

Duplicate file 913

C O P Y/M M.

REPORT ON THE GROUNDWATER IN THE MINING AREAS OF BLYVOOR-
UITZICHT, WEST DRIEFONTEIN, DOORNFONTEIN AND VENTERSPOST
MINES AND ITS RELATION TO THE SUPPLIES OF THE OBERHOLZER
AND VENTERSPOST LOOP IRRIGATION BOARDS

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On June 30, 1954 Mr. Fernie and myself had interviews with officials of the New Consolidated Gold-Fields and Rand Mines at Johannesburg and on the following day we visited the above area and interviewed the Secretaries of the Oberholzer and Venterspost Irrigation Boards and also Messrs. Wright and Curtin the Manager and Watersupply engineer at Blyvooruitzicht G.M. Co.

Although some data were collected, the information available is still insufficient to bring out a final report on the water supplies of the area. I hope to collect further data from the respective Mining Companies, and if necessary, especially if the Director of Irrigation wishes to have a final report, additional surveys can be carried out on the basis of which it should be possible to give a much clearer and probably correct picture of the setup as a whole.

At this stage I only wish to answer the questions put by the Director of Irrigation in his Minute No. 905/400/1/10703 of 16th June, 1954, on the basis of available data, and make some general remarks.

It has to be assumed that all the water pumped from the Mine Workings (in Witwatersrand sediments under a cover of dolomite with a thickness of up to $\frac{1}{2}$ 3,000 feet) is replenished by the water contained in the dolomite, and that any depletion of water due to the pumping, will first occur in the dolomite and ultimately in the Witwatersrand.

The replenishment of the water in the dolomite is by infiltration of rainwater and of water flowing in the ^oWanderfontein Loop, and the annual increment may vary to a certain extent, depending on various factors, e.g. intensity

of rainstorms and total rain-fall of season.

The flow of an "eye" represents the difference between the water gains and water losses e.g. by transpiration, evaporation, leakage underground to lower compartment and water pumped from the compartment.

(i) Practically the whole of the Doornfontein Mining Lease Area lies on a dolomite compartment west of and lower than the compartment from which the Oberholzer eye is fed. Ninety percent of the Blyvooruitzicht Mining Lease Area lies on the dolomite compartment, or subsidiary compartment, feeding the Wonderfontein (Oberholzer) eye and ten percent further west on a lower compartment. Although mining is still confined to an area underneath the Oberholzer compartment, development is towards the west and may already have crossed into the lower compartment.

Eighty percent of the Mining Lease Area of West Driefontein lies on the Oberholzer dolomite Compartment and twenty percent on the Bank compartment. Shafts Nos. 1, 2 and 3 are in the Oberholzer compartment, and No. 4 is on the dyke forming the barrier between the two compartments. It is intended to sink No. 5 shaft in the Oberholzer compartment, No. 6 on the same dyke as No. 4 and No. 7 in the Bank Compartment. Mining and development at present are practically all beneath the Oberholzer compartment.

(ii) The positions of all the dykes cutting the dolomite and forming the compartments, as known at present, have been plotted on a Map of West Witwatersrand Areas Ltd, and handed over to Mr. Fernie.

The water level in any dolomite compartment forms a horizontal plane approximately equal in elevation to the eye of that compartment.

The following water levels have been established:

Bank eye4937'	above M.S.L. by Mr. Smit (barometer)
Oberholzer eye	4813'	" " " " " "
Turffontein eye	4645'	" " " " " "
Borehole E3 on Driefontein	4813'	above M.S.L. by Dr. Krige.
Borehole G.M.B.1, Gerhardsminnebronne	4638'	above M.S.L. by Dr. Krige.
Borehole No. 18, Doornfontein4954'	above M.S.L. by Dr. Krige
Shaft No. 1 Blyvooruitzicht4834'	above M.S.L. by Mine Officials.
Shaft No. 2	"4837' above M.S.L. by Mine Officials.
Shaft No. 3	"4837' above M.S.L. by Mine Officials.

It would therefore seem that if the measurements are correct, there is a possibility that the shafts at Blyvooruitzicht are situated in a subsidiary compartment formed by an east-west trending dyke, and having a water level about 20' higher than that of the Oberholzer eye. If this compartment does exist it is very likely that its water spills over, below the surface, into the Oberholzer compartment. The pumping at the mine will therefore only effect the eye to the extent that part of the increment of the Oberholzer supply will be cut off. This is a point that can only be determined, one way of the other, by a further investigation.

(iii) Only that part of the $7\frac{1}{2}$ - 12 m.g.d., which the Blyvooruitzicht mine has to pump from the workings, which is not put back as waste into the dolomite compartment from where it was indirectly obtained, i.e. the water used on the mine, for irrigation or pumped into another compartment, will effect the water of that dolomite compartment which replenishes the Witwatersrand sediments below. Up to the present most of the water pumped from the Mine has been run to waste and seeped back into the dolomite compartment. The effect of the pumping on the water in the dolomite will be more marked when all the water is used for some purpose or other. Only the Oberholzer eye will be affected and not the Bank eye. The

extent to which the Oberholzer eye will be effected hinges on the unknown factor of the subsidiary compartment. By careful observations of water-levels, over a period, the position can be clarified.

(iv) According to information obtained from the mining officials the Doornfontein Mine is still dry, and this explains the application to take 700,000 g.p.d. from Blyvooruitzicht to Doornfontein. There is a great possibility however that the mine will not always remain dry as with further development strong water-fissures may be intersected. If water is struck in Doornfontein it will no longer be necessary to take surplus water from Blyvooruitzicht to Doornfontein. The Bank and Oberholzer eyes will not be affected by water pumped from any part of the Doornfontein Mine with the exception of a negligibly small area in the south-eastern corner of the property.

The present rate of pumping from West Driefontein Mine is approximately 2 m.g.d. and all the water is run to waste on the property. It is expected that the amount pumped will gradually increase as the mine is further developed and worked.

It is not possible to predict the maximum quantity that will have to be pumped from any of the mines as it depends solely on the rate of flow of the water into the mine workings. It may be mentioned, however, that the pumping rate at Venterspost Mine has stabilized at approximately 10 m.g.d. and the mining officials hope that the figure will not be higher in the other mines. It does however seem very probable that Blyvooruitzicht will have to cope with more water as the pumping rate shows a steady increase of 800,000 g.p.d. per annum and the 8 m.g.d. mark has already been reached.

(v) The water pumped from the West Driefontein at present, and Blyvooruitzicht mines is replenished from dolomite compartments lower than that which supplied the eye at Venterspost, and the supply of the Venterspost Loop Irrigation Board will therefore not be affected.

The Venterspost Loop Board is using only about 3 m.g.d. of the 9 m.g.d. supplied to their canals by the Venterspost G.M. Co., and the rest is run to waste into the Wonderfontein Loop. Part of this supply finds its way into the compartment which supplies the Bank eye. If this supply of surplus water is cut off the Bank eye will be affected detrimentally.

(vi) At this stage it is rather difficult to access the effect of percolation of uranium, and other, effluents into the dolomite compartment. The effluent may be filtered to a certain extent if it seeps through deep soil, if, on the other hand, the water is let into a sinkhole the filtration will be negligible. Most of the water supplies used by the mines form closed circuits and the effluents are negligible compared to the large body of water that is being contaminated. Chemical tests over a period should show any deterioration of the water from the eye.

GENERAL

The pumping and disposal of water from mines on the Far West Rand is a matter that should be tackled and dealt with in its entity, and for that purpose further investigation is required, and all available data must be collected and analysed.

The complicated and far-reaching nature of the problem is well illustrated by the position of the Venterspost Mine and the Venterspost Loop Irrigation Board.

Approximately 10 m.g.d. is being pumped from the Venterspost Mine. It is clear that this water is being replenished by water from the dolomite above as the Venterspost eye has gone dry since the pumping commenced and now the Mine supplies the Board with approx. 9 m.g.d. as against the approx. 6 m.g.d. that the Board originally obtained from the eye.

The Mine is, however, pumping approx. 4 m.g.d. more than the original yield of the eye and the water in the dolomite compartment is gradually being lowered. The implication is that the mine is gradually emptying the stored water in the Venterspost eye compartment, and the eye will only flow again when the compartment is refilled and if the artificial and natural losses from the compartment is less than the increment of water.

If the mine should continue to pump 10 m.g.d. and dispose of all the water outside the compartment it will mean that when the mine closes down in 30 years time the Venterspost 00g compartment has been emptied by an amount of water that will require about 20 years to refill by natural infiltration of rain water.

Therefore, from the day that the mine closes down and the pumps are stopped the Venterspost Loop Board will be without a drop of water from the eye for the next twenty years. This will be as a direct result of the waste of the "capital" water by the mine through pumping and not returning sufficient water to the compartment to keep it full. I believe that further investigation into this matter is required.

Within a few years, when the West Driefontein and Blyvooruitzicht Mines will be pumping at more than 10 m.g.d. each, and not returning any of the water to the compartment, the Oberholzer Irrigation Board will be in the same predicament as the Venterspost Board is today, i.e. they will believe that they have more water available than they used to have, whereas their apparently increased supply is only by the exhaustion of their "capital" water supply.

If it is further considered that it is the intention of the mines to use part of this water for irrigating other non-riparian lands it would seem rather unfair to use the "capital" of the Irrigation Board for putting other areas under irrigation.

I would therefore like to suggest that:-

- (a) The Blyvooruitzicht Mine be granted permission to dispose of 700,000 g.p.d. by pumping to Doornfontein mine until such time as the latter mine will be pumping sufficient water from its own workings.
- (b) The disposal of the rest of the water pumped from the mines only be finally decided after further investigations have been carried out and a ground water inventory of the area has been drawn up.
- (c) If it becomes essential that the Blyvooruitzicht Mine should pipe some of its surplus water into the Oberholzer Irrigation canal so as not to flood private property it would seem that the cost of the pipes or canal should be borne by the mine at this stage, as it is doubtful whether the Irrigation Board will derive any lasting benefit from the additional water, which may still be only their "capital".
- (d) The guages be erected at the Oberholzer and Bank eyes as soon as possible and that arrangements be made for the accurate reading of the guages. It would also be advisable to erect sensitive water stage recorders in the pools above each of the eyes for determining the relation between the flows and the water levels at the eyes.
- (e) Arrangements should also be made with the mines concerned for recording the water levels in the mining

areas, accurately, at weekly intervals.

(f) Further investigations be carried out by the Geological Survey with a view to drawing up a groundwater inventory for the area, if the Director of Irrigation feels that the matter should be pursued further.

(Signed) J.F. Enslin.

Geological Survey,

Pretoria,

9th July, 1954.