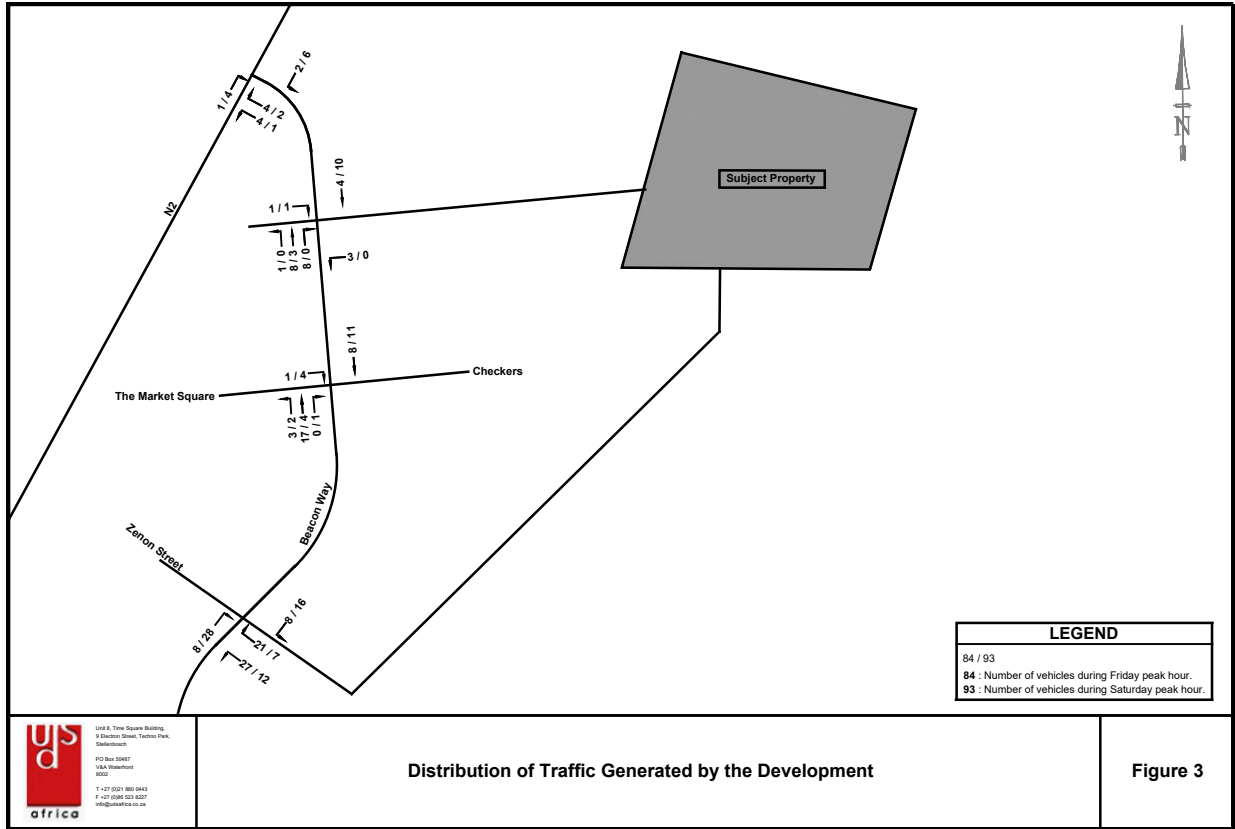


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Appendix D: Municipal Services Capacity Analysis (GLS Consulting)

Draft report

27 February 2023

The Director: Engineering Services
Bitou Municipality
Private Bag X1002
Plettenberg Bay
6600

Attention: Ms Asiphe Mgoqi

Dear Madam,

PROPOSED RESIDENTIAL DEVELOPMENT ON ERF 6504 AND THE REMAINDER OF ERF 6503, PLETTENBERG BAY: CAPACITY ANALYSIS OF THE BULK WATER & SEWER SERVICES

The request by Mr Riaan van Dyk of Vita Consulting Engineers for GLS Consulting to investigate and comment on the bulk water supply and sewer discharge of the proposed development (retirement village development on portion 53 of Farm 444, Plettenberg Bay), refers.

This document should inter alia be read in conjunction with the Water Master Plan (performed for the Bitou Municipality) dated June 2020 and the Sewer Master Plan dated June 2020.

The proposed development was not taken into consideration for the master plans for the water and sewer networks.

1 WATER DISTRIBUTION SYSTEM

1.1 Distribution zone

For this re-analysis of the water master plan it is proposed that the development area should be accommodated in the existing Goose Valley reservoir zone. The proposed connection to the existing water system is to the existing 250 mm diameter supply pipeline from the Goose Valley reservoir in Beacon Way, as shown on Figure 1 attached.

The proposed development is situated inside the water priority area.

1.2 Water demand

No provision was made in the original water analysis for the master plan for development on Erf 6504 and the remainder of Erf 6503 in Plettenberg Bay .

For this re-analysis, the total annual average daily demand (AADD) and fire flow for the proposed development were calculated and classified as follows:

- 40 x retirement units @ 0,6 kL/d/unit = 24,0 kL/d
- 31 x Single residential units @ 1,0 kL/d/unit = 31,0 kL/d
- TOTAL = 55,0 kL/d *

* As per Table J.2 from Section J – Water Supply of “The Neighbourhood Planning and Design Guide” (so called “Red book”).

- Fire flow criteria (Low risk) = 15 L/s @ 10 m

1.3 Present situation

1.3.1 Reticulation network

It is recommended that the proposed development is accommodated within the existing Goose Valley reservoir water distribution zone and not within the Town PRV no. 3 zone.

The Goose Valley water distribution zone is supplied with water from the Goose Valley reservoir (Top Water Level (TWL) of 89.7 m above mean sea level (m a.s.l.)) through a 250 mm Ø main supply pipe under gravity. The existing water reticulation system also supplies bulk water to the Wittedrift and Matjiesfontein reservoirs (through the reticulation network, see section 1.3.3 further on in the report) and has consequently insufficient capacity to accommodate the domestic water demand of the proposed development in order to comply with the pressure and fire flow criteria as set out in the master plan.

Link services items BPW14.1 will be required to connect the internal reticulation network of the proposed development to the existing municipal water network.

Link services

- BPW14.1 : 70 m x 200 mm Ø new pipe = R 284 000 *

(* Including P & G, Contingencies and Fees, but excluding VAT - Year 2022/23 Rand Value. This is a rough estimate, which does not include major unforeseen costs).

The route of link services item BPW14.1 is schematically shown on Figure 1, but has to be finalised subsequent to a detailed pipeline route investigation.

1.3.2 Reservoir capacity

Bulk water is currently supplied from the Goose Valley reservoir to the Matjiesfontein and Wittedrift reservoirs, which has a negative effect on the available reservoir storage capacity available for the Goose Valley reservoir supply area (this is discussed in section 1.3.3 of this report further on).

The Matjiesfontein reservoir is the main supply reservoir for the areas east of the Keurbooms River and the Wittedrift reservoir is the main supply reservoir for Wittedrift and Green Valley.

The Goose Valley reservoir has consequently insufficient spare capacity to accommodate any additional developments.

Note: The Goose Valley reservoir will have sufficient spare capacity available to accommodate the development if the Wittedrift and Matjiesfontein reservoirs are supplied with water directly from the Town reservoirs through a dedicated bulk system, as discussed in paragraph 1.4.1 further on in the report.

1.3.3 Bulk supply

The Plettenberg Bay bulk water system was designed to supply the Wittedrift and Matjiesfontein reservoirs with bulk water from the Town reservoirs, located on the Plettenberg Bay Water Treatment Plant (WTP) site, and the Goose Valley reservoir with bulk water through the Goose Valley PS, also located at the Plettenberg Bay WTP site.

The Matjiesfontein reservoir was supplied with water through a 150 mm diameter dedicated pipeline between the Town reservoirs and the Matjiesfontein reservoir, and the Wittedrift reservoir through a 90 mm diameter pipe that connects to the Town/Matjiesfontein pipeline.

The 150 mm supply pipe to the Matjiesfontein and Wittedrift reservoirs is however at capacity (capacity of pipeline is $\pm 1,0$ ML/d and peak demand of the supply system is currently $\pm 2,3$ ML/d) and bulk supply to the Matjiesfontein and Wittedrift reservoirs is therefore currently supplied from the Goose Valley reservoir through the network of the Goose Valley water distribution zone. The Goose Valley reticulation network connects to the Matjiesfontein bulk pipeline before the bridge over the Keurbooms River.

The system is therefore currently not operated as it was designed for. The current operation consequently puts pressure on the available spare capacity of the Goose Valley system and is also not economically the best solution for the longer term (water that could have gravitated to the Matjiesfontein reservoir is currently pumped via the Goose Valley system).

The Goose Valley reservoir is supplied with water through a 200 mm diameter dedicated pipe between the Goose Valley PS and reservoir.

The capacity of the existing Goose Valley PS and accompanying 200 mm supply pipeline is 40 L/s (3,4 ML/d if pumped 24 hours a day). Peak demand from the Plettenberg Bay WTP to the Goose Valley reservoir is calculated at 2,7 ML/d (based on bulk water readings of the Goose Valley PS supplied by Bitou Municipality from July 2020 to March 2022). This implies that during peak demand conditions (December holiday) the Goose Valley PS should be operational 19 hours a day in order to supply the demand.

Bitou Municipality has indicated that their Goose Valley bulk system is under pressure during peak demand conditions and that the larger bulk system (supply to Matjiesfontein reservoir) should be upgraded according to the master plan before additional developments can be accommodated within the existing Goose Valley reservoir supply area.

1.4 Implementation of the master plan

1.4.1 Bulk supply

In the water master plan the following upgrades are proposed in order to augment the existing bulk supply system between the Town reservoirs at the WTP site and the Matjiesfontein reservoir on the eastern side of the Keurbooms River:

Bulk supply augmentation

• BPW.B39	: 930 m x 400 mm Ø new bulk pipe (replace 150 mm Ø)	= R	6 108 000 *
• BPW.B67	: 2 670 m x 355 mm Ø new bulk pipe (replace 150 mm Ø)	= R	13 813 000 *
• Item 1	: Close existing isolating valve	= R	No cost
		Total = R	19 921 000 *

In the Water Master Plan item DPW.B40 was proposed to connect an existing 300 mm Ø pipeline from the Town reservoir zone to the existing 150 mm Ø Matjiesfontein bulk pipeline (at the intersection of the N2 National Road and the service road towards the Goose Valley reservoir), in order to augment bulk water supply to the Matjiesfontein and Wittedrift reservoirs.

Bitou Municipality has however indicated that this 300 mm Ø pipeline (3,6 km asbestos cement pipeline from the Town reservoirs) is in a poor condition, has been abandoned and can not be utilised to augment the bulk water supply system. The master plan should therefore be amended to reflect this.

It is therefore proposed that the following master plan item is included in the water master plan in the place of the existing 300 mm Ø AC pipeline.

- Item 2 : 3 600 m x 400 mm Ø new bulk pipe (replace 300 mm Ø) = R 22 631 000 *

These upgrades will solve the existing backlog of bulk supply to the Matjiesfontein reservoir as well as provide spare capacity for potential future development areas, as documented in the water master plan.

(* Including P & G, Contingencies and Fees, but excluding VAT - Year 2022/23 Rand Value. This is a rough estimate, which does not include major unforeseen costs).

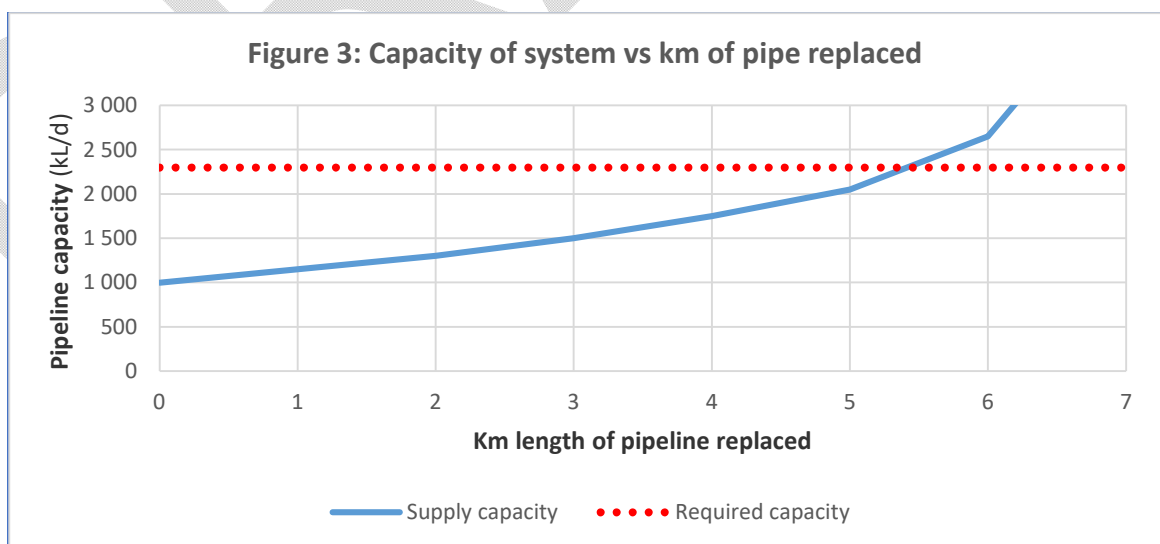
Take note that the routes of the proposed pipelines are schematically shown on Figure 2 attached, but have to be finalised subsequent to detail pipeline route investigations.

1.5 Minimum upgrades required to bulk system

The capacity of the existing bulk supply system from the Town reservoirs to the Matjiesfontein reservoir is calculated at 1,0 ML/d. The required supply to the Matjiesfontein reservoir during peak holiday periods is calculated at 2,3 ML/d (refer to paragraph 1.3.3).

It is therefore proposed that the existing 150 mm Ø pipeline between the Town reservoirs and the bridge over the Keurbooms River is replaced and isolated from the existing Goose Valley network as proposed in the water master plan in order to augment supply to the Matjiesfontein reservoir. This will then alleviate pressure that currently exist on the supply to the Goose Valley reservoir in order to accommodate future developments within the reservoir supply area.

Figure 3 below shows how supply to the Matjiesfontein reservoir will improve as sections of master plan items 2, BPW.B39 and BPW.B67 are implemented (from the Town reservoir towards the Keurbooms River):



Roughly 5,5 km of the existing 7,7 km x 150 mm Ø bulk pipeline between the Town reservoirs and the Keurbooms River should be upgraded in order to supply the Matjiesfontein reservoir from the Town reservoirs under gravity (no augmentation of bulk supply from the Goose Valley reservoir will then be required).

The minimum upgrades required to improve the existing bulk supply system in order to accommodate the proposed development in the existing system are:

- Master plan item 2 (3,6 km x 400 mm Ø replace existing 300 mm Ø abandoned AC pipe).
- Master plan item BPW.B39 (0,9 km x 400 mm Ø replace existing 150 mm Ø bulk pipe).
- Portion of master plan item BPW.B67 (1,0 km x 355 mm Ø replace existing 150 mm Ø bulk pipe).

1.6 *Additional development planned in the short-term for Goose Valley reservoir zone*

Although GLS Consulting cannot comment on the implementation timeframes of proposed developments, it should be noted that capacity analyses for the following developments (that should be supplied with water from the Goose Valley/Matjiesfontein/Wittedrift bulk supply system) have been performed in the last 3 years:

- Portion 32 of Farm 304 (Final report dated 15 September 2022, estimated water demand of 9,6 kL/d).
- Portion 38 of Farm 444 (Final report dated 3 October 2022, estimated water demand of 10,2 kL/d).
- Erf 155, Keurboomstrand (Final report dated 7 December 2022, estimated water demand of 3,0 kL/d).
- Portions 19 & 27 of Farm 444 (Final report dated 7 December 2022, estimated water demand of 234,9 kL/d).
- Portion 53 of Farm 444 (Final report dated 7 December 2022, estimated water demand of 101,9 kL/d).
- Portion 7 of Farm 306, Wittedrift (Final report dated 9 December 2022, estimated water demand of 60,0 kL/d).
- Erven 103 & 104, Wittedrift (Final report dated 9 December 2022, estimated water demand of 36,0 kL/d).
- Erf 342, Wittedrift (Final report dated 9 December 2022, estimated water demand of 4,7 kL/d).
- Portion 91 of Farm 304 (Draft report dated 27 February 2023, estimated water demand of 43,8 kL/d).

The scope of the report does not cover the cumulative effect of the proposed developments. However, it should be noted that the simultaneous development of the proposed developments will accelerate the need for the master plan to be implemented.

2 SEWER NETWORK

2.1 *Drainage area*

It is proposed that sewage from the proposed development is accommodated within the existing Plettenberg Bay Pumping Station (PS) 1 drainage area.

The proposed connection point for the internal sewer reticulation network of the development to the existing municipal sewer system is to the existing 150 mm diameter outfall sewer in Susan Street, as shown on Figure 4 attached.

From PS no. 1 sewage is pumped through a 160 mm diameter rising main directly towards the Plettenberg Bay PS no. 1a.

Sewage is pumped from the Plettenberg Bay PS 1a through a 355 mm diameter dedicated rising main to the Ganse Valley Wastewater Treatment Plant (WWTP).

The proposed development is situated inside the sewer priority area.

2.2 *Sewer flow*

No provision was made in the original sewer master plan for development on Erf 6504 and the remainder of Erf 6503.

For this re-analysis, the peak daily dry weather flow (PDDWF) for the proposed development was calculated at 38,5 kL/d.

2.3 *Present situation*

The existing gravity sewer system between the proposed development gravitating towards the Plettenberg Bay PS 1 and the pumping system from the Plettenberg PS 1 to Plettenberg Bay PS1a have sufficient capacity to accommodate the proposed development.

The Plettenberg Bay PS 1a and accompanying 355 mm diameter rising main also have sufficient spare capacity to accommodate the proposed development.

3 CONCLUSION

The developer of Erf 6504 and the remainder of Erf 6503 in Plettenberg Bay may be liable for the payment of a Development Contribution (as calculated by Bitou Municipality) for bulk water and sewer infrastructure as per Council Policy.

The master plan indicated that the proposed development area should be accommodated in the existing Goose Valley reservoir zone. The proposed connection to the existing water system is to the existing 250 mm diameter supply pipeline from the Goose Valley reservoir in Beacon Way, as shown on Figure 1. Link services items BPW14.1 is required to connect the internal reticulation network of the proposed development to the existing municipal water network.

The bulk water system to the Goose Valley, Wittedrift and Matjiesfontein reservoirs is at capacity and should be upgraded according to the master plan before additional developments within the reservoir supply areas can be accommodated.

The minimum upgrades required to improve the existing bulk supply system (in order to accommodate the proposed development together with other potential development areas within the existing supply areas of the Goose Valley, Wittedrift and Matjiesfontein reservoirs), are:

- Master plan item 2 (3,6 km x 400 mm Ø replace existing 300 mm Ø abandoned AC pipe).
- Master plan item BPW.B39 (0,9 km x 400 mm Ø replace existing 150 mm Ø bulk pipe).
- Portion of master plan item BPW.B67 (1,0 km x 355 mm Ø replace existing 150 mm Ø bulk pipe).

There is sufficient capacity in the existing Plettenberg Bay sewer reticulation system to accommodate the proposed development. The recommended position for the sewer connection for the proposed development is to the existing 150 mm diameter outfall sewer in Susan Street, as shown on Figure 4 attached.

Also, find attached hereto Appendix A which includes general notes from Bitou Local Municipality regarding development approvals and conditions.

We trust that you find this of value.

Yours sincerely,

GLS CONSULTING (PTY) LTD
REG. NO.: 2007/003039/07



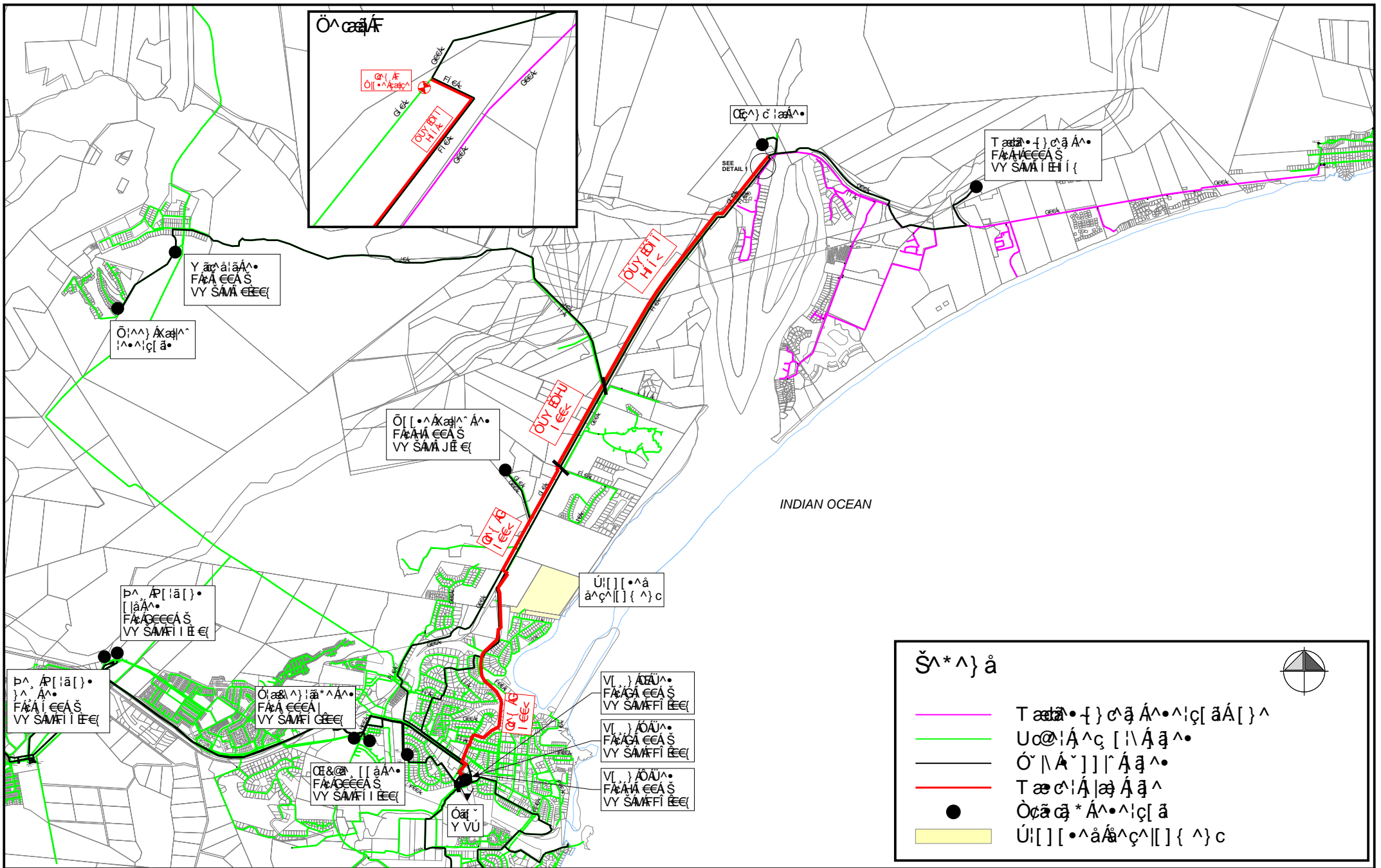
Per: PC DU PLESSIS

cc. Vita Consulting Engineers
51 Lourensford Estate
Somerset West
7130

Attention: Mr Riaan van Dyk

GENERAL NOTES FROM BITOU LOCAL MUNICIPALITY ATTACHED TO GLS BULK WATER AND SEWER SERVICES CAPACITY REPORT

1. The GLS report is a services capacity report and the costs estimated in this report are only approximate values applicable at the time of the study.
2. Should the development be approved by Council the approval will be linked to certain development conditions. These conditions will be the official conditions applicable to the project and will take precedence over this report. Once approval is granted, Council will enter into a formal services agreement with the developer.
3. Costs for network upgrades, etc. As mentioned in the GLS report could change from time to time due to escalation, new tariff structures, additional requirements etc.
4. The Developer may be liable to pay a Development Contribution as per Council policy. The value payable will be calculated using Bitou Local Municipality's Development Contribution Calculator.
5. The Development Contribution monies are calculated according to the approved Council Policy at the time of payment.
6. The Development Contribution monies are payable before the approval of the building plan certificate or final approval of the subdivision for the transfer of units will be issued, as applicable for the type of development.
7. Where servitudes are required, all the costs and arrangements therefore will be for the developer's account.
8. The developer will be solely responsible for the cost of the link services as identified in the GLS report. The developer will also be responsible for the costs of upgrading to the minimum requirements of the services as identified in the GLS report. These costs may however be offset against the Development Contribution monies payable.
9. The above conditions are subject to any approved Council policies, which may be amended from time to time.



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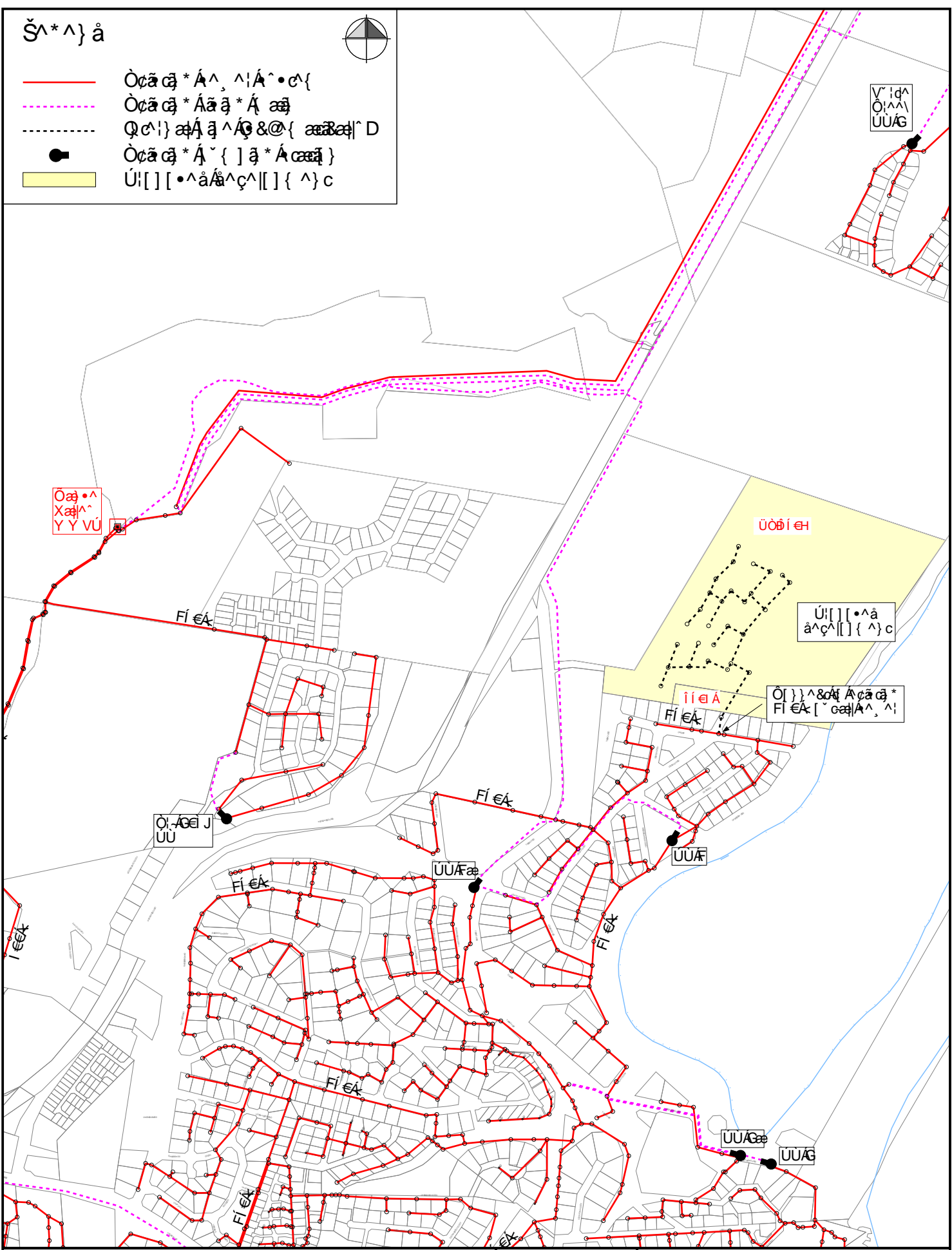


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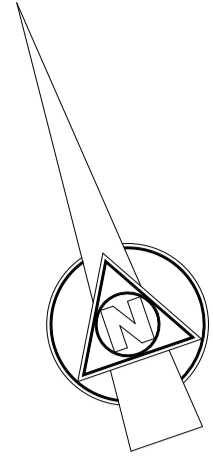


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Appendix E: Civil Engineering Services Layouts (VITA Consulting)

CIVIL ENGINEERING SERVICES LEGEND

- 160mm Ø PVC-U
- 25.40m @ 1:49.2
- FOUL SEWER MANHOLE COVER AND INVERT LEVEL SHOWN
- FS9
- FOUL SEWER RISING MAIN
- POTABLE WATER SIZES AS SHOWN (UPVC CLASS 12)
- FH
- GATE VALVE AND FIRE HYDRANT (TYPE 4)
- DOUBLE AND SINGLE ERF CONNECTIONS
- W2
- WATER SETTING OUT NODES
- 1500mm WIDE STORMWATER CHANNEL
- STORMWATER LINE (SPIGOT & SOCKET CLASS 75D) 375mm Ø (UNLESS OTHERWISE SHOWN)
- SW 1
- SW MANHOLE
- STORMWATER IN/OUTLET STRUCTURE
- GENERAL SLEEVES (UPVC CLASS 6) SIZE AND NUMBER SHOWN



621444

- GENERAL NOTES**
1. ALL WORK MUST BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATION (SAS 100) AND THE GENERAL CONDITIONS OF CONTRACT FOR THE CONSTRUCTION OF CIVIL ENGINEERING WORKS.
 2. CO-ORDINATES ARE BASED ON THE W.G.S.84 SYSTEM.
 3. THE CONTRACTOR HAS TO CHECK ALL SETTING OUT INFORMATION ON SITE AND NOTIFY THE ENGINEER OF ANY IRREGULARITIES PRIOR TO CONSTRUCTION.
 4. ALL MODIFICATIONS TO EXISTING SERVICES AND DEVIATIONS FROM THE DESIGN TO BE AS PER INSTRUCTION FROM THE ENGINEER ONLY.
 5. THE ENGINEER'S DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECT'S, CONSULTANTS AND SPECIALISTS' DRAWINGS. ANY DISCREPANCIES SHALL BE REFERRED TO THE ENGINEER PRIOR TO CONSTRUCTION.
 6. COVER LEVELS TO CONFORM TO THE FOLLOWING:
 - 6.1. TOP OF ROAD LEVELS INSIDE ROAD RESERVES.
 - 6.2. 75mm ABOVE NATURAL GROUND LEVEL IN UNDEVELOPED AREAS.
 - 6.3. THE CONTRACTOR HAS TO ENSURE THAT THE COVER LEVELS TIES IN WITH THE SURROUNDING LEVELS AND NOTIFY THE ENGINEER OF ANY IRREGULARITIES.
 7. ERF CONNECTIONS:
 - 7.1. POTABLE WATER AND ELECTRICAL CONNECTIONS MAY BE MADE TO AVOID HORIZONTAL CLASHES WITH SHALLOW SERVICES.
 - 7.2. FOUL SEWER MUST BE VERTICALLY REALIGNED TO AVOID HORIZONTAL CLASHES.
 - 7.3. CONNECTIONS MAY BE SHIFTED TO AVOID VERTICAL CLASHES.

CONSULTING ENGINEER

VITA CONSULTING ENGINEERS

Plot 15, Leppington Estate, Somers Road, 7150
Tel: +61 8 727 3333 Email: info@vita-engineers.com.au

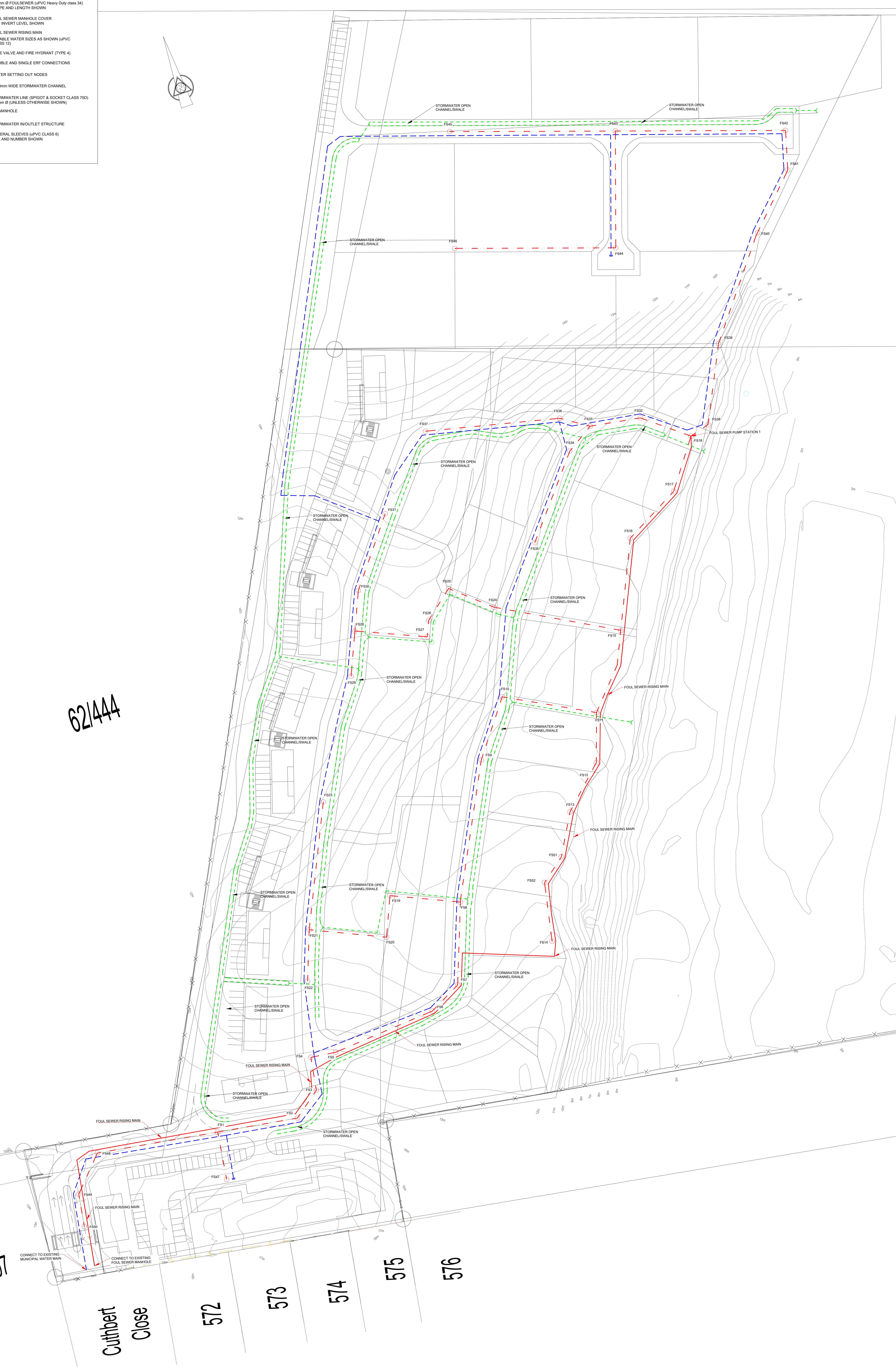
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A	25/06/2023	ISSUED FOR INFORMATION	GS
B	26/06/2023	ISSUED FOR INFORMATION	GS
C	26/07/2023	ISSUED FOR INFORMATION	GS

PROJECT NAME
PLETT LAGOON, PORTION 1 of ERF 6503 - PLETTENBERG BAY

DRAWING TITLE
COMBINED SERVICES LAYOUT

APPROVAL	DATE	SCALE	SIZE
SIGNATURE	DATE	SCALE	SIZE
	22/06/2023	1:500	A0

DRAWING NO.	REV
22051_CIV_01	C



Cuthbert Close

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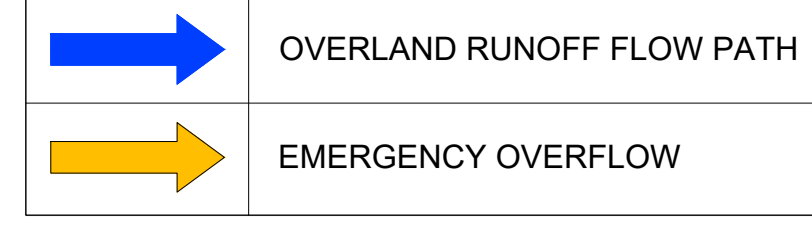
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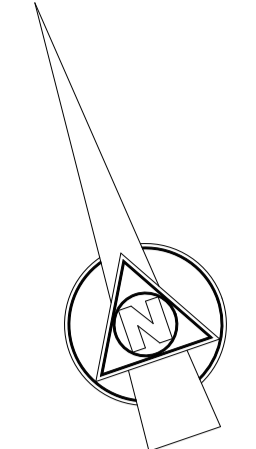
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CATCHMENT AREAS	
Catchment A	= 8.549 Ha
TOTAL	= 8.549 Ha



621444

- GENERAL NOTES
1. ALL WORK MUST BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATION (SAS 100) AND THE GENERAL CONDITIONS OF CONTRACT FOR THE CONSTRUCTION OF CIVIL ENGINEERING WORKS.
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 - 7.2. FOUL SEWER MUST BE VERTICALLY REALIGNED TO AVOID HORIZONTAL CLASHES.
 - 7.3. CONNECTIONS MAY BE SHIFTED TO AVOID VERTICAL CLASHES.

CONSULTING ENGINEER

VITA CONSULTING ENGINEERS

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Tel: 07 478 22 333 Email: info@vita.co.za

REV	DATE	DESCRIPTION	CHECKED
A	20/06/2023	ISSUED FOR INFORMATION	GS
B	20/06/2023	ISSUED FOR INFORMATION	GS

PROJECT NAME
PLETT LAGOON, PORTION 1 of ERF 6923, PLETTENBERG BAY

DRAWING TITLE
STORMWATER CATCHMENT AREA LAYOUT

APPROVAL	DATE	SCALE	SIZE
SIGNATURE	22/06/2023	1:500	A0

DRAWING NO.	REV
22051_SWC_01	B

- Notes :
1. Beacons Note Verified as part of survey
 2. Contours Through Bushy areas are approximate
 3. All elevations are above approximate mean sea level

Cuthbert Close
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Appendix F: Minutes of Bitou Engineering Department Meeting - 9
March 2023

Riaan van Dyk

From: Riaan van Dyk <riaan@vitaeng.co.za>
Sent: Monday, March 13, 2023 8:10 AM
To: 'Asiphe Masivuye Mgoqi'; 'Edward Charles Oosthuizen'
Cc: 'Lwamkelo Mapasa'
Subject: Plettenberg Bay Developments
Attachments: Portions 19 & 27 of Farm 444 - Figure 5(Draft).pdf; Portions 19 & 27 of Farm 444 - Figure 2(Draft).pdf

Good morning Asiphe/Eddie,

Thank you very much for taking time to meet on Thursday

I hereby wish to confirm the following items discussed during our meeting:

1) Appointment letters

- a. Bitou stated that they have had previous discussions with other consulting engineers regarding the developments on Farm 444/38 and Farm 304/32. RvD will submit appointment letters to Bitou to confirm his appointment as civil engineering consultant on the aforementioned developments.

2) Temporary water solution (refer figure 5)

- a. GLS provided a temporary solution (*installation of an additional 160mm bulk main off the existing 160mm distribution main in the N2 road reserve – refer figure 5*) which will free up an additional 860kl/day.
- b. This temporary solution formed the basis for the approval of the development on Farm 444/19 & 27, with specific conditions incorporated in the Service Level Agreement for the permanent solution.
- c. There is sufficient capacity in the 860kl/day to accommodate the developments on Farm 444/38, Farm 304/32 and erf 6503.
- d. The temporary solution should form the basis for the approval of the aforementioned developments, with the similar conditions to be included in the SLA:
 - i. Design, installation, etc. costs for the temporary solution will be the responsibility of the developer/developers and will not be deductible from the Augmentation Levee's
 - ii. The temporary solution is not a permanent solution and Augmentation Levee's for Water and Sewage will be used towards the permanent solution.
 - iii. The proposed pro-rata contribution towards the temporary solution must be resolved between the developers of the different properties.

3) Permanent water solution (refer figure 2)

- a. The permanent water solution entails the construction of a new 400mm/355mm watermain from the Bitou WTP to the Aventura Reservoir, with the costs estimated by GLS to be approximately R36m.
- b. The route, design, application and approval process for the pipeline will take approximately 18months.
- c. Bitou will liaise with their designated appointed consulting engineers to start the process as soon as possible.
- d. Augmentation Levees (*water and sewerage*) from each development will be used for the installation of a portion of the pipeline.
- e. A Service Level Agreement must be drafted for each development.
- f. Bitou's designated appointed consulting engineers will be responsible for professional services for phases 1-3 (*feasibility, approval and detail design*) of the pipeline and consulting engineers from each development will be responsible for phases 4-6 (*procurement, construction and close-out*)

- g. The Augmentation Levee's for each development (*and/or phase of the development*) will be re-calculated according to the specific year in which the levee's are paid.
- 4) Confirm capacity and connections with GLS
- a. Vita must set up a meeting with GLS to confirm the position and capacity of each development's connection into the bulk municipal network.
- 5) Possible off-grid solutions
- a. Bitou stated that they are willing to approve off-grid water and sewage solutions, on condition that specific requirements are met, with special conditions included in the SLA
 - i. The developer is responsible to obtain all the necessary environmental and regulatory approvals (*including GA or WULA*)
 - ii. All electrical equipment (*borehole, booster pumps, etc.*) must have a back-up electrical supply (*generator, inverter and battery pack or solar*)
 - iii. Potable water must adhere to SANS 241 Class 1 water parameters.
 - iv. Wastewater must be treated to Department of Water Affairs (DWA) General Limits parameters.
 - v. Water and treated effluent samples must be collected, analyzed by an independent laboratory and submitted to Bitou council on a monthly basis for the first year and quarterly basis for the second year.
 - vi. Should the water samples not adhere to the required standards, the developer/homeowners association will be liable for the costs to install the required potable water and foul sewer connections (*as proposed in the GLS capacity reports*).
 - vii. Augmentation levee's for potable water will not be applicable if the development adheres to the off grid requirements, but foul sewer levee's will still be applicable

I trust that you find the above a fair reflection of our meeting – I will forward the relevant documents (*appointments letters, draft Services Reports, proposed SLA wording, etc.*) as soon as possible.

Regards,

Riaan van Dyk *Pr. Eng*

Director

M 084 207 3223

E riaan@vitaeng.co.za

VITA CONSULTING
ENGINEERS

51 Lourensford Estate, Somerset West, 7130

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