



Figure 19 Kangaroo Creek Dam 9 August 2011



Figure 20 Kangaroo Creek Dam 17 October 2011



Figure 21 Kangaroo Creek Dam 13 December 2011



Figure 22 Kangaroo Creek Dam 7 February 2012



Figure 23 Kangaroo Creek Dam 19 April 2012



Figure 24 Kangaroo Creek Dam 8 June 2012

Kangaroo Creek Waterhole Photo Monitoring: 1 October 2009 - 7 August 2014

Angus Place Colliery's LW940

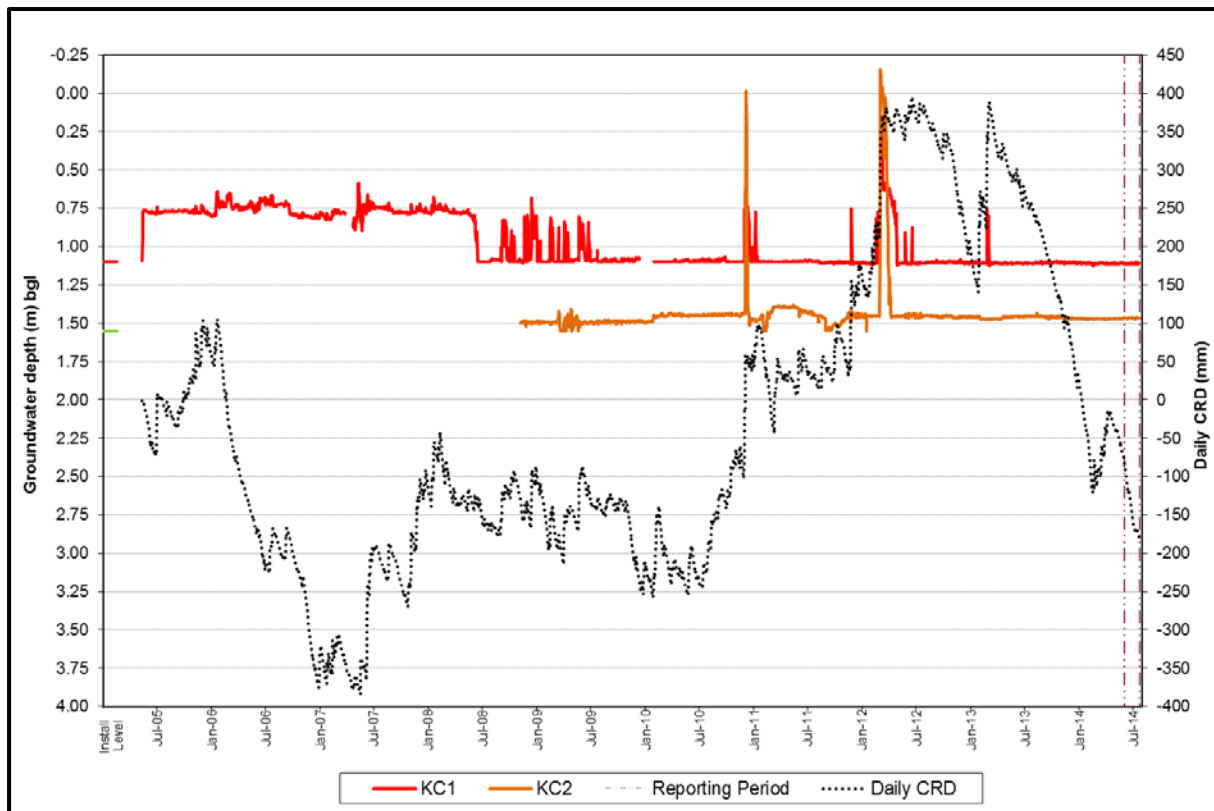


Figure 1 – Kangaroo Creek Piezometer Monitoring Data and Cumulative Rainfall Deviation

Figure 1 shows Kangaroo Creek Swamp Piezometer Monitoring Data (KC1 and KC2) and Cumulative Rainfall Deviation over the period between 2006 and 2014. It shows hydrographs of the swamp piezometers installed at Kangaroo Creek Swamp (refer Figure 10.1 of both Angus Place and Springvale EISs for the location of the swamp), together with the cumulative rainfall deviation (CRD), which is indicated by the black trendline. The KC1 piezometer is located downstream of Kangaroo Creek Swamp and the KC2 piezometer is located upstream of the swamp.

Figure 1 shows that there is a very strong correlation between the trendline of standing water level beneath the swamp and the cumulative rainfall deviation trendline for the KC2 piezometer over the eight years of monitoring at this location. This data indicated that the swamp is periodically waterlogged at this location (standing water levels respond to rainfall). The data also indicates that there have been no significant impacts to swamp hydrology in response to longwall mining at KC2. Groundwater levels at KC1 appear to have been affected by the longwall mining of Angus Place Colliery's LW940, which was below the lower reaches of the swamp, as there was a sudden reduction in groundwater levels in June 2008, unrelated to rainfall. The CRD trend also helps to understand changes in presence and flows of surface water. Since March 2013, there has been rainfall deficit in excess of 550 mm (a significant proportion of the annual average Newnes Plateau rainfall of 1092 mm). The rainfall deficit in the past 18 months is greater than any period since the end of 2005 (including the drought of 2006-2007). This helps to explain the lack of surface water

present in recent monitoring periods e.g. February, June and August 2014 (and photos taken in May 2014 for the purpose of community submissions to the Angus Place and Springvale Mine Extension Project EISs). The photo used in the EIS (Photograph 2.16 in Angus Place EIS and Photograph 2.13 Springvale EIS) was taken on 16 July 2013 and can be seen to be consistent with monitoring photos in prior and subsequent periods. In the five years of photographic monitoring since the measured reduction in groundwater levels at KC1 piezometer, there have only been **three monitoring events out of 41 monthly or bi-monthly monitoring events** where water has not been present in the waterhole (February 2014, June 2014 and August 2014) and these events, as noted above and Figure 1 shows, relate to deficit in rainfall in the period. On these occasions groundwater seeps from upstream can still be seen to be present (refer Figures 38, 40 and 41).



Figure 1 Kangaroo Creek Swamp Waterhole 1 October 2009



Figure 2 Kangaroo Creek Swamp Waterhole 25 November 2009



Figure 3 Kangaroo Creek Swamp Waterhole 30 December 2009



Figure 4 Kangaroo Creek Swamp Waterhole 20 January 2010



Figure 5 Kangaroo Creek Swamp Waterhole 18 February 2010



Figure 6 Kangaroo Creek Swamp Waterhole 17 March 2010



Figure 7 Kangaroo Creek Swamp Waterhole 19 April 2010



Figure 8 Kangaroo Creek Swamp Waterhole 5 May 2010



Figure 9 Kangaroo Creek Swamp Waterhole 22 June 2010



Figure 10 Kangaroo Creek Swamp Waterhole 28 July 2010



Figure 11 Kangaroo Creek Swamp Waterhole 23 August 2010



Figure 12 Kangaroo Creek Swamp Waterhole 29 September 2010