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Amatikulu Aquaculture Development Zone: Concept Design Report

**Prepared for:
The Department of Agriculture, Forestry and Fisheries**



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1. Introduction

The Department of Agriculture, Forestry and Fisheries (DAFF) are facilitating the establishment of Aquaculture Development Zones (ADZ's), one of which is the proposed development zone at Amatikulu in KwaZulu-Natal.

NuLeaf Planning and Environmental (Pty) Ltd. has been appointed by the DAFF, as a service provider, to undertake and facilitate an Environmental Impact Assessment process for this proposed land-based ADZ. In this regard, NuLeaf have partnered with MBB Consulting Engineers to assist with the design of support infrastructure and the civil engineering that will be required for the ADZ. This design report documents the drivers of the layout and civil infrastructure for the project.

2. Background

The finding of this report is supported by:

- The collection of background information about the Amatikulu site, including historical imagery, the CSIR Environmental Screening Study (2015), the DAFF Concept Document, accounts of historical use and others.
- Several site investigations between July and September 2017 by various members of the professional team, including engineering and ecology specialists.
- A range of consultations with various specialists and engineers from other projects that have gained experience in aquaculture.

3. Aspects that have Informed Design & Layout

The following matters were taken into consideration by the project team in arriving at the concept plan for the Amatikulu ADZ. The approach was to design a layout that would allow for flexibility in the EIA process and to accommodate specific aquaculture types that may be envisaged by future investors and developers.

4. Historical Land use and Infrastructure

The Amatikulu ADZ was historically used as a prawn and ornamental fish farm. This historical footprint has informed the concept design. Much of the infrastructure that was historically used for ornamental fish farming can be repurposed for ornamental and other freshwater species. This has informed the area that has been allocated to freshwater aquaculture (F1, F2, F3, F4 and F5). Areas allocated for marine aquaculture (M1, M2, M3, M4 and M5) trace the footprint of the old prawn farming facilities and some of the most easterly development areas that allow closer proximity to the sea.

The existing pet food factory and offices, has been identified as a central point for processing, packaging, feed storage and administration.



Layout 1: General overview of envisaged production infrastructure for freshwater aquaculture (F1, F2, F3, F4 and F5) and marine aquaculture (M1, M2, M3, M4 and M5).

5. Environmental Concerns

The environmental concerns have been taken into consideration by:

- Allowing no development in the eastern primary dune
- Allowing a development buffer between the ADZ and the estuary

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- Motivating that the wetland area was historically used for prawn and ornamental fish farming, and would be used for this purpose again, albeit that drainage and storm water protection will be important.



Layout 2: Green area shoring the primary dune and directly adjacent inland dune face and coastal wetland slack that is not ecologically suitable for aquaculture development.

6. Terrain

Through drone-based survey work it has been determined that the western side of the ADZ site is very steep and not suitable for aquaculture development. These areas have been excluded and allocated to “open space”



Layout 3: Green western corridor, showing steep, wet and forested areas that is not suitable for aquaculture development.

7. Species and Production Systems

Provision has been made in the layout for the farming of marine and freshwater species, in the following blocks. Although allocated as specific blocks, the EIA will apply for permission to allow the amendment of the layout of these blocks were future developers and investors to propose differently:

Table 1: Freshwater and Marine production blocks, possible systems and species.

Block	Size (ha)	Possible Systems	Primary Species	Alternative Species
F1	3.47	New freshwater facilities – open ponds / open tanks / tunnels with ponds or tanks / indoor recirculation or semi-flow through	Ornamental Fish	Catfish Tilapia Crocodiles
F2	2.13	Refurbish and rebuild ornamental farming facilities	Ornamental Fish	Catfish Tilapia
F3	0.82			
F4	1.81			
F5	4.43	New freshwater facilities – ponds / open tanks / tunnels with ponds or tanks / indoor recirculation or semi-flow through (on terrace)	Ornamental Fish	Catfish Tilapia
M1	4.89	New marine facilities consisting of tunnel ponds as a first choice, but also possibly open ponds or indoor recirculation or semi-flow through	Dusky Kob	Prawns (tunnel / indoor) Barramundi Seaweed
M2	5.64			
M3	6.27			
M4	1.48			
M5	6.31			



Layout 4: Combined overview of proposed aquaculture infrastructure and areas (green) that are not suitable for aquaculture development.

8. Civil Infrastructure Needs

The following bulk civil infrastructure has been provided for and will inform further planning

8.1. Roads

Based on the allocation of production blocks, sensitive areas, topography and the need for access, a road network has been developed. These roads will consist of compacted gravel roads for all farming areas and paved surfaces around the central administrative clock, feed store, processing and packaging facilities.



Layout 5: Proposed layout of roads and access routes for the Amatikulu Aquaculture Development Zone.

8.2. Marine Water Supply / Discharge

A bulk supply and discharge design has been completed, with the understanding that this will need feasibility assessment.



Layout 6: Proposed seawater supply, treatment and discharge for the Amatikulu Aquaculture Development Zone, including estuarine abstraction and discharge.

The seawater supply has two components:

- A supply line from the ocean (full strength sea water), which could possibly be installed by horizontal drilling, but which will need feasibility assessment¹. This supply line will be connected to a pumphouse above the highwater mark, and deliver 60 litres per second into 2 x 2500 cubic meter holding reservoirs on the northern side of the ADZ.
- A supply line from the estuary (partial to full strength sea water). This supply line will be connected to a pumphouse outside of the flood line of the estuary

¹ The feasibility assessment can consider beach welling, albeit that this has been rendered unfeasible due to the dynamic nature of the beach in the area.

and deliver 60 litres per second into 2 x 2500 cubic meter holding reservoirs on the northern side of the ADZ.

- The volumes above have been calculated based on a 20% daily recharge of all marine production facilities, which in turn has been based on optimal spacing of tunnel based pond systems to a depth of 1,5 meters. This will be adequate for other types of marine farming also. The reservoir configuration will allow for unreduced production water flows for up to 2 days if incoming water supply was cut. This can be extended significantly through management practices that allow for reduced production flow in emergency situations.
- From the supply reservoirs, provision has been made for primary/bulk seawater supply to each marine production block (by gravitational feed).
- Each production block has been connected to a primary / bulk marine discharge line capable of handling 3000 cubic meters of flow under gravity. This water is directed to a seawater treatment facility, which discharges treated water to the estuary, or which could discharge to the sea directly.

8.3. Freshwater Supply / Discharge

A bulk supply and discharge design has been completed for freshwater, based on supply from 3 boreholes in areas that have historically delivered freshwater to the facilities.



Layout 7: Proposed freshwater supply, treatment and discharge for the Amatikulu Aquaculture Development Zone.

The freshwater supply components are:

- A supply line from the three boreholes (capable of collectively delivering 60 litres per second) into 2 x 2500 cubic meter holding reservoirs on the northern side of the ADZ.
- The volumes above have been calculated based on a 20% daily recharge of all freshwater production facilities and for delivery of potable water. The reservoir configuration will allow for unreduced production water flows for up to 2 days if incoming water supply was cut. This can be extended significantly through management practices that allow for reduced production flow in emergency situations.

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- From the supply reservoirs, provision has been made for primary/bulk freshwater supply to each freshwater production block (by gravitational feed).
- Each production block has been connected to a primary / bulk freshwater discharge line under gravity. This water is directed to a freshwater treatment facility, which discharges to a wetland and seeps into the freshwater aquifer of the area or the estuary.

8.4. Potable Water Supply

Potable water has been allowed for from a treatment facility at the freshwater (aquaculture supply) reservoir. A primary/main/bulk supply line connects this facility with the central administrative, processing, packaging area and provides sufficient potable water for 500 people in the ADZ, and for the processing facilities (30 cubic meters per day).



Layout 8: Proposed potable water supply for the Amatikulu Aquaculture Development Zone.

8.5. Wastewater and Sewerage

Wastewater and sewerage has been allowed for via a primary/main/bulk discharge line that connects the central administrative, processing, packaging area and provides sufficient capacity for 500 people in the ADZ, and for the processing facilities runoff. The waste and sewerage water is directed to an on-site treatment facility that discharges treated water into a wetland and seeps into the freshwater aquifer of the area or the estuary.



Layout 9: Proposed wastewater and sewerage provision for the Amatikulu Aquaculture Development Zone.

8.6. Electrical Reticulation

Each of the production blocks, the water pumping, storage and treatment facilities as well as the central administrative block, storage area, processing and packing areas have been allocated bulk electrical supply based on estimated needs and usage.



Layout 10: Proposed electrical reticulation for the Amatikulu Aquaculture Development Zone.

8.7. Overall Layout Plan for Services

The aspects discussed in the sections above, has been captured on an overall engineer's layout plan for services (see attached). This plan will inform the EIA process.

9. Conclusion

We trust that the information in this report will meet the expectations of the DAFF project team.

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