REPORT TO THE

INFRASTRUCTURE, ENGINEERING AND ENERGY SERVICES COMMITTEE

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THE EXECUTIVE DIRECTOR: INFRASTRUCTURE AND ENGINEERING

8 SEPTEMBER 2016

GROUNDWATER EXPLORATION - PROJECT STATUS REPORT - 8 SEPTEMBER 2016

PURPOSE

The purpose of this report is to inform the committee on the progress made in the Groundwater exploration project to augment the existing water sources of the Metro.

BACKGROUND

In February 2014 the Metro approved a groundwater exploration project that focussed on the Groot Winterhoek – Coega Ridge Table Mountain Group Aquifer in the Coega Kop and Uitenhage areas. The one-year contract has now been completed. While the total estimated yield from all groundwater sources within a reasonable radius of NMBM's bulk supply infrastructure is approximately 80 Ml/day, the maximum potential of the Coega Aquifer is estimated to be 26 Ml/day including the flow from the Uitenhage Springs (which is currently ~6 Ml/day). A license application to DWA for this flow (26 Ml/day) has been submitted and is currently being assessed and awaiting approval.

PROGRESS

The 1st stage of the project, exploration drilling, has been completed. The key points are:

- 12 exploration sites were drilled on municipal land in the Coega Kop area. All are close to the Coega Kop municipal reservoir.
- The boreholes drilled were for exploration purposes only and will inform the positions of the production holes that will follow.
- The total estimated drilling yield from the highest yielding hole at each site is 33 Ml/day. This yield is NOT the sustainable yield of the aquifer; it merely shows that the boreholes were correctly sited.
- The boreholes were test pumped and the results showed that 4 sites **are** suitable for production boreholes and 2 more **may** be suitable for production boreholes.
- The exploration boreholes are not suited for estimating "sustainable" yields (some collapsed below the casing depth), but from the test pumping a rough estimate of their combined yield is between 8 Ml/day and 14 Ml/day (assuming all 6 are suitable for production). It is expected that the production boreholes will be higher-yielding than the exploration boreholes due to their larger diameter.
- The balance of the aquifer's estimated capacity, approximately 6 12 Ml/day (26 Ml/day minus the Uitenhage Springs minus the Coega Kop borehole yield) may need to be obtained from boreholes in the Uitenhage area (where sites have already been pegged). This 6-12 Ml/day yield assumes the production boreholes at Coega Kop are similar-yielding to the exploration boreholes (but as stated earlier, they are expected to be higher-yielding).
- Due to the high pressures currently in the aquifer (up to 60m), it is not possible to perform a test pump analyses for the purpose of determining the characteristics of the aquifer.
- For the above reason it is necessary to release the pressure in the aquifer by releasing water from the aquifer over a period of time. This can be done by drilling a production hole and releasing the water into the environment or by blending it with treated water from another source. To reduce wastage the latter is being investigated.
- Water can be transferred via a pipe and pump system to the existing Nooitgedagt Low Level Scheme pipeline.
- In order to dilute the high iron and manganese content of the borehole water to within the acceptable limits, as prescribed in the standard for drinking water guidelines, it will be blended with treated water from Nooitgedagt WTW at a specific ratio.
- This ratio is dependent on the concentrations of iron and manganese in the groundwater as well as in the water from Nooitgedagt WTW. The water demand in the Nooitgedagt Low Level Scheme will also dictate the ratio.

- The initial water quality information of the wellfield indicated that blending would be possible and that at least 5Mt/d could be blended, resulting in considerable long term savings.
- Recent water quality tests have however shown that blending might not be viable because of extremely high concentrations of iron and manganese.
- The first stage of a thorough water sampling schedule of the wellfield was implemented to reestablish whether blending is viable or not.
- The results are being analysed to determine if blending is a viable option and what effect the 2 types of water will have on the chemistry of the water.
- If blending is viable a pipeline from the wellfield to the Nooitgedacht Low Level Scheme will be constructed. This will be a permanent arrangement and will result in a considerable operational cost saving as the water needs minimum treatment.
- If blending is not viable, the water will have to be discharged into the Coega River. Environmental approval will have to be obtained for this option.
- The balance of the water yield from the Coega Kop well field will have to be treated in order to remove the high iron and manganese content to within acceptable standards. This will entail the construction of a WTW near Coega Kop reservoir.
- Once it has been determined whether the blending pipeline will be constructed or not, the detail design of the wellfield will continue and the subsequent tender will be finalized.
- The Concept design of the ultimate system has been completed.
- An EIA Consultant has been appointed through CETT for the full scope of works.
- The EIA and WULA processes have already commenced.
- The final recommended yield after the production boreholes have been drilled will take a number of factors into account:
 - $\circ~$ The sustainable yield of the aquifer (we will not "over-abstract" the aquifer);
 - The DWA license agreement (DWS are currently reviewing our license application);
 - Environmental and other user considerations (these have been accounted for in our license application); and
 - The optimum abstraction rates from individual boreholes so as to minimise operation and maintenance costs.

WATER QUALITY / TREATMENT

The water is exceptionally fresh (i.e. very low salinity) but iron and manganese will cause aesthetic problems and will have to be removed or blended with water from other sources prior to distribution for potable purposes.

- Due to the high quality of the water, minimum treatment is required.
- The most cost effective process to remove the iron and manganese is via a biological treatment process called biofiltration.
- This process mainly consists of controlling the Oxygen and pH levels in order to remove the iron and manganese.
- Typically the WTW will consist of an inlet, chemical dosing for pH control, 6 bio filters and a clear well. As expected in any standard WTW, various mechanical and electrical equipment will be needed in the WTW.

COST ESTIMATE

The cost estimate is based on a continuous potable water supply of between $15 - 20M\ell/day$ including all relevant infrastructure required to treat and distribute the treated water into the Municipal system.

- The current capital cost estimate for the project is R 140mil, which equites to about R 7mil per Mt/d of water compared to about R 13mil per Mt/d for the Nooitgedagt Low Level Scheme.
- Due to the quality of the water, operational cost is estimated at a very low R 1.30 per k² compared to the operational costs of NMBM's other conventional water treatment works.
- Compared to other current augmentation projects it remains the cheapest source of water for NMBM.
- Expenditure to date is R25mil.

PROGRAMME

The key milestones for the project are:

- Drilling of probe and exploration boreholes completed.
- Implement a thorough water sampling schedule to confirm the quality of the groundwater. This is a critical determinant to the design of the treatment process ongoing
- Determine whether blending of groundwater into the Nooitgedacht Low level Scheme is viable in progress
- Finalize detailed designs and tender documents
- Finalize the EIA process.
- Procurement process and commencement of construction.
- Commission water treatment works October 2018

CONCLUSION

The main conclusions thus far are:

- The drilling in the Coega Kop area was successful in that very high-yielding exploration boreholes were drilled. Arguably the highest in South Africa.
- Some boreholes in the Coega Kop area are strongly artesian, and therefore the pumping costs will be relatively low.
- The water quality is good (very low salinity) although iron and manganese will need to be removed.
- The borehole sites are close to existing bulk infrastructure (particularly the Coega Kop reservoir and the Nooitgedacht Pipelines).
- The production boreholes still have to be drilled.
- The comprehensive water sampling schedule needs to be completed to re-establish the quality of the water.
- The viability of blending groundwater into the Nooitgedacht Low Level Scheme can be determined once the water quality has been re-established.
- Once a decision has been made with regards to the blending of groundwater, the detailed designs of the wellfield and the subsequent tender document can be finalized.
- The EIA and WULA processes for full scope of works have commenced.

FOR INFORMATION

B.J. Martin	:	041 5065436
File	:	3/2/4/4; 2/13/3/2

B MARTIN ON BEHALF OF EXECUTIVE DIRECTOR INFRASTRUCTURE & ENGINEERING

DATE