3.5 Topography of study area

Elevation ranged from 224 m to 477 m (Bull Mountain) in the general vicinity of the study area (Figure 5). The streams drained from high land in the Vickery State Forest to the north-east of the Project. Steep slopes were associated with the upper headwaters, and rehabilitated landforms (Figure 6).

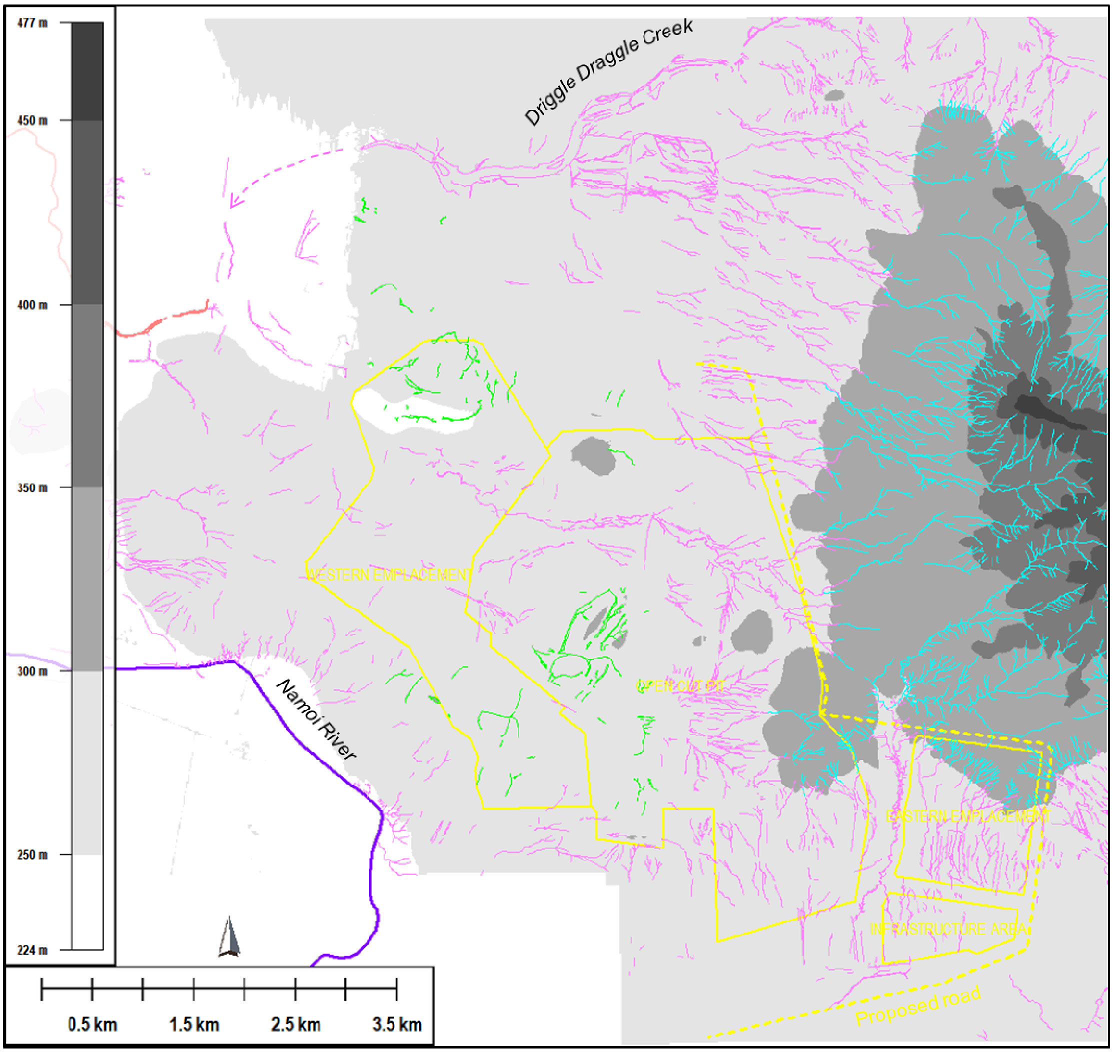

Figure 5. Distribution of land elevation throughout the study area.

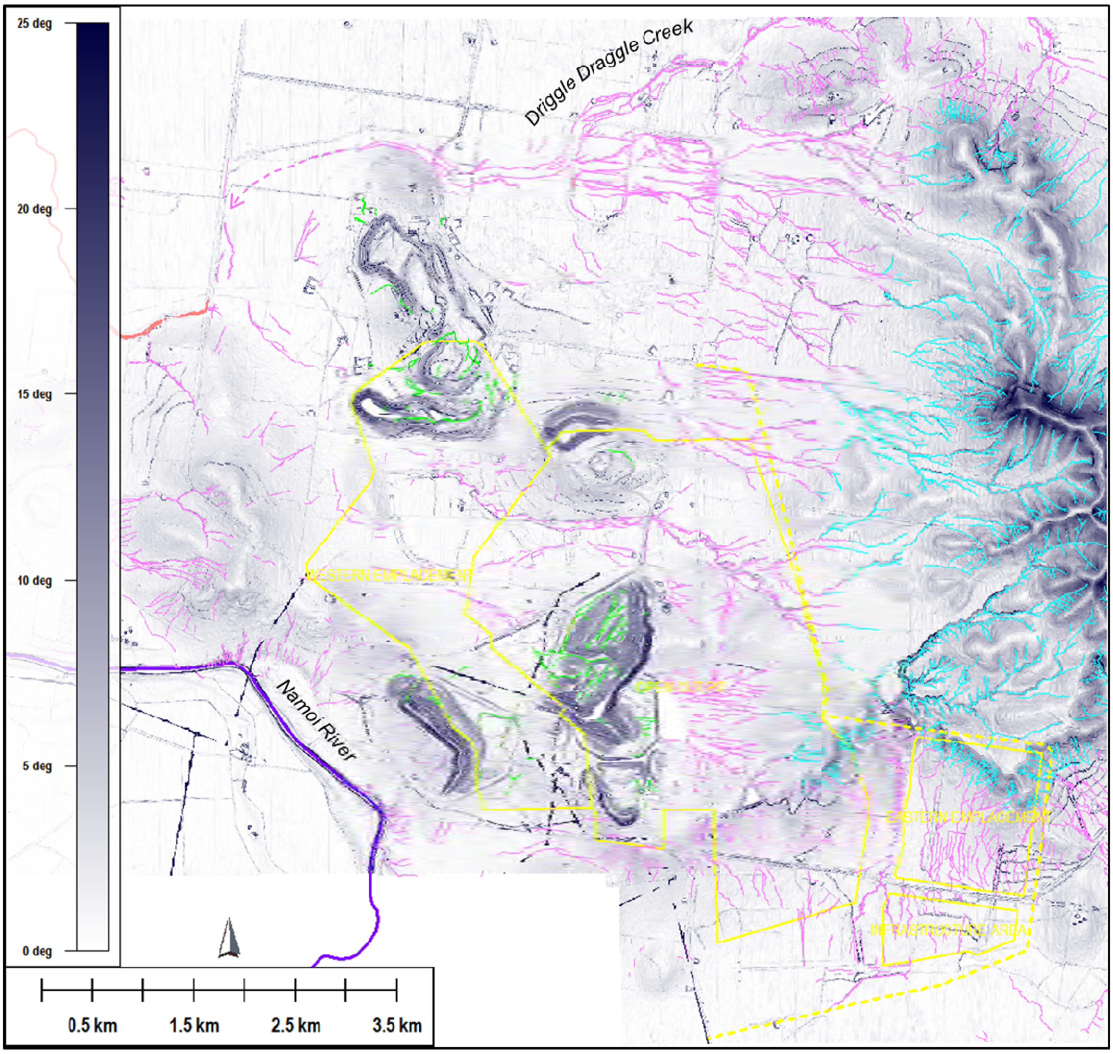

Figure 6. Distribution of land surface slope throughout the study area.

3.6 Bed material

Headwater streams flowed through exposed bedrock, cobble and gravel (Figure 7). Valley fill streams were usually in fine-grained cohesive material, although it also contained gravel and sand, and occasionally this coarser material was dominant (Figure 7).

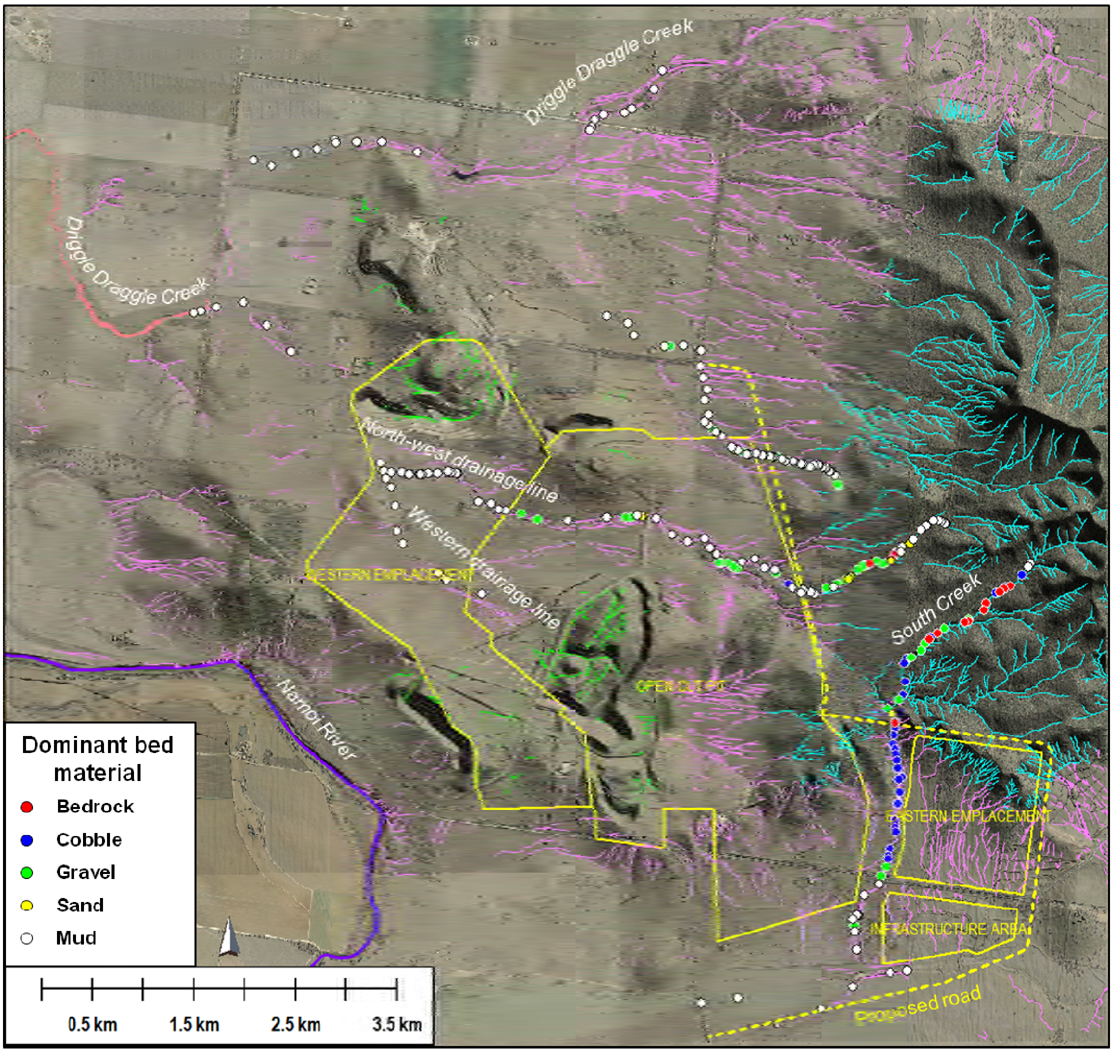

Figure 7. Dominant bed material of surveyed streams in the study area. Each dot represents a field observation (not all streams were surveyed).

3.7 Knickpoints

Knickpoints were common in both Headwater and Valley fill stream types (Figure 8). However, knickpoints were quite different in these two environments. In Headwater streams the knickpoints were usually in bedrock and they were in the order of 2 m high (Figure 8). In Valley fill streams the knickpoints were in cohesive sediments and were generally 0.5 m or lower in height (Figure 8).

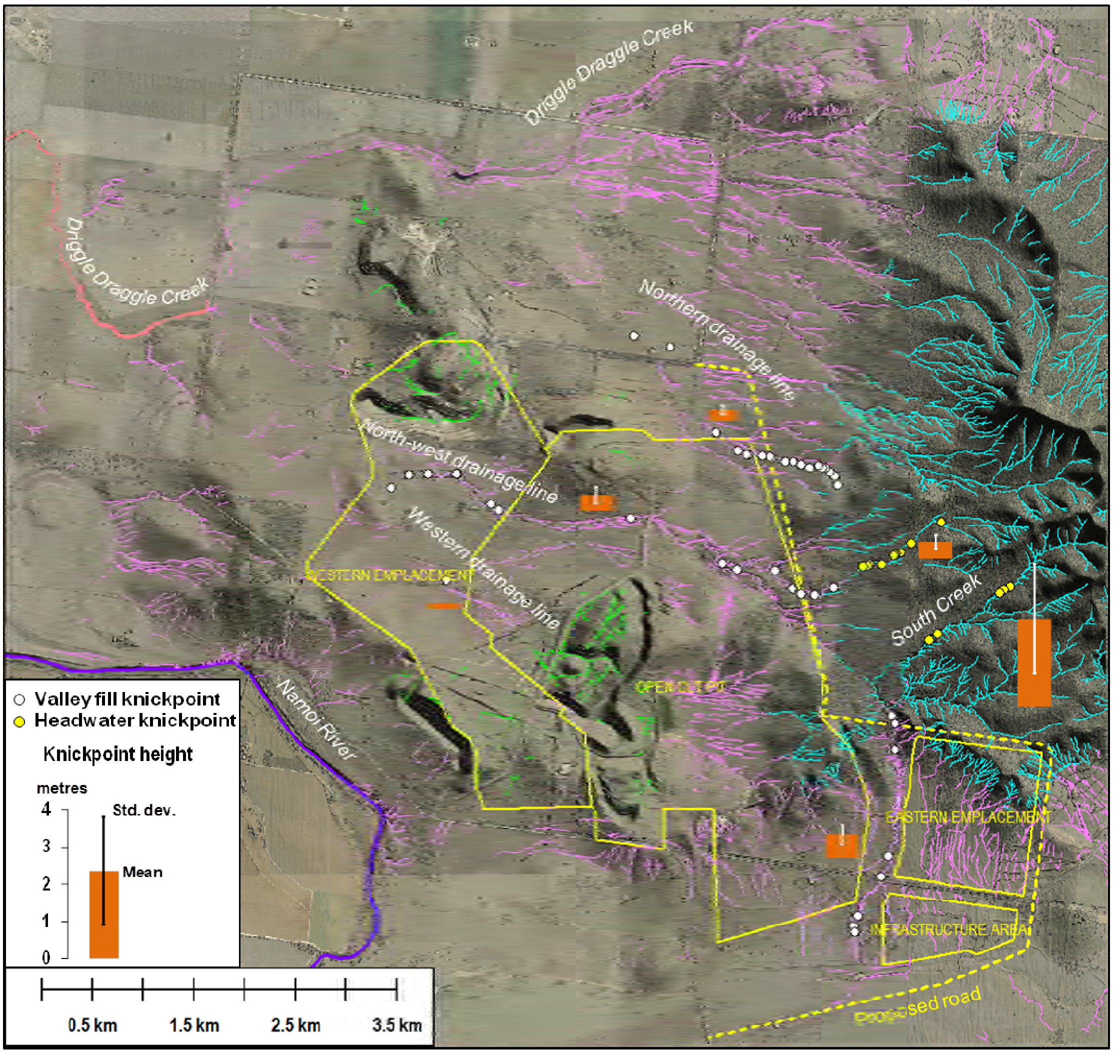

Figure 8. Distribution of knickpoints and their heights in the study area. Each dot represents the location of a knickpoint observed in the field (not all streams were surveyed).

3.8 Large woody debris

Large woody debris density was moderate in the Headwater streams, but in general, Valley fill streams lacked large woody debris as they flowed through light woodland or pasture (Figure 9). Significant quantities of large woody debris would not be expected in Valley fill streams.

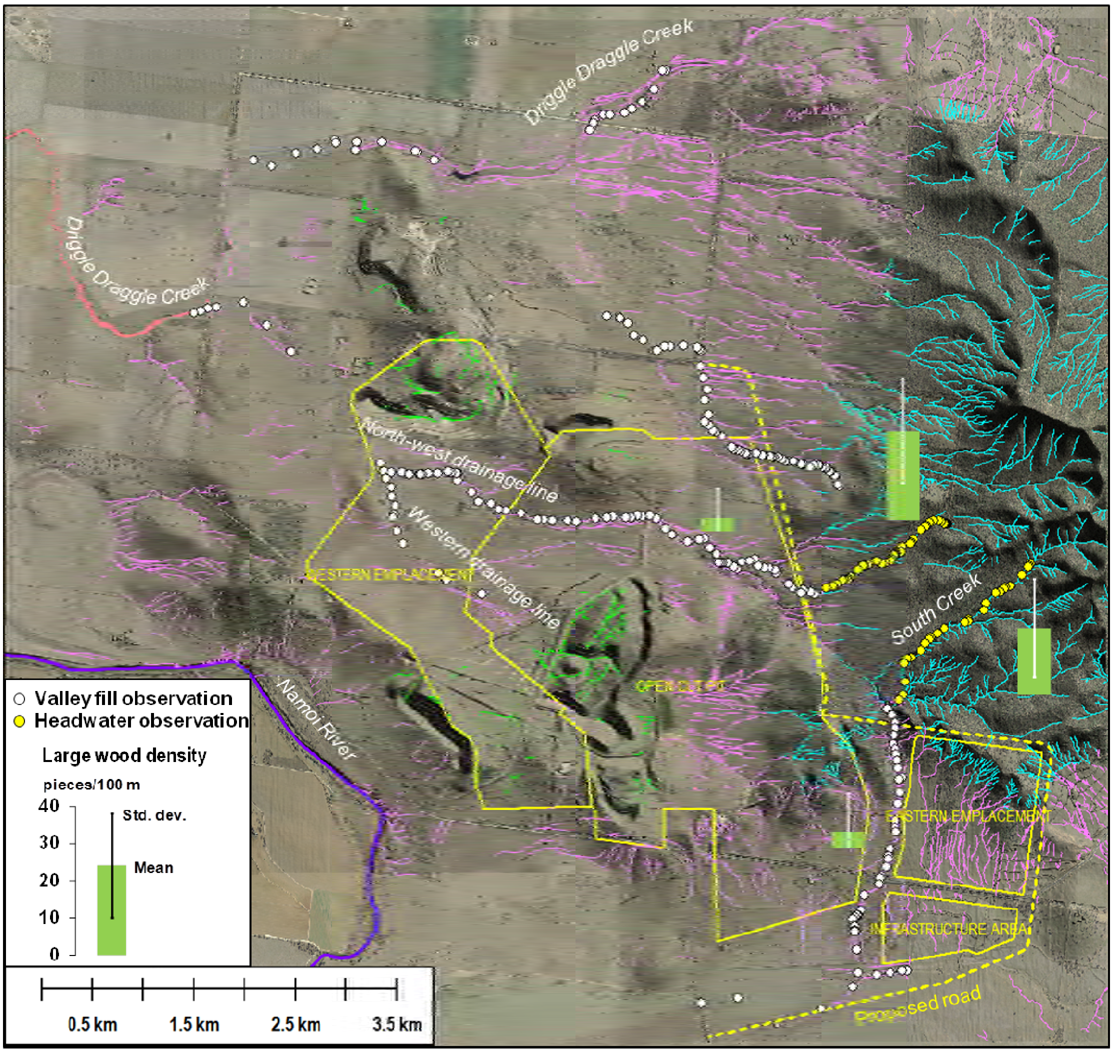

Figure 9. Distribution of large woody debris density in the study area. Each dot represents a field observation (not all streams were surveyed).

3.9 Pools

The headwater streams had naturally variable bed levels, which created water of varying depth. However, only three notable pools were observed in the entire surveyed area (excluding several dams). One pool was observed in the headwaters of South Creek, and the other two pools were formed upstream of track crossings.

3.10 Summary of existing conditions

The majority of the drainage lines within the area that would be directly impacted by the proposed mine are Valley fill type. These streams generally have temporary hydrology, indistinct and discontinuous channel form, cohesive fine-grained bed material, no large woody debris (unless flowing through a wooded area), and low energy. The Valley fill streams have occasional shallow knickpoints present, but typically, the length of channel with scoured bed downstream of the knickpoints is less than 20 m long. In their headwaters, these streams have a well defined channel, flowing in bedrock and coarse-grained bed material, with moderate amounts of large woody debris and low to moderate energy. At the downstream end of the drainage network, Driggle Draggle Creek becomes sufficiently large to form a defined meandering channel.

4 Potential Impacts of the Proposed Project

4.1 Altered distribution of stream power

The impact of the proposed Project on fluvial geomorphological character would be to excavate and emplace waste rock above some existing Valley fill streams, and some existing drainage lines on rehabilitated landforms. Alteration of drainage to divert runoff around the open cut could potentially impact stream form by decreasing or increasing flow.

The Western drainage line and North-west drainage lines will be progressively deprived of runoff as the mine progresses (Figure 2). The runoff of the upper North-west drainage and Northern drainage lines will be diverted northward into the Northern drainage line, which will result in an increase in stream power through the middle stages of the Project (Figure 2). However, the Northern drainage line is a very low energy system, and this small increase in stream power would likely be inconsequential. Overall, there would be a slight decrease in stream power of Driggle Draggle Creek compared with the existing conditions (Figure 2), but the change is so small that it would likely be inconsequential. Similarly, the change in stream power of South Creek would be small (Figure 2), and probably inconsequential.

4.2 Namoi River licenced extraction

A licenced volume of water will be extracted from the Namoi River, near location H in Figure 4. The volume of water involved is a small percentage of the river flow and would not impact geomorphological processes.

4.3 Private haul road between Blue Vale Road and the Whitehaven CHPP

The Project will involve construction of an approximately 1 km long section of private haul road (including an overpass over the Kamilaroi Highway) between Blue Vale Road and the Whitehaven CHPP. This section of road would be constructed on the Namoi River floodplain and pass within about 200 m of the river channel. The main impact of this road would be on the hydraulics of flood flows (considered in the Surface Water Assessment [Appendix B of the EIS]) and no impact on geomorphological processes of the Namoi River is anticipated.

5 Recommended Mitigations and Monitoring

5.1 Mitigations

There is a very small risk that over time, additional runoff to the Northern drainage line as a result of diversion of water around the pit, would increase knickpoint formation in that system. The other streams in the study area will likely become more stable due to reduced runoff. The most important mitigation is maintenance of complete vegetation cover. The energy of this environment is so low that good vegetation cover will virtually eliminate the risk of stream instability.

5.2 Monitoring

On the basis of the analysis presented in this report, only the Northern drainage line warrants monitoring. This should be in the form of an annual inspection on foot, mapping the precise location and height of knickpoints. Any movement in the location of the knickpoint exceeding 2 m, or deepening exceeding 0.5 m, compared to existing conditions, should be reported and ameliorated through erosion control measures.

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