7-2. MONITORING WELLS BETWEEN LUE AND SITE

Concern:
Investigation wells enable an understanding of the geology between activities and neighbouring beneficial users of groundwater. No investigation bores have been drilled between the site and the Lue Village. These would have been useful to investigate site hydrogeology and identify any barriers that may protect riverine ecosystems and shallow bore users from drawdown associated with mining. At Lue village, around 10 households can depend on groundwater for potable use during times of water scarcity. Potential impacts on riverine ecosystems and shallow bore users requires definition in the EIS.

Query response to the following SEARs for SSD 5765:

- A description of the existing environment likely to be affected by the development, using sufficient baseline data
- A description of mitigations and
  - Whether these are best practice and represent a full range of measures
  - Whether they will be effective / key performance indicators
  - Contingency plans for residual risks / monitoring and reporting on environmental performance
- An assessment of the likely impacts of all stages of the development, including any cumulative impacts, taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice
- Part 3: Any interference with an aquifer caused by the development does not exceed the respective water table, water pressure and water quality requirements specified for item 1 in columns 2, 3 and 4 of Table 1 of the *Aquifer Interference Policy* for each relevant water source listed in column 1 of that Table
- Part 3: Impacts to significant water resources or threatened species are minimised to the greatest extent practicable
- Assessment of Lawsons Creek and Price Creek
- Assessment of likely impacts to aquifers; detailed site water balance, management of excess water and reliability
- DRG, Attachment 2A requires rehabilitation methods including:
  e) monitoring for rehabilitation
  i) details of triggering intervention
  k) details of post-rehabilitation management
  l)i) assessment of rehabilitation techniques against objectives
  l) ii) assessment of potential acid mine drainage
  l) iii) processes to identify and management geochemical risks throughout mine life
  m) iii) groundwater assessment for final water level in any tailing storage facility void
  o) consideration of controls
- DRE/DPE requires a Water Management Strategy that considers
  - the existing surface and groundwater qualities
  - a robust baseline
  - a description of how groundwater and aquatic ecosystems will be monitored, Trigger Action Response Plan and trend identification

DISCUSSION

According to SEARs, sufficient baseline data is required to characterise and describe the existing environment. A firm understanding of the existing environment enables predictions of the likely hydrogeological impacts caused by a development to be used for decision making. If the existing hydrogeology is not well understood, there is a large chance that groundwater models and predictions will be unsuitable for decision making. This query relates to the locations of bores used to characterise the hydrogeology. The rights of domestic and stock use, as well as licenced bore users are protected, and the *Aquifer Interference Policy 2012* requires minimal impacts to be adequately determined.

> To understand the groundwater impact to the Lue village area, groundwater investigation bores are required. None have been drilled over the 1.5 km separating the site from Lawsons creek near the village

No investigation or monitoring bores have been drilled between those close to the site (BGW18, 38, etc) and Lue (Bowdens Silver, 2020) shown as Figure 2. Over this 1.5 km distance (Figure 1), EIS modelling has predicted a 1 m drawdown in the water level in (and presumably under) Lawsons creek near the Lue Village. The lack of investigation wells in the 1.5 km between the pit and Lue does not enable a solid understanding of the hydraulic connectivity between the proposed pit and Lue.

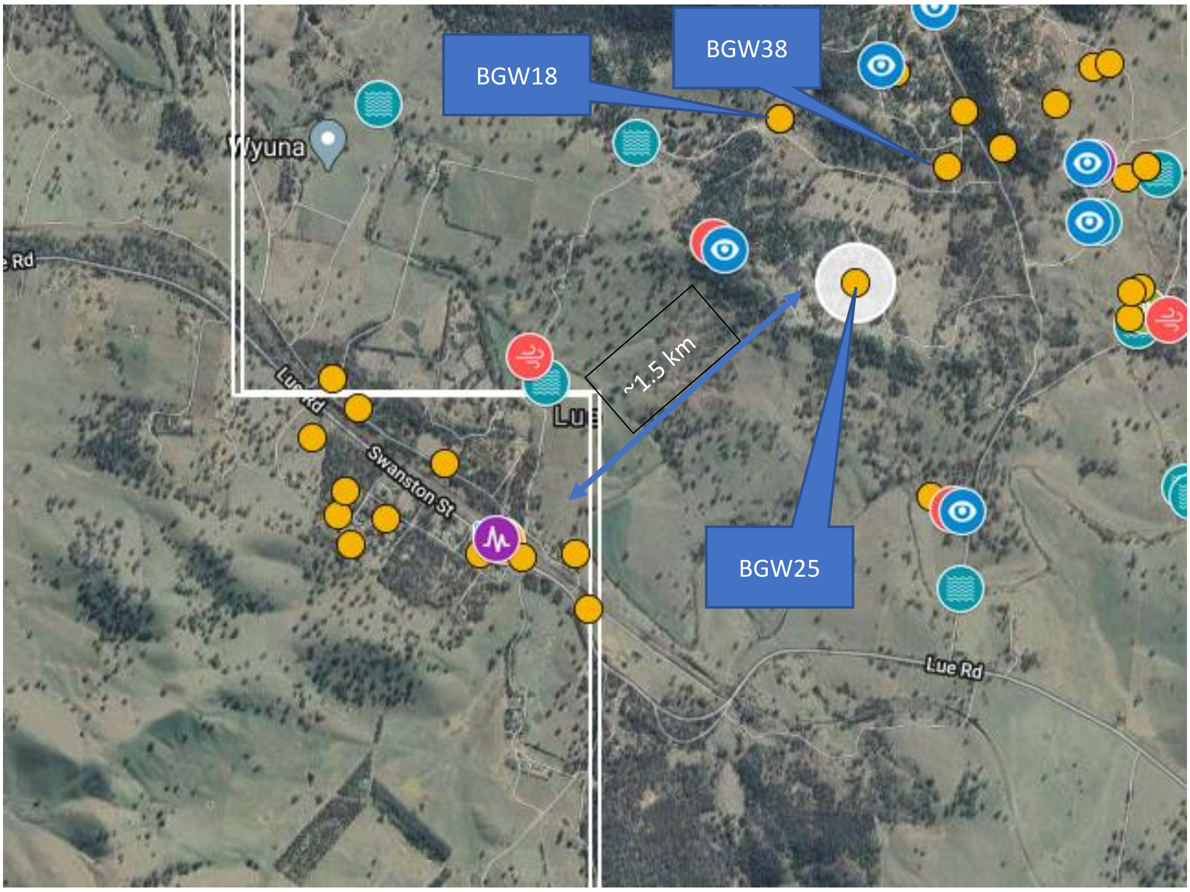

Figure 1: Monitoring near Lue (Bowdens Silver, 2020)

Without an understanding of the impact to significant receptors, the risk of the project and how these risks can be managed using best practice cannot be considered.

The EIS considers data from monitoring wells located on the site and the following data from within the village:

1. Aquifer properties – derived from data northeast of the red line in Figure 2
2. Groundwater quality - tested from 6 samples in Lue Village out of 60 samples across the site
3. Groundwater levels monitored in the wells shown in Figure 3

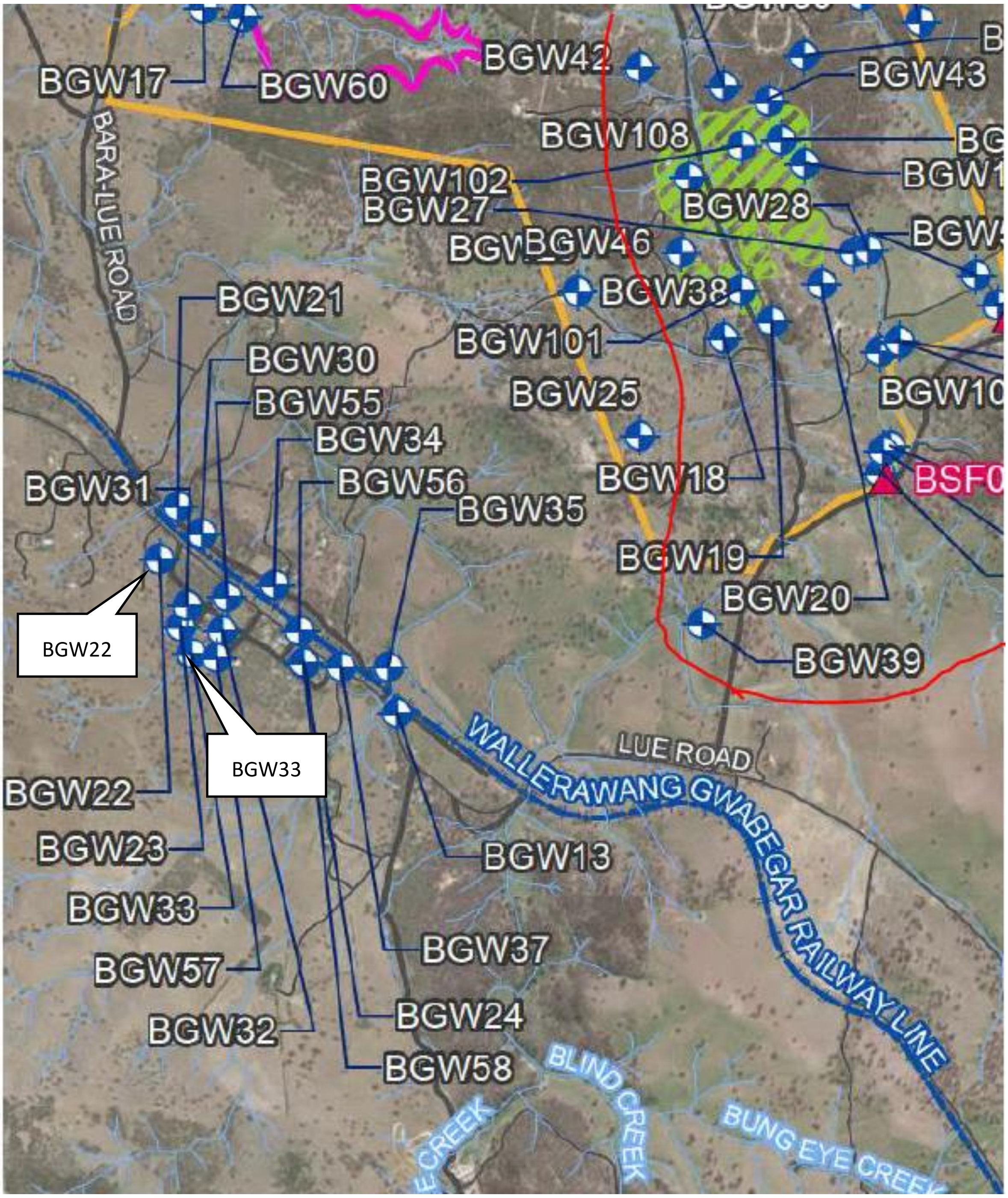

Figure 2: Wells tested for hydraulic aquifer properties are to the northeast of the red line – Figure 23 in (Bowdens Silver, 2020, pp. 5-88)

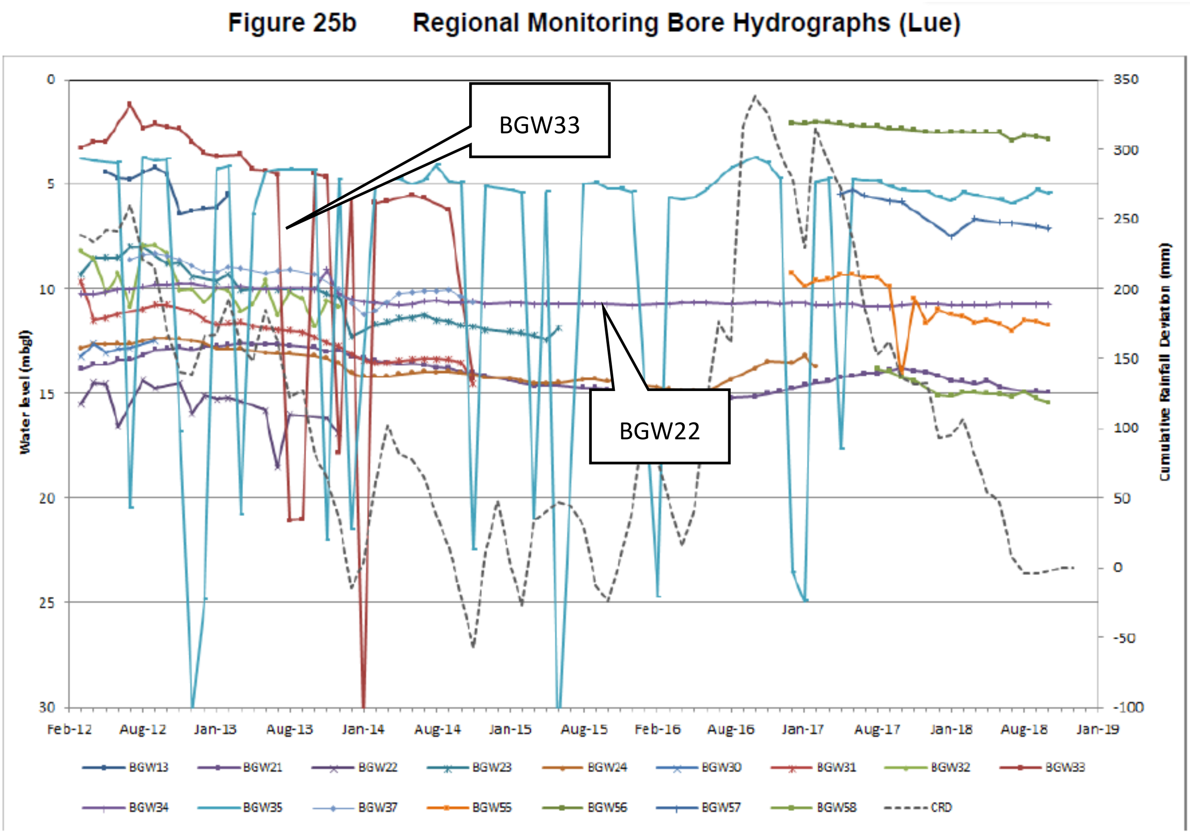

Figure 3: Groundwater hydrographs, showing difference in water level response in BGW22 & BGW33 shown in Figure 1. Source: Figure 25b of (Jacobs (Australia), 2020, pp. 5-91)

It is not clear from the information provided in the EIS what time period the groundwater contours reflect. Given that there can be groundwater level variations of up to 10 m in some wells (Figure 3 and Figure 4), it is important to define a particular period from which to generate the contours to accurately represent the flow field.

For example, the EIS does not explain why the 557 m AHD groundwater level was used for well BGW39 as opposed to a level of around 550 m.

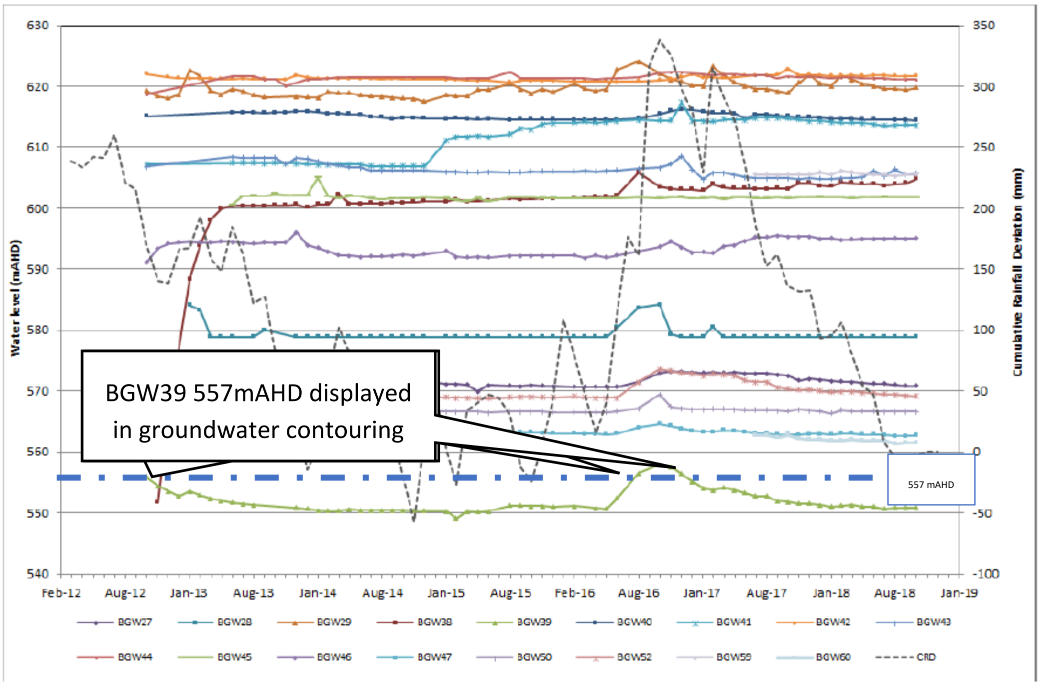

Figure 4: BGW39 groundwater hydrograph. Source modified from Figure 26b (Jacobs (Australia), 2020, pp. 5-93)

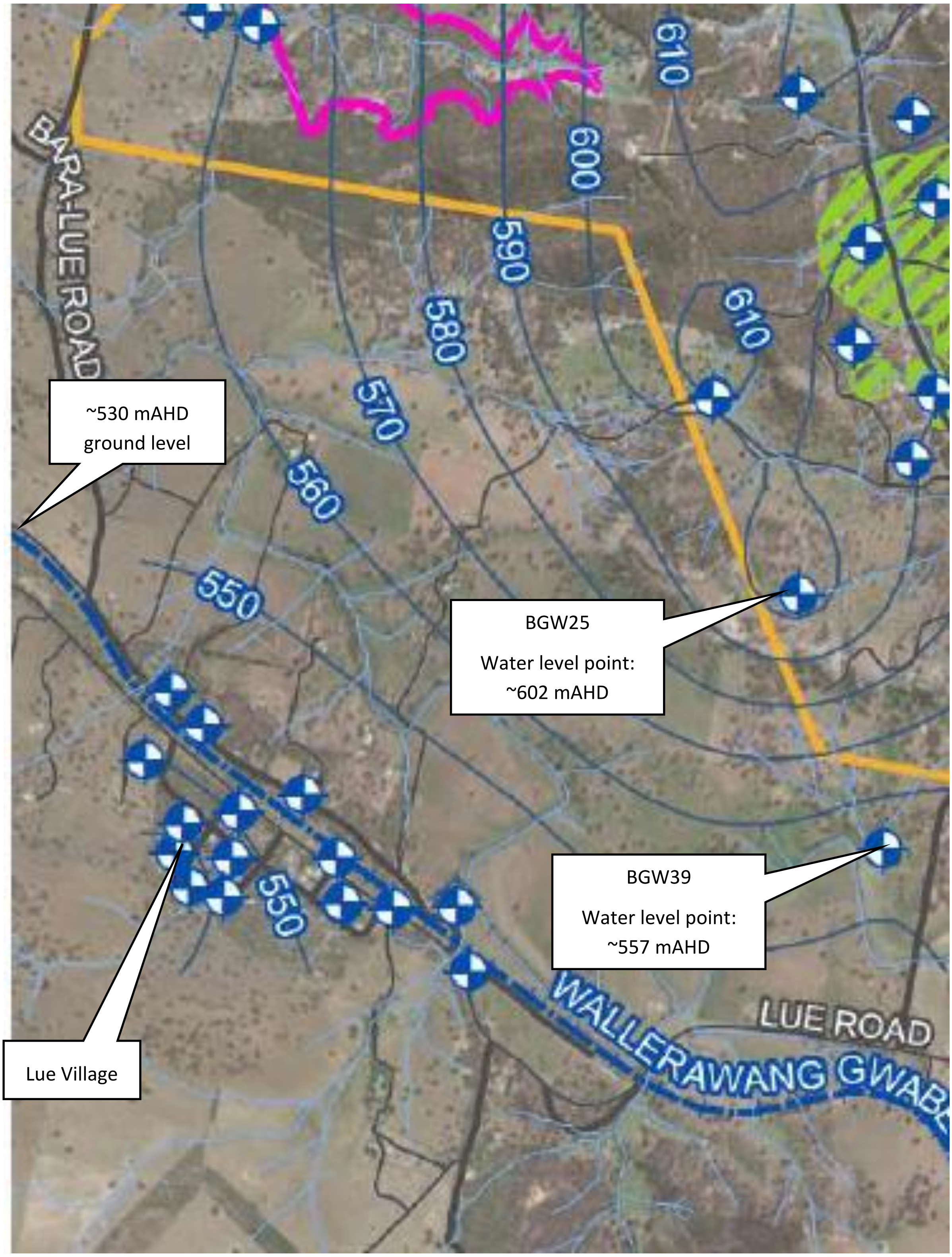

Figure 5: Groundwater contour map inferring groundwater flow direction

Inspection of Figure 26a of (Jacobs (Australia), 2020, pp. 5-92) shows that data for neighbouring monitoring well BGW25 was only taken from July 2013 to July 2015 – dates that do not align with the available data for BGW39. While the groundwater levels are, for some reason, not plotted in mAHD on Figure 26a, using a ground elevation of 630 mAHD, the water level elevation can be estimated at 577 mAHD. This is 25 m lower than the contouring presented in Figure 5. This unexplained uncertainty in groundwater level contouring could be addressed if investigation and monitoring wells were installed between the site and the Lue Village.

No hydrogeological information or study is focussed on the hydrogeology between the site and Lue village, a centre for community concerns.

The EIS acknowledges that groundwater would be of non-potable quality around the site. The assumption that non-potable groundwater would not impact on Lue is hard to justify in the absence of groundwater level and hydrostratigraphy data between the source and receptor.

Presently, native groundwater around the Lue village is maintained at potable water quality; quality which may be supported by surface water recharge in alluvium around Lawsons Creek. The EIS states that reductions in baseflow to Hawkins and Lawsons Creeks occur 28-34 years after mining commences.

The principal Beneficial Uses impacted by changes in groundwater availability and quality are the significant terrestrial and aquatic ecosystems and the groundwater bore users. Many of these occur near the township of Lue, however, there is no hydrostratigraphic section, nor cross section, between the proposed mine and Lue to indicate the pathway linking the proposed activity to the Beneficial Uses. The modelling cross section (Jacobs (Australia), 2020) does not indicate the extent of the alluvium around Lawsons Creek near Lue. The hydrostratigraphy and aquifer accessed by the 23 private bores is not provided, despite a range of aquifers in the area (Coomber Formation, Tannabutta Group, Adaminaby Group, Dungeree Volcanics, and alluvium). The distribution of the alluvium is provided in Figure 54 (Jacobs (Australia), 2020, pp. 5-147). This areal distribution is not reflected on any cross section between the site and Lue village.

Importantly, a well on the site (GW802779, 500 m south east of the proposed pit) reported a yield of 20 L/s in the fractured Coomber Formation. A southwest to northeast cross section, if presented, would have shown that the Coomber formation is likely continuous between GW802779 and Lawsons Creek near Lue. The groundwater contouring in Figure 6 shows data gaps to the west. The lack of investigation wells between the pit and Lue does not enable a solid understanding of the hydraulic connectivity between the proposed pit and Lue.

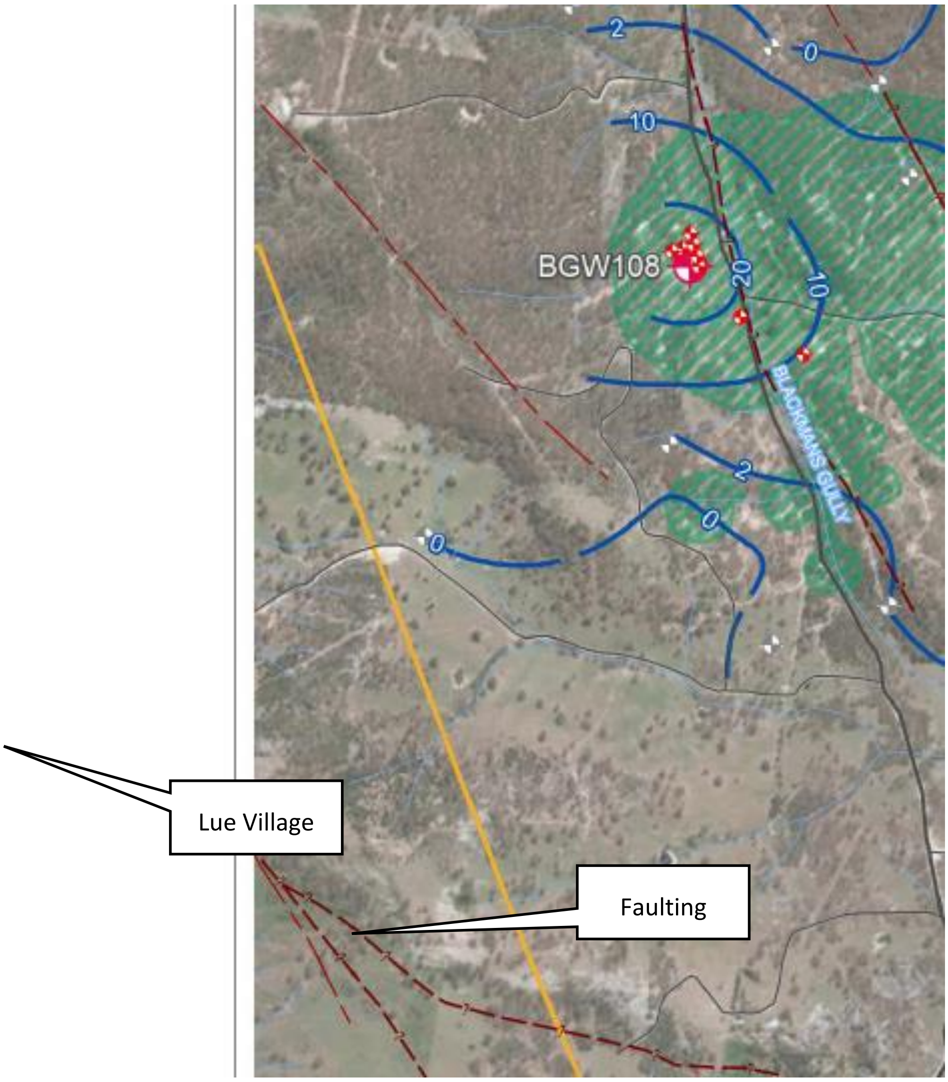

Figure 6: Provenance of hydraulic conductivity (does not approach Lue Village) from Figure 17 (Jacobs (Australia), 2020, pp. 5-74).

REFERENCES

Bowdens Silver, 2020. *Monitoring.* [Online]
Available at: https://bowdenssilver.com.au/monitoring/
[Accessed 21 June 2020].

Jacobs (Australia), 2020. *Part 5 - Groundwater Assessment,* Sydney: Silver Mines Pty. Limited.