

MASELSPOORT RECYCLING

PRELIMINARY DESIGN REPORT

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1. INTRODUCTION

Bigen Africa Services (Pty) Ltd were appointed by Mangaung Metro Municipality (MMM) to execute the required consulting services for the bulk water transfer of treated water from the existing waste water treatment plants to Maselspoort for the purpose of recycling.

The purpose of this report is to address the above requirements and to identify and design the most appropriate pipeline and pump station infrastructure to develop reliable recycling system.

2. BACKGROUND

Maselspoort WTW currently receives bulk water from the Modder River which is augmented by continuous effluent from Thaba Nchu and Botshabelo WWTW. The Modder River flow is also augmented by the Novo Transfer Scheme, a costly scheme to operate. The river is also supported by natural storm water runoff during summer rains.

A previous feasibility study was conducted to investigate the economic and technical feasibility of recycling water from municipal waste water treatment works by recirculating the water via a new bulk water transfer scheme to Maselspoort Water Treatment Works on the banks of the Modder River. The study compared the current Novo Transfer Scheme historical augmentation over the past decade with the option to utilise an alternative source such as the treated waste water that is currently discharged into the Renoster Spruit.

New infrastructure requirements were identified for the purpose of costing comparisons. An energy and twenty year NPV cost comparison indicated a more cost effective way of bulk augmentation but also saving water by the re-use, an initiative supported by Department of Water Affairs.

3. SCHEME COMPONENTS

In order to transfer water from the existing WWTW (Bloemspruit WWTW and North Eastern WWTW), a pipeline and booster pump station are required to successfully transfer water to Maselspoort WTW.

3.1 Pipeline

The proposed pipeline, approximately one meter diameter will transfer water from the outlet of the Bloemspruit maturation ponds (56MI/day) to Maselspoort and Moches Dam. The pipeline will also receive the treated water from the new North Eastern Waste Water Treatment Plant (45MI). The pipeline design will be optimised during detail design to utilise existing static head to the maximum for energy saving related to booster pumping. The client requested that GRP pipe technology be investigated for the use of the low pressure high flow requirements.

The following pipelines are proposed (Please refer to layout plan in annexure A):

Route A to B:	12 324m (North Eastern WWTW outlet to Maselspoort)
Route D to A:	6 342m (Bloemspruit WWTW to route A-B / Maselspoort)
Route G to C:	4 006m (Connection to Moches Dam)
Route E to F:	1 272m (Mochesdam to Maselspoort)
Phase future:	Sterkwater WWTW to Node A (Gravitate to Moches Dam/Maselspoort)

3.2 Pump Station

The water from Bloemspruit WWTW will be able to gravitate directly to Mochesdam or Maselspoort thus no pumping will be required in order to recycle 56MI/day.

Transferring water from the North Eastern WWTW would require a low lift, high flow booster pump station. The current upgrades (short to medium term) will enable 45MI/day transfer. Future planning for the North Eastern WWTW indicates more water will be treated at this location (90MI/day). Provision to transfer 90MI day from the North Eastern WTW will be allowed for.

Provision should also be made to abstract water from the Renosterspruit in future and/or during emergencies.

The pumpstation will be equipped with the required access roads and security fencing in accordance with the local design standards.

4. ENERGY EFFICIENCY

The generation of hydro-electricity, as a result of the gravity feed towards Mockes Dam and Maselspoort can be implemented.

It is estimated that approximately 200kW can be generated and possibly supplied into the Centlec grid. Further investigations and consultations between the Mangaung Metro Municipality and Centlec will be required.

The pipeline between Moches Dam and Maselspoort will be used in an opposite flow direction, thus saving energy and associated electrical costs at Maselspoort pump station.

5. MASELSPOORT TREATMENT PLANT UPGRADE

Mangaung Metro Municipality has adopted a strategy utilise local resources to its full potential by re-circulating as much water as possible, instead of transferring water from the Novo Transfer system. Every drop of water that is purified by recirculation will ensure less water to be transferred from the Welbedacht Dam (Caledon River) or possibly the planned Gariiep dam scheme (Caledon and Orange Rivers).

A preliminary design is currently underway to upgrade the treatment processes at the Maselspoort WTP to treat raw water that will in future include an increasing percentage of treated sewage effluent, to required potable standards. Maselspoort WTW is currently treating water from Botshabelo and Thaba Nchu WWTW. A typical concern in water re-use application is the accumulation of salts (dissolved solids) in the water cycle. A preliminary assessment of the potential for total dissolved solids to accumulate in water to be re-used in Bloemfontein, beyond the allowable limit prescribed in the SANS 241 Standard for Drinking Water, indicated no substantial increase in total dissolved solids that would be of serious concern. The primary reason for the non-accumulation of dissolved solids is the continuous blending with water from the low dissolved solids water from the Caledon River system.

With the current VIP eradication program, approximately 50 000 additional stands will be serviced with water borne sanitation by 2020. Based on a daily sewage flow of 500 ℓ per stand, the total effluent discharged from Botshabelo and Thaba Nchu will increase with approximately 25 Mℓ per day. With an allowance of 10% for conveyance losses, approximately 22.5 Mℓ additional treated sewage effluent will be discharged to Maselspoort Dam by 2020. The estimated total volume of treated sewage effluent that will be discharged from Botshabelo and Thaba Nchu by 2020 is thus estimated at 33 Mℓ per day and will be increasing further with future development in these areas.

6. OPERATIONAL CONSIDERATIONS

The system will be optimised so that no more releases will be required from the Rustfontein Dam. This will allow full optimisation of Rustfontein dam volume for the purpose of water purification at Rustfontein WTW.

Maselspoort WTW will function only by treating the natural river run-off during summer months which will be stored in Mochesdam and Maselspoort Weir and will be augmented by the recirculation of water in the Renoster Spruit catchment areas as well as the current Botshabelo and Thaba Nchu WWTW treated effluent.

7. COST IMPLICATIONS

The total cost estimate (first order) for the scheme can be summarized as follows:

Pump station costs (Mech&Elect)	R 6,5 million
Civil Works (Roads, fences and building)	R 2,50 million
Pipework (@R10 000/meter)	R 239,44 million

(Historical releases from Rustfontein dam indicate that typical four (4) water releases are required per year, especially during the late winter and spring period before the rainy season starts. At the current levy charged by Bloem Water (R4,16 /kl) this equates to approximately R14,6 million per release or R58 million per annum.)

8. Annexure A – Layout Drawing

