

Appendix 12 Peer Review of the GDE Risk Assessment (Desert Wildlife Services, November 2016)

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Dear Alex,

I have read through the GHD draft impact assessment of the predicted effects of groundwater drawdown on GDEs associated with the proposed Nolans Rare Earths mine. From my knowledge of the use of groundwater by plants in the region, the general information presented and the conclusions reached appear to be sound.

As stated in the risk assessment, there is limited knowledge of the use of groundwater by trees in the central Australian region, with the most relevant studies being conducted in the adjacent Ti Tree Basin including *Eucalyptus camaldulensis*, *Eucalyptus victrix*, *Corymbia opaca* and *Erythrina vespertilio* (O'Grady et al. 2009; Santini et al. 2016) and the Pilbara region of W.A. for the coolabah species *Eucalyptus victrix* (Pfautsch et al. 2015). In summary, those studies imply the use of groundwater by these species, at least in some situations in the region and/or areas of comparable climate.

What is unknown is the amount of reliance on groundwater (especially what the impact would be if access was no longer available), and the depth to which trees may access groundwater. However, indications from other studies elsewhere appear to suggest a threshold depth of around 10m, below which the use of groundwater (while perhaps still occurring for some individual trees) becomes less relevant to features such as vegetation composition and structure (Zolfhager 2013, Zolfhager et al. 2014). Measured water table depths in the affected drawdown area of > 15m suggests that, except in the immediate region of the mine site, impacts on vegetation will be minimal.

An interesting feature of the area is the presence of vegetation which might be expected to be utilising groundwater (e.g. river red gums) at sites with a depth to the regional (Reaphook paleo-channel aquifer) water-table in excess of 25m, e.g. along Day Creek. Three alternative scenarios may account for these observations:

1. Trees having very deep roots that can access groundwater at depths approaching 30m. This is possible but unlikely to be supporting stands of river red gum and bean tree with basal area of around $8\text{m}^2\text{Ha}^{-1}$ (as observed along Day Creek), as increasing depth to the water table places additional stress on the tree's internal water transport system equivalent to increasing tree height. Pfautsch et al. (2015) observed *Eucalyptus victrix*, a facultative phreatophyte, occurring where groundwater depths were 29m, but could not say whether or not roots were reaching to this depth.

2. Trees are not accessing the water table at all but are simply using deep soil water resources. This is possible, but has not been demonstrated for river red gums for example.
3. Trees are accessing a perched water table which is independent of the regional water table of the Reaphook Paleochannel.

Under either scenario, small amounts of draw down occurring over long time frames appears unlikely to have significant impact, given that previous studies have shown that significant use of groundwater occurs at water table depths of less than 10m (e.g. O'Grady et al. 2010; Zolfhager 2013, Zolfhager et al. 2014).

I have included some comments in the draft risk assessment. The references below refer to both those used above and in comments on the draft.

Andrew Schubert
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9th November, 2016.

References

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