Appendix A

Protect Our Water Alliance submission to IPC on Russell Vale Underground Expansion Project

Notes on Groundwater drawdown effects on forests from:

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1. The Russell Vale Colliery Revised Underground Expansion Project final report (UMWELT 2020) suggests that an area ~50 km^2 may be affected by long-term groundwater drawdown between 1 and 2 m as a consequence of mining activity (figure 10.1).

2. Groundwater drawdown causes a significant on groundwater dependent ecosystems such as riparian vegetation and swamps. This impact has presumably been discussed elsewhere in relation to Russell Vale. However, the dominant vegetation in the mine area is eucalypt forest which is not groundwater dependent and so no impact is predicted by the mine proponents.

3. There have been few studies into the impact of groundwater drawdown on these kinds of forests (termed mesic rather than semi-arid because normally there is sufficient water in the upper soil for growth). The most relevant is Zolfaghar et al 2014 who studied forest fragments in the Nepean catchment (not far from Russell Vale) that had been effected by groundwater extraction in bores. They found a dramatic reduction in tree biomass, leaf mass and leaf production at depths between 5.5 and 9.8 m, but not between 2.4 and 5.5. This suggests that the forests in the area of Russell Vale are sensitive to a drop in the water table, but if it is within the projected range of 2m, there should be little impact.

4. Where such forests vary naturally in the depth of the groundwater table, the understorey plant community tends to differ as well (Hingee et al 2017).

5. An overseas studies of floodplain Oak forests (which probably have quite different water relations) found that in sites with groundwater drawdown, the trees were more susceptible to the annual summer drought (Skiadaresis et al 2019).

6. Even though modest groundwater drawdown such as 2m does not have a major impact on long-term forest growth, it probably does reduce the trees' ability to remain healthy through drought. Drought leads to a reduction in live moisture content of the leaves and if this falls below a certain threshold, the leaves become flammable (Nolan et al 2016). This effect was probably the main cause of the huge extend of the forest bushfires in 2019/20 (Nolan et al 2020, NSW Bushfire Inquiry 2020). Eucalypt trees can survive without access to groundwater, but the studies mentioned above suggest that they are more likely to suffer drought stress (and high flammability) if their access to groundwater is reduced. This is hard to quantify because there has been no study linking groundwater to live moisture content.

In summary, there is potential for groundwater drawdown to stifle forest growth and change understory plant composition, but it is not likely that the predicted 1-2m predicted drop will have a substantial effect. On the other hand, this drop may be enough to make the forest more susceptible to drought, hence lowering live moisture content of the leaves and increasing bushfire risk. There

are thousands of homes within 20 km of the drawdown area so this issues should be given serious consideration.

References

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