Infrastructure planning

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 PORTION 91 OF FARM 304, KEURBOOMSTRAND: CAPACITY ANALYSIS OF THE BULK WATER & SEWER SERVICES

The request by Mr Deon Botes of Poise Consulting Engineers for GLS Consulting to investigate and comment on the bulk water supply and sewer discharge of the proposed development (residential development of 73 group housing units on portion 91 of Farm 304, Keurboomstrand), 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 of portion 91 of Farm 304 was conceptually taken into consideration in the June 2020 water and sewer master plans as future development area P81.

1 WATER DISTRIBUTION SYSTEM

1.1 Distribution zone

The master planning indicated that the proposed development should be supplied with water from the existing Matjiesfontein reservoir. The proposed connection point for the development on portion 91 of Farm 304 is at the existing 200 mm water main in main road to Keurboomstrand, as shown on Figure 1 attached.

The proposed development is situated inside the water priority area.

1.2 Water demand

The water analysis for the June 2020 master plan was performed with a total annual average daily demand (AADD) for the proposed development on portion 91 of Farm 304 (future development area P81 in the June 2020 water master plan) of 120,0 kL/d.

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Directors: RL Pole, AG Hingeston, AN Umichand

For this re-analysis the AADD and fire flows for the proposed development on portion 91 of Farm 304 were calculated as follows:

- 73 Group housing units @ 0,6 kL/d/unit = 43,8 kL/d
- Fire flow criteria (Low risk) = 15 L/s @ 10 m

1.3 Present situation

1.3.1 Reticulation network

The Matjiesfontein water distribution zone is supplied with water from the Matjiesfontein reservoir (Top Water Level (TWL) of 55.4 m above mean sea level (m a.s.l.)) through a 300 mm Ø main supply pipe under gravity. The existing water reticulation system has sufficient capacity to accommodate the water demand of the proposed development in order to comply with the pressure and fire flow criteria as set out in the master plan.

1.3.2 Reservoir capacity

The criteria for total reservoir volume used in the Bitou Water Master Plan is 48 hours of the AADD (of the reservoir supply zone).

The proposed development will be supplied with bulk water from the Matjiesfontein reservoir. No additional reservoir storage capacity will be required in order to accommodate the proposed development.

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 ±1,0 ML/d and peak demand of the supply system is currently ±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.

The larger bulk system (supply to Matjiesfontein reservoir) should be upgraded according to the master plan before additional developments can be accommodated within the supply areas of the existing Goose Valley, Wittedrift and Matjiesfontein reservoirs.

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 June 2020 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 Wittedrif 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).

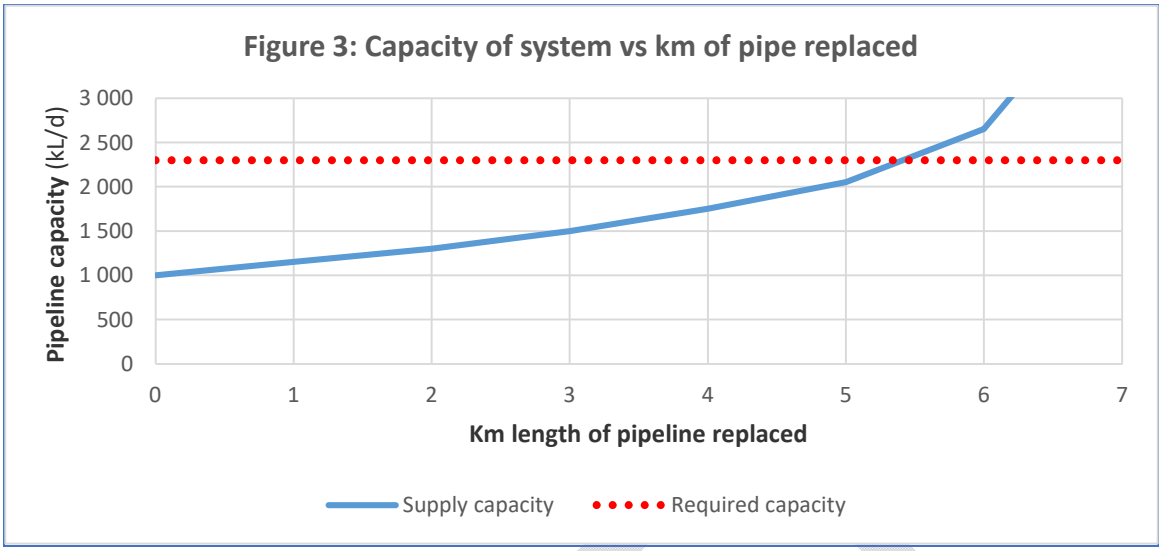
Take note that the routes of the proposed pipelines are schematically shown on Figure 2 attached, but have to be finalised subsequent to detail pipeline route investigations.

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.

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 within Goose Valley/Matjiesfontein/Wittedrift bulk supply system*

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).

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 bulk master plan items to be implemented.

2 SEWER NETWORK

2.1 Drainage area

The development falls within the existing Keurboom Main pump station (PS) drainage area. The proposed connection point for the development is at the existing 160 mm outfall sewer to the south of the development area, as shown on Figure 4 attached.

Sewage is pumped from the Keurboom Main PS to the Matjiesfontein PS through a 200 mm diameter rising main and from the Matjiesfontein PS to the Aventura PS through a 200 mm Ø rising main. From the Aventura PS sewage is pumped through a 200 mm Ø rising main to the Ganse Valley Wastewater Treatment Plant (WWTP).

The proposed development is situated inside the sewer priority area.

2.2 Sewer flow

The sewer analysis for the June 2020 sewer master plan was done with a peak daily dry weather flow (PDDWF) for the proposed development on portion 91 of Farm 304 (future development area P81 in the June 2020 sewer master plan) of 91,9 kL/d.

For this re-analysis, the PDDWF for the proposed development was calculated at 30,7 kL/d.

2.3 Present situation

2.3.1 Gravity sewers

There is sufficient capacity in the existing gravity sewer system between the proposed development and the existing Keurboom Main PS to accommodate the proposed development.

2.3.2 Pumping stations & rising mains

<u>Keurboom Main PS</u>

The existing Keurboom Main PS (with a capacity of 27 L/s and an accompanying 200 mm diameter rising main) has sufficient capacity to accommodate the proposed development.

<u>Matjiesfontein PS</u>

The existing Matjiesfontein PS has a capacity of 50 L/s with an accompanying 200 mm Ø rising main and has sufficient capacity to accommodate the proposed development.

The Matjiesfontein PS's rising main is however in a poor condition and will have to be replaced in the near future. The ultimate planned capacity of the Matjiesfontein PS is 70 L/s. We therefore recommend that the existing 200 mm Ø Matjiesfontein PS rising main be upgraded to a 315 mm Ø rising main in order to accommodate the ultimate planned Matjiesfontein PS capacity.

<u>Aventura PS</u>

The existing Aventura PS has a capacity of 38 L/s* with an accompanying 200 mm Ø rising main.

The existing instantaneous peak flow at the Aventura PS is as follows:

Flow from upstream Wittedrift PS		=	8,0 L/s
Flow from upstream Twin Rivers PS2		=	5,0 L/s
Flow from upstream Aventura resort PS		=	5,0 L/s
Flow from upstream Matjiesfontein PS		=	50,0 L/s
	Total	=	68,0 L/s

The combined instantaneous peak flow that can arrive at the Aventura PS (when the upstream Wittedrift PS, Twin Rivers PS2, Aventura resort PS, and Matjiesfontein PS are pumping simultaneously) is more than the capacity of the Aventura PS (68,0 L/s versus capacity of 38,0 L/s), and overflowing of the Aventura PS will therefore occur if the size of the existing sump of the Aventura PS is insufficient to balance out the peak flows from the respective pumping stations.

Bitou Municipality has however indicated that the volume of the sump has recently been upgraded and the retention time of the sump is currently roughly 4 hours.

* Note: As part of the upgrading of the sump volume at the Aventura PS, the pumps have been upgraded to a pumping capacity of 78 L/s, but no upgrading has been performed to the existing Aventura PS rising main. The PS has Variable Speed Drive (VSD) motors, and the capacity of the pump station is currently restricted to roughly 38 L/s, due to the high head loss through the rising main when the pumps operate at a higher capacity.

A pumping capacity of 78 L/s at the Aventura PS will be sufficient to accommodate the proposed development on Portion 91 of Farm 304 in the existing sewer system.

The ultimate planned capacity of the Aventura PS is 135 L/s. We therefore recommend that the existing 200 mm Ø Aventura PS's rising main is upgraded to a 355 mm Ø (master plan item BPS34.2) to accommodate the ultimate planned Aventura PS capacity.

2.4 Implementation of the master plan

The following master plan items will be required to reinforce the existing system in order to accommodate the proposed development, as shown on Figure 5 attached.

Network upgrade (Required)

• BPS34.2	: 5 400 m x 355 mm Ø Upgrade existing Aventura PS rising main	R 27 652 000 *
• BPS38.2	: 1 800 m x 315 mm Ø Upgrade Matjiesfontein PS rising main	R 7 674 000 *
	Total	R 35 326 000 *

(* 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).

Take note that the routes of the proposed pipelines are schematically shown on Figure 5 attached, but have to be finalised subsequent to detail pipeline route investigations.

3 CONCLUSION

The developer of portion 91 of Farm 304 in Keurboomstrand 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.

Accommodation of the development in the present reticulation system will require no upgrading of the existing reticulation system to comply with the pressure and fire flow criteria as set out in the master plan.

The bulk water system to the Matjiesfontein reservoir is however at capacity and should be upgraded according to the master plan before additional developments within the reservoir supply area 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).

It is proposed that sewage from the development is accommodated within the existing Keurboom Main PS drainage area. From the Keurboom Main PS sewage is pumped to the Matjiesfontein PS, from the Matjiesfontein PS to the Aventura PS and from the Aventura PS to the Ganse Valley Wastewater Treatment Plant (WWTP).

The existing bulk sewer system downstream of the Matjiesfontein PS has insufficient capacity to accommodate the proposed development.

The minimum upgrades required to accommodate the proposed development in the existing sewer system are master plan items BPS34.2 (upgrade capacity of the Aventura PS's rising main) & BPS38.2 (replace existing rising main from the Matjiesfontein PS).

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

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Per: PC DU PLESSIS

cc. Mr Deon Botes , Poise Consulting Engineers

APPENDIX A **February 2023**

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.

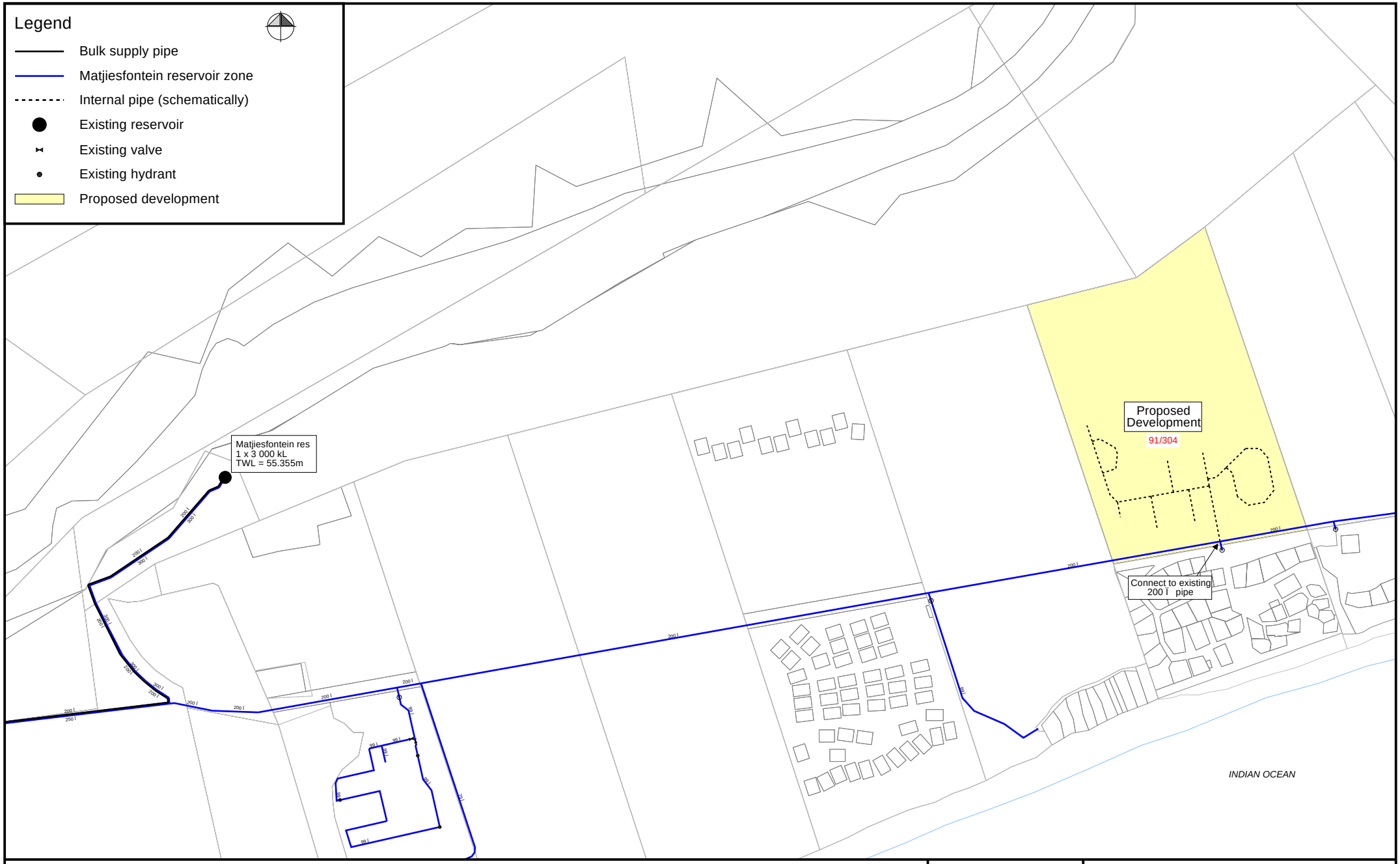
5. The Development Contribution monies are calculated according to the approved Council Policy at the time of payment.

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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Portion 91 of Farm 304 - Keurboomstrand

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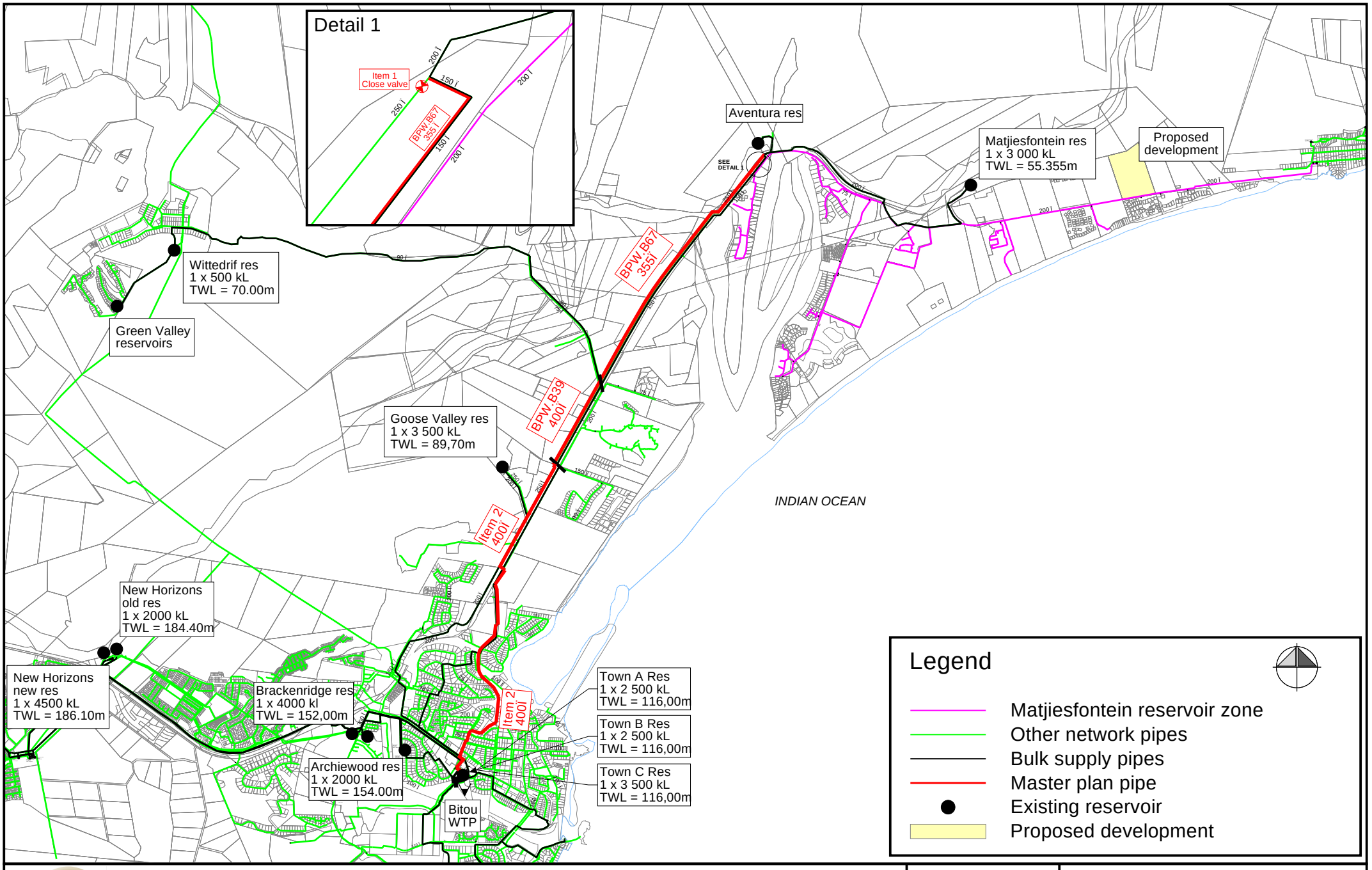
Figure 1 (Draft)

Proposed Development
Farm 304/91 - Keurboomstrand
Existing Water System



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Portion 91 of Farm 304 - Keurboomstrand

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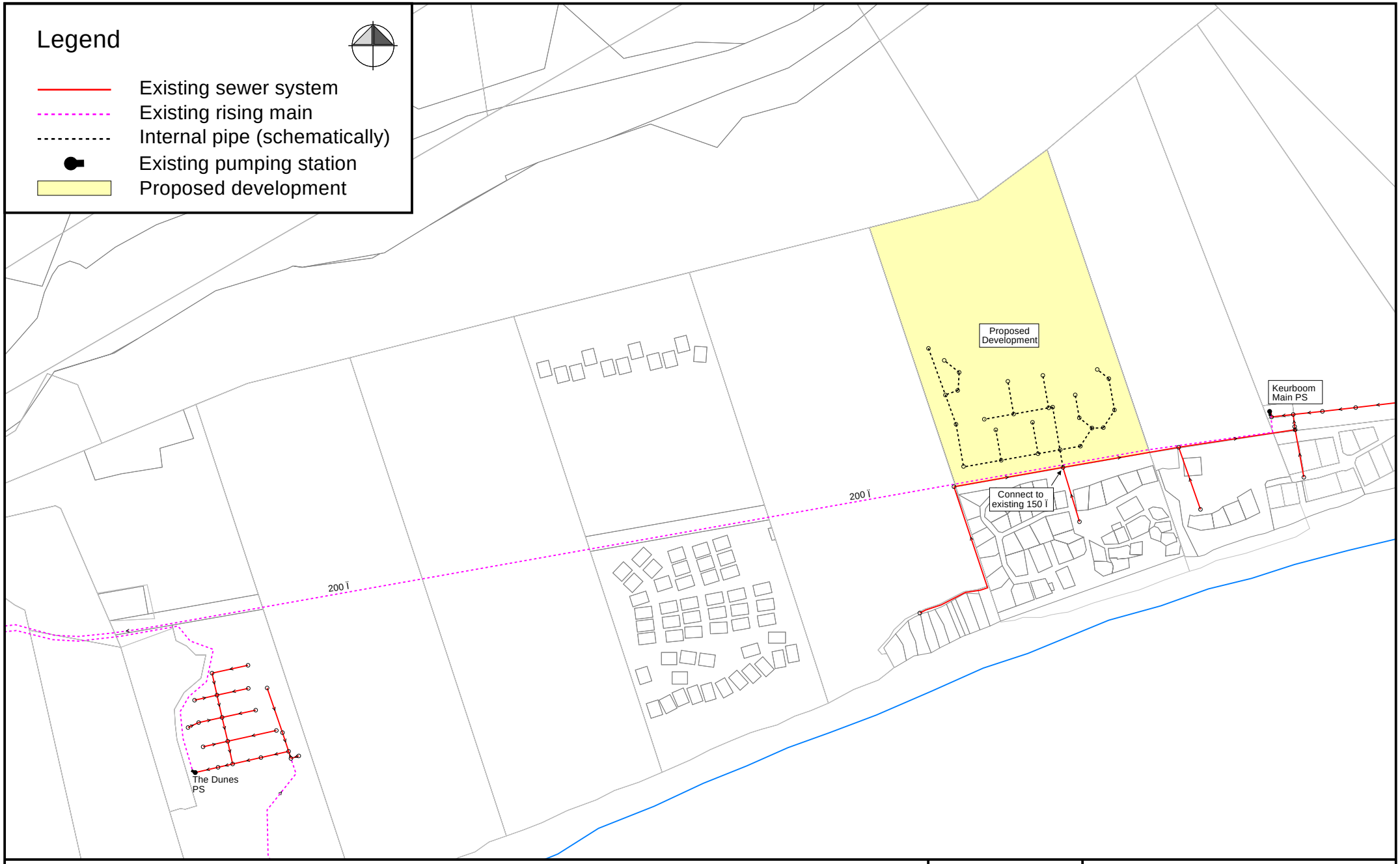
Figure 2 (Draft)

Proposed Development
Farm 304/91 - Keurboomstrand
Water master plan



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Portion 91 of Farm 304 - Keurboomstrand

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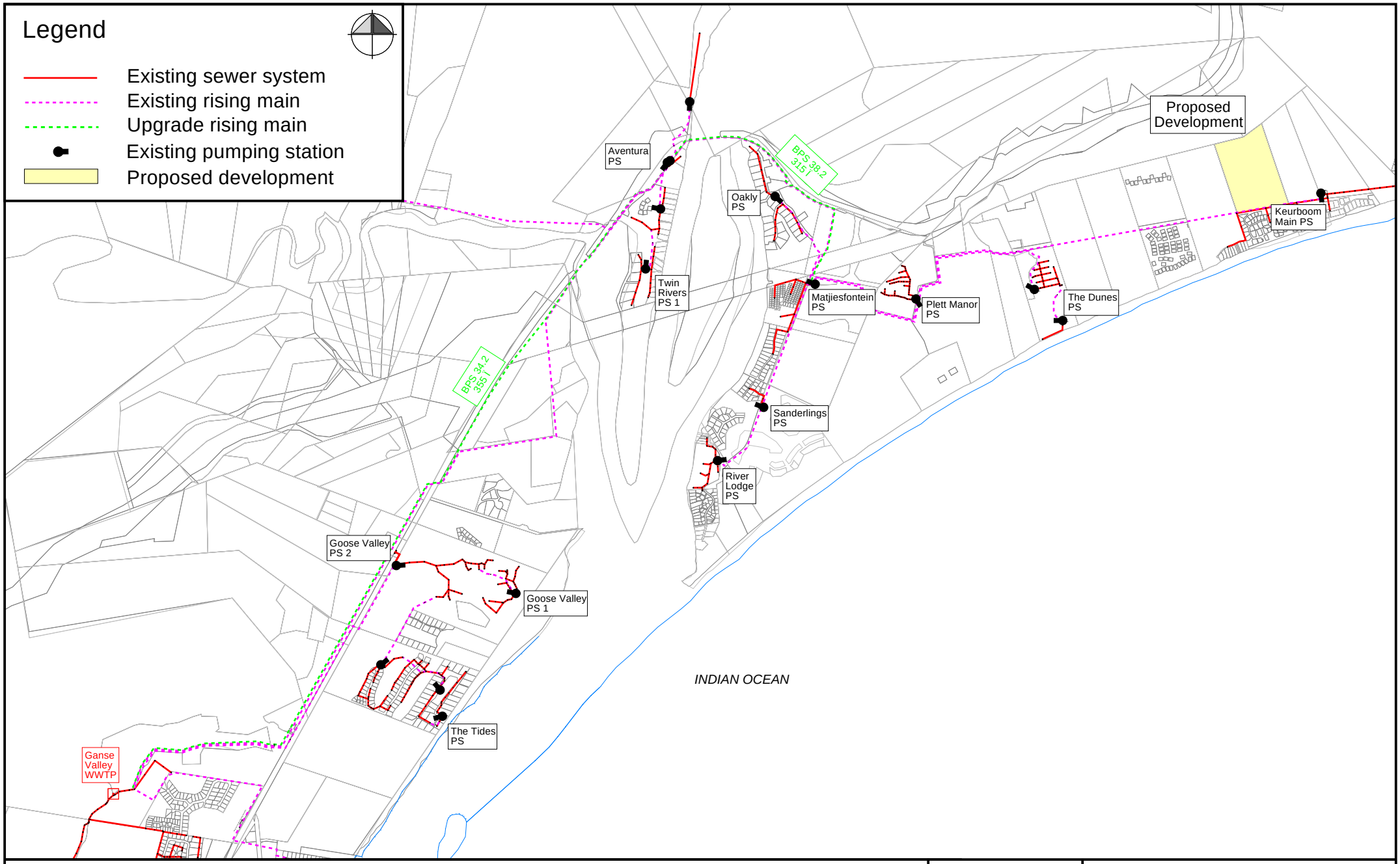
Figure 4 (Draft)
Proposed Development
Farm 304/91 - Keurboomstrand
Existing Sewer System



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Portion 91 of Farm 304 - Keurboomstrand

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Figure 5 (Draft)
Proposed Development
Farm 304/91 - Keurboomstrand
Sewer Master Plan