Report

Preliminary assessment and recommendations regarding improving the safety of the small earthen dam on Nuwerus, Farm 450 Portion 6, Worcester

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1. Background

Mr Frederik Louw of the farm Nuwerus requested a preliminary assessment and recommendations to improve the safety and efficiency of a small earth dam on his the Farm 450 Portion 6, Worcester.

Figure 1: Locality map showing Nuwerus Farm 450 Portion 6, Worcester.

Figure 2: Satellite image depicting the main watercourses, earth dam and the boundaries of Farm 450/6, Worcester. Imagery sourced from Google Earth.
According to discussions held on 21 June 2011, Mr Louw intends to improve the dam on the property and utilize the dam to store his scheduled water. The improvements are planned to coincide with the development of a solar power plant on the property. The developers of solar power plant requested Mr Louw to ensure the dam is made safe, thereby ensuring that their infrastructure built above the 1:50 year flood line is secure.

Environmental authorization for the earth works thus form part of those planned for the solar park and will be undertaken by the same contractors.

2. Methodology

A brief site inspection was held on the 21 June 2011. From information gathered in the field, the 0.5m contours supplied by the land surveyor and the flood line as determined by the specialist, a number of preliminary drawings are made.

![Figure 3. Farm dam embankment and non-seasonal water course downstream.](image1)

![Figure 4. Dry dam basin.](image2)

![Figure 5. Contour (0.5m) map of the dam embankment and proposed overflow. The thick solid black line indicates the position of the 1:50 year flood line were the dam to be left in its current state i.e. no spillway.](image3)
Figure 6. Profile transect through the dam embankment showing the current steep upstream and downstream slopes and the recommended slopes to correct this. Not to scale.

Figure 7. Profile along the dam embankment showing the current sagging crest and the recommended level to correct this. Not to scale.

Figure 8. Dam volume curves showing the recommended spillway height of 322.8m amsl which would result in a dam capacity of 49000 m$^3$. 
3. Conclusions

- The dam in its current state will overtop across the middle of the dam wall (324.0 m amsl) when full or during a 1:50 flood event.
- The slope of the wall has a 1.5:1 outside or downstream slope and 2:1 inside slope.
- The embankment currently leaks at the toe of the dam.
- The dam currently has a volume of more than 50 000 m3.

4. Recommendations

- The top of the dam wall should be reshaped to either 324.7 m amsl (as per Figure 7).
- The dam wall should be re-shaped to decrease the slope of the wall to 2:1 outside slope and 3:1 inside slope (as per Figure 6).
- An impermeable clay layer should be used to line the inside wall of the dam, preventing loss of water.
- A 22 metre wide concrete spillway should be constructed at 322.8 m amsl. The dam volume when filled to this height would be 49 000 m3.
- The maximum embankment height from outside toe to crest will be less than 8m.