Objections to Wilpinjong Coal Mine Mod 3 – Pit 8 Extension:

As a local resident of Mudgee I am disturbed by the many issues noted while assessing the Geological and Geomorphological documents consultants have prepared to support the Wilpinjong Coal Mine Mod 3 – Pit 8 Extension proposal.
My concerns have led to the following conclusions:

- **Retaining wide grassland perimeters around opencut pits adjacent to forested areas is needed.**
- **Other fauna groups are also significant specialist inhabitants of these habitats and <u>should receive equal consideration</u>**
- **Many flora groups have species that are also specialist inhabitants of or immediately adjacent to these Sensitive Geological Features and need to be considered.**
- **Public Data available from the National Parks and Wildlife Service NSW (NPWS) regarding those species likely to be present in the subject area should be obtained.**
- **The Geomorphological advice provided to Wilpinjong Coal Mines (WCM) has been outdated since 1929 by modern researchers.**
- **<u>Review of this advice should be sought by WCM from its consultants.</u>**
- **Digging of coalmining pits leads to earthquakes that are caused by the industry of mining, as demonstrated at 6.1.1 .**
- **As with blasting, earthquake damage to SGF's may occur in the vicinity of Pit 8 extension.**
- **Ongoing inspections of caves and clifflines to assess blast vibration limits as mining advances towards the east**
- **Performance of representative sensitive geological sites should be monitored on an on-going basis**
- **An annual inspection of representative geological sites be undertaken by an independent geotechnical engineer … to confirm blast related impacts are being avoided for the Project.***"*
- **Pre and post blast surveys focusing on other areas with high susceptibility to blast damage recommended be undertaken.**
- **Results of all the above surveys and other environmental checks be made available for public scrutiny.**
- **<u>The Pit 8 Extension proposal should NOT be approved.</u>**

A "Initial Assessment of Geological Feature Sensitivity – Pit 8 Extension and Rocky Hill"

All quotes below from <u>these documents</u> are in "italics". "<u>Underlined</u>" words or phrases are issues this submission addresses. **Bold text highlights objections to or issues noted within documents A and B.**

4.3 Sensitive Geological Features (SGF's)

"*The Modification proposes to extend mining operations into a largely cleared valley that is bordered to the north by the Goulburn River National Park and several small hills within WCM owned land (figure 3). The valley itself is surrounded by vegetated hills and sandstone ridgelines*"

Many mammal, bird, and reptile species shelter in the surrounding hills each day. Here they are offered the protection provided by Sensitive Geological Features and other rocky or difficult terrain, and forest or shrublands. However the" Sensitive Geological Features" are only part of the essential habitat for many creatures.

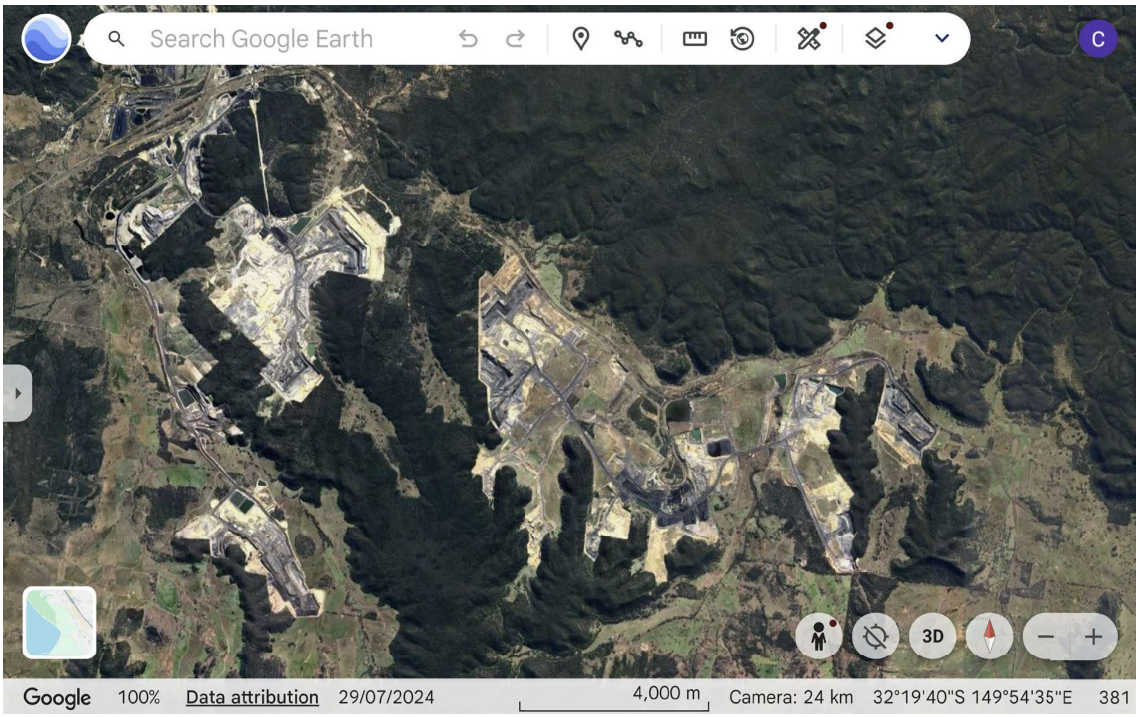
Around sunset many of these animals leave these protective hills and ridgelines to reach the adjacent valley grasslands to feed overnight. Roadkill Wombats, Wallabies and Kangaroos are often evidence of these movements. Owls and other nocturnal hunters may also have this daily routine. These movements frequently observed while working as the National Parks and Wildlife Service (NPWS) Ranger for the northwest 1/3 of Wollemi National Park. Many park neighbours also commented on these movements.

Opencut pits remove the majority of feeding places for this wildlife. Species population numbers locally must be impacted. Consequently local extinctions occur, which for particularly threatened species such as Brush-tailed Rock Wallabies can lead to regional extinctions or worse.

Retaining wide grassland perimeters around opencut pits adjacent to forested areas is needed. Such perimeters may have existed at these places in the past but now rarely at this or other local mines. Now the disturbed pit areas are mostly immediately adjacent to the forest, including the boundary of NPWS managed lands.

- **Retaining wide grassland perimeters around opencut pits adjacent to forested areas is needed.**

Moolarben and Wilpinjong opencut mine sites 29/07/2024:



"…. there is likely to be a large diversity of specialist fauna species that inhabit the sandstone cliff lines and ridges … <u>These include</u>, but are not limited to :

- *Threatened microbat species;*
- *Reptiles and amphibian species; and*
- *Mammal species."*

Mammals included Brush-tailed Rock Wallabies (BTRW) which were present in this district. They favoured habitats found in areas of "Sensitive Geological Features"(SGF's). CSIRO wildlife researchers undertook BTRW social habits research in the Phipps Cutting area of Wollemi National Park during the 1970's. BTRW surveys occurred in the late 1990's in the area, but without success in finding evidence of their remaining in this Upper Hunter – Goulburn River vicinity. They now appear to be locally extinct in this region.

- **Other fauna groups are also significant specialist inhabitants of these habitats and <u>should receive equal consideration.</u>**

<u>They include</u> :

- Birds (Swallows, Martins, nesting Lyrebirds, et al)

- Insects (Wasps, native Bees, et al)

<u>Many flora groups have species that are also specialist inhabitants of or immediately adjacent to these Sensitive Geological Features and need to be included</u> . Many of these species are also poorly researched and may be very localised in their distribution and consequently potentially Rare and/or Threatened. These may include:

- Lichens, Mosses and Liverworts;
- Rock and other Orchid species;
- Ferns;
- Sandpaper Figs, other specialised shrubs and trees;
- other lithophytic plants.

<u>* Many flora groups have species that are also specialist inhabitants of or immediately adjacent to these Sensitive Geological Features and need to be considered.</u>

4.4 Available Data

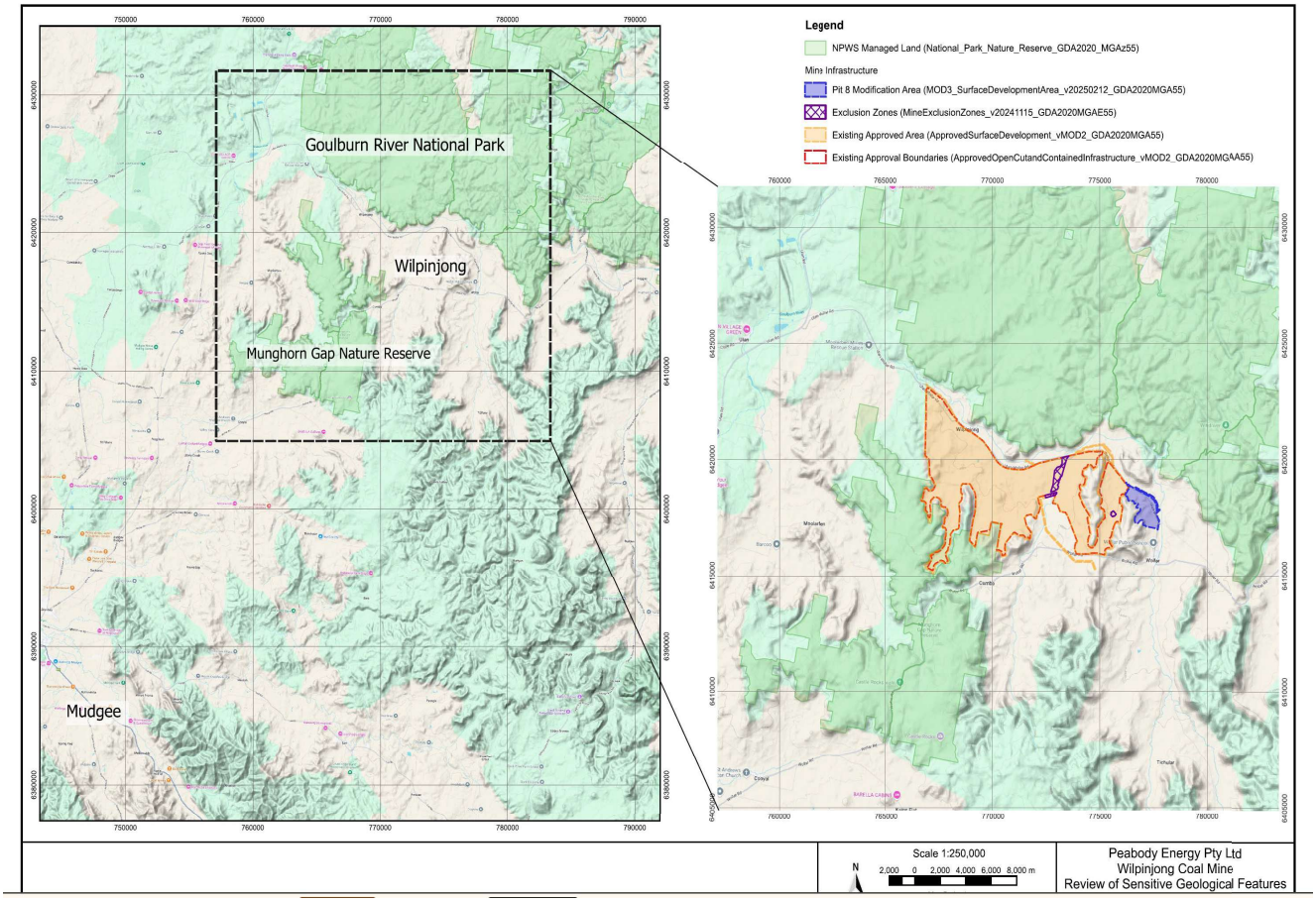
"*PSM has examined private and public data sources to inform this assessment including:*

- *Private Data .....*
- ***<u>Public Data</u>***
  - *2 m Digital Elevation Model*
  - *Historical satellite photography*
  - *Geological mapping from the NSW survey (Seamless Geology)"*

However despite reference in **4.3** above to "*a large diversity of specialist fauna species that inhabit the sandstone cliff lines and ridges*" but incomplete listing of these species groups, **there has been no listed inquiry regarding the Public Data available from the National Parks and Wildlife Service NSW (NPWS) regarding those species likely to be present in the subject area. Vegetation and animal surveys have been conducted in the adjacent Munghorn Gap Nature Reserve and Goulburn River National Park. Rare and/or Threatened species present are listed in the survey reports.**

- **Public Data available from the National Parks and Wildlife Service NSW (NPWS) regarding those species likely to be present in the subject area should be obtained.**

Location map showing adjacent NPWS managed lands included below:



6. Engineering Geology Model

6.1 Rock Mass Classification

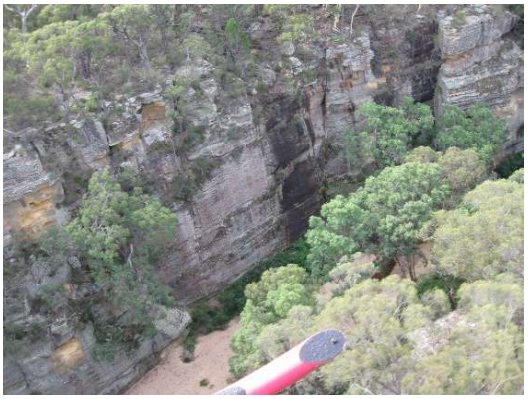
"*.....the rock mass surrounding the project comprises .....*

- ***Sandstone: ...****pale -yellow orange to pale grey* ....
- ***Siltstone: .....***
- ***Conglomerate:*** *Pale yellow and grey*. .....
- *Fresh to slightly weathered"*

"Fresh to slightly weathered" Sandstone in this condition most likely be seen where there has been recent large rockfalls, as shown at rockfall Inset 7B. **Much of the rock mass has been impacted by chemical weathering of the sandstone and conglomerate, which has occurred over very long periods of time. Both 'case hardening' and 'core softening' processes are widespread within sandstone masses.** Slightly acidic groundwater seeping through the sandstones has led to the dissolution of silica and iron. Precipitation of this iron oxide and silica in pore spaces near the rock surface has led to **case hardening** (as seen in Inset 14A and others) **"a process which increases the hardness and reduces the permeability of the affected zone"** (Young, R.W. et al, 2009, p.150).

"**Core softening**" occurs as a result of the dissolution of silica and iron by "seepage water through the blocks of sandstone, and not just down fractures. Extension of the cavern occurs by granular disintegration of the active surface after solutional weathering has destroyed interlocking and cementation within the micro-framework of the sandstone." " ... chemical – rather than mechanical – weathering is almost invariably the dominant agent." (Young, R.W. et al, 2009, pp.152 and 144). Insets 14A and 15 also show the pale-yellow orange associated with core softening.

Lichens and algae establish on the **hard and stable case-hardened surfaces**. From a distance the sandstone appears grey. Close inspection mostly reveals the hard lichen covered rock skin to be a variety of lichen colours – the rock colour is obscured.



"*Siltstone in rock outcrops is prone to accelerated weathering due to its poorly cemented character:*
• The accelerated weathering of siltstone units undercuts and promotes the formation of caves and sandstone/conglomerate overhangs."

Sandstone Geomorphologists R. W. Young et al, 2009, have a different explanation :

"The majority of recesses developed along shale or claystone beds that we have seen below sandstone cliffs involve brittle fracture, not plastic deformation (Fig. 3.5). …. The claystones in the recess are certainly altered, by seepage or subaerial weathering, but the fragments are generally still quite resistant to plastic deformation. Nonetheless, close inspection of many undercut faces reveals that it is not always the clayey rocks, but rather **sandstones immediately above them that are the focus of disintegration and the formation of a recess.** The primary cause again seems to be a reduction in the strength of the rock. Pells (1977) has demonstrated that the uniaxial strength of the Hawkesbury sandstone is reduced by more than 50% from a dry to a fully saturated condition." (Young, R. W. et al, 2009, pp. 58-59).

"***Type1, 2, 3*** *Sandstone caves: ….. 'Exposure to elements have formed a hard shell around the detached blocks. Erosion of the softer interior by wind creates deep isolated caves …… '"*

Again, Sandstone Geomorphologists R. W. Young et al have a different explanation :

"*Hard Shell"* formation: Much of the rock mass has been impacted by chemical weathering of the sandstone and conglomerate, which has occurred over very long periods of time. Slightly acidic groundwater seeping through the sandstones has led to the dissolution of silica and iron. Precipitation of this iron oxide and silica in pore spaces near the rock surface has led to case hardening, "a process which increases the hardness and reduces the permeability of the affected zone" (Young, R.W. et al, 2009, p.150).

by wind" "It is the movement of water through the rock that initiates and expands caverns. It has long been recognised that active weathering within caverns involves disintegration of the rock, so that loose grains fall from the surface and accumulate on the floor. . Debris may be (but often is not) removed by wind, and **contrary to much popular opinion – sand-blasting is not the means by which caverned niches are formed** (Blackwelder, 1929)" (Young, R.W. et al, 2009, p.148).

- **The Geomorphological advice provided to Wilpinjong Coal Mines (WCM) has been outdated since 1929 by modern researchers.**
- **Review of this advice should be sought by WCM from its consultants.**

6.1.1 Natural Processes

"The dominant processes include:

- *Weathering and erosion of soil and rock material, including saturation from extended wet periods;*
- *Differential erosion of siltstone beds undercutting sandstone/conglomerate beds;* [read 6.1 above !]
- *Surficial slumping of loose soil mass and rock mass;*
- *Thermal fluctuations including intense bush fire;*
- *Individual rockfalls and landsliding; and*
- *Flora and fauna-initiated processes such as root jacking.*

"…….. a blocky rock mass may be more susceptible to impact from natural processes [including earthquakes !] *where loosening and minor damage has occurred due to blast vibrations. Impacts to the landform as a result of these processes would be visibly similar to the expected outcomes from 'minor' blast damage if blast damage were to occur."*

Cavernous weathering is commonly found in areas of "Sensitive Geological Features" (SGR's). These features are fragile and may be damaged by vibrations from both blasting and mining-caused earthquakes.

Earthquakes are not included in the list of natural processes that could impact Sensitive Geological Features. **Development of opencut coalmining pits can influence the magnitude and frequency of earthquakes potentially leading to collapsed SGF's**. The increased frequency of earthquakes in the vicinity is evidenced by the Geoscience Australia records below: visit https://earthquakes.ga.gov.au/helpThe first Geoscience Australia website earthquake map below shows earthquakes greater than Richter 2.5 that occurred in the Hunter Valley and surrounds during the 10 year period 26/10/2015-2025.

Obvious are the earthquake concentrations around the opencut Yancoal Moolarben mine and Peabody Wilpinjong mine (both between Ulan and Wollar), BHP Mt Arthur mine (south of Muswellbrook), and the 50/50 Peabody/Glencore Wambo mine (south of Singleton).

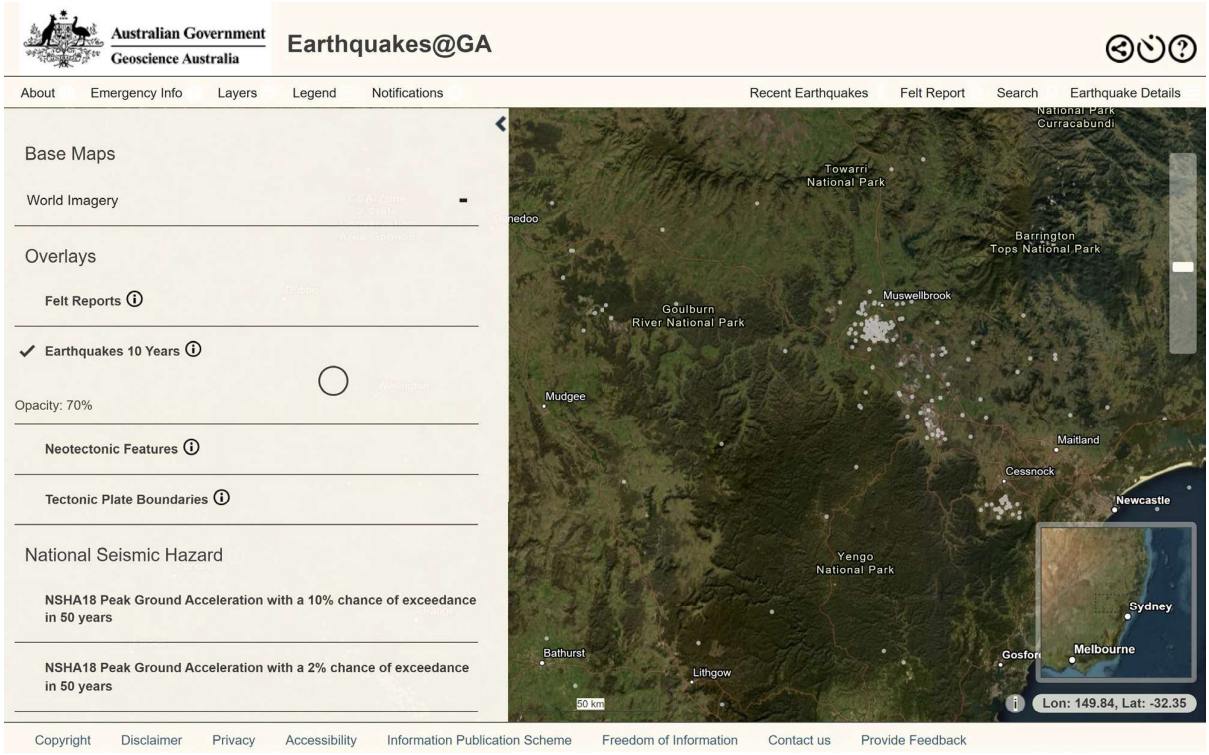
The continuation of earthquakes in the vicinity of mining final voids may occur for an unknown period of time, with consequent continuing potential impacts on Sensitive Geological Features.

Continuing earthquakes associated with ground subsidence have been recorded around the underground Austar Mine. It is south of Cessnock also shown below. This Yancoal mine was closed following underground miner deaths in 2014. Investigation identified the following contributing factors to the incident:

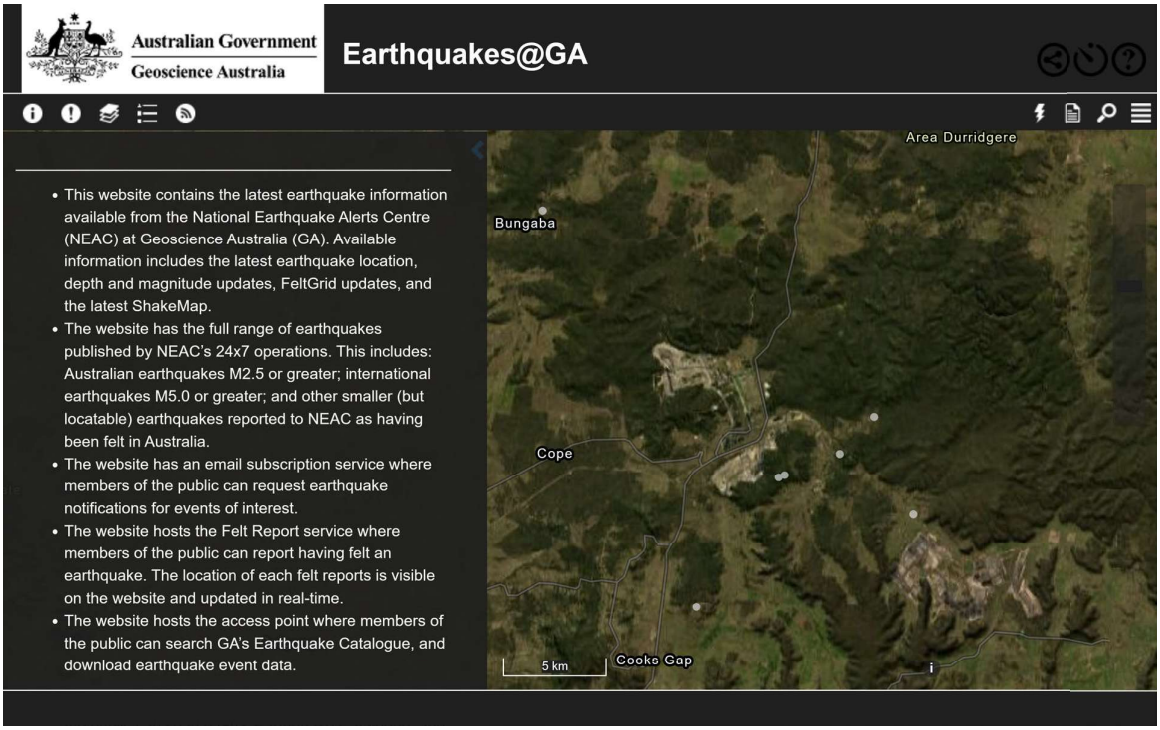
- high levels of pre-mining vertical stress due to the depth of mining (+500 m);
- presence of disturbed structural geology in the region; and
- variable thickness massive sandstone units in the near roof overburden.

While on the GA website https://earthquakes.ga.gov.au/restore/057d1bc6-fb2d-45c9-9dd4-5d2db0969350 left click on any earthquake epicentre dot to access information about that earthquake.

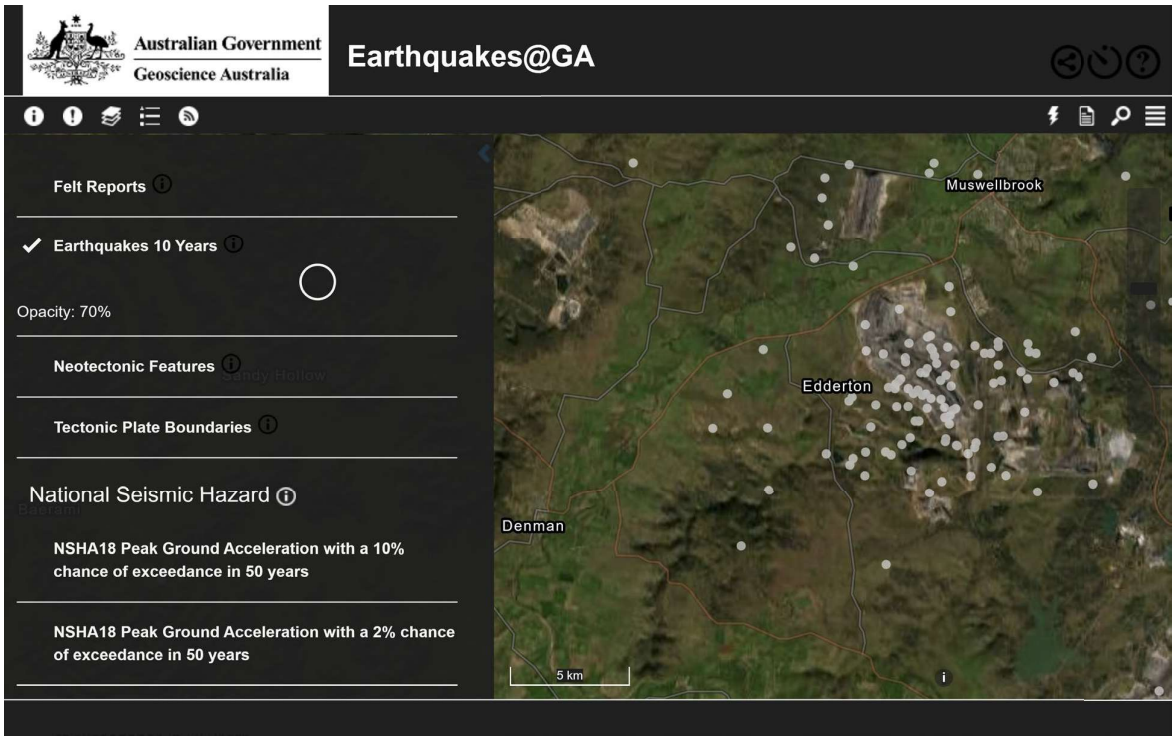
Zoom in on that dot to see fine details of the topography and landuse, including opencut mining, at that site.



- Earthquakes are also recorded in the vicinity of other Hunter Valley mines.
- Other quakes shown away from Hunter Valley are mostly due to natural causes.
- Earthquakes can be related to “Isostatic rebound”, including following erosion events, such as open-cut mining and mountain erosion, and post-glacial melting of ice sheets.
  Explained on link: https://www.youtube.com/watch?v=3rk2jx3eRDE
- Opencut coalmining pits replicate erosion of the earths’ crust. The weight loss of overburden and coal removal causes the crust to **isostatically rebound**, leading to rock strata cracking causing earthquakes.
- **The Moolarben-Wilpinjong earthquake cluster <u>shown below</u> very likely will become more extensive following further extension of opencut coalmining pits such as Pit 8 extension.**
- **Sensitive Geological Features will be at risk from earthquakes caused by nearby coalmining pits in the same way that mine blasting may cause damage.**



- **Below is <u>BHP Mt Arthur opencut mine</u>:**



Tennant Creek Earthquake 1988:
Australia's biggest recorded earthquake occurred in a region thought to be tectonically stable with no recent recorded events. "Within 12 hours on January 22,1988, three major earthquakes with surface-wave magnitudes (Ms) of 6.3, 6.4, and 6.7 struck the Tennant Creek area, Northern Territory, Australia.
These earthquakes occurred in the interior of the tectonically stable Precambrian shield of the Australian plate, about 1,500 km from the nearest plate margin. They join a group of only nine other historic intraplate earthquakes in the world that have produced documented surface ruptures in stable continental interiors. The Tennant Creek earthquakes produced surface ruptures along two major fault strands that have a total length of about 32 kilometres." Crone, J. et al (1992)

Faults in this kind of tectonic setting have **long time intervals between surface ruptures –likely more than 100 to 1,000's of years**.

- **The recorded lack of such big earthquakes in the Upper Hunter region gives no assurance such an earthquake will not happen here.**

"The 1989 Newcastle earthquake was an intraplate earthquake that occurred in Newcastle, New South Wales, on Thursday 28 December. The shock measured 5.6 on the Richter scale and was one of Australia's most serious natural disasters, killing 13 people and injuring more than 160. The damage bill has been estimated at A$4 billion (or $9.5 billion in 2022, adjusted for inflation). .... the former head of the earthquake monitoring group at Geoscience Australia, Dr David Denham, (said) that the Newcastle earthquake occurred some distance from mining activity: 'The depths of the focus of the earthquake was about 13-14 kilometres, **whereas the ones associated with mining, they're actually right close to the mine, because that's where the stress release takes place**.' " Wikipedia (2025).

7.1.1.1 Other Failure Methods Impacting Natural Environment

"*Adding to the complexity of distinguishing damage to the natural environment is that damage to the rock mass can occur by processes other than blasting, including:*

- *Earthquakes, which cause ground motions that are very similar to blasting,*
- .....

These failure methods are naturally occurring and ongoing, and observable in any natural environment."

Earthquakes are only listed here, and were not listed at "*6.1.1. Natural Processes*" above.

- **Digging of coalmining pits leads to earthquakes that are caused by the industry of mining, as demonstrated above at 6.1.1 . As with blasting, earthquake damage to SGF's may occur in the vicinity of Pit 8 extension.**
- **<u>The Pit 8 Extension proposal should NOT be approved.</u>**

7.2 Current Published Vibration Limits

"*Currently there are no regulatory criteria in Australia for restricting impacts onf natural landscapes subject to blast vibrations, or what distinguishes significant from insignificant blast damage."*

7.2.1 Blast Damage Classification

*"In view of this, **blasting performance criteria** have been developed for Wilpinjong Coal Mine (WCM)*

*"**Indistinguishable** – Effectively no material impact on the landscape .....*

"Minor – Blast vibrations may cause minor cosmetic change to the landscape, but not at a scale significantly larger or significantly more widespread than existing natural processes .....

"Moderate - Similar to Minor category, but with slightly larger damage volumes up to several m^3 and/or noticeably higher frequency of damage through the area than that which occurs under influence of existing natural processes.

"Major - Large impacts that exceed the Moderate Damage category ... "

*" ... there should be **<u>indistinguishable</u>** damage as a result of mining to sensitive geological features surrounding the WCM and the proposed Pit 8 modification extents.*

"As such the level of damage arising from mining can be designed to limit impacts to those that are indistinguishable from natural processes."

" ... current Consent Conditions for the WCM ... requires no damage to moderate to high Aboriginal cultural heritage significance rock shelters, and no more than negligible damage to low Aboriginal cultural heritage significance rock shelters, in the Munghorn Gap Nature Reserve.

"Negligible is defined in the Consent Conditions as 'Small and unimportant, such as to be not worth considering'.

Surveys including photography have been undertaken along all SGF's that may be impacted by the Pit 8 extension. Comparisons can be made during inspections during and following mining operations.

"9 Conclusions and Recommendations

It is understood that Blast Plans will be developed to ensure satisfaction of satisfy the above conditions.

"Recommended actions include:

- *"Ongoing inspections of caves and clifflines to .... assess blast vibration limits .....as mining advances towards the east*
- *"Performance of representative sensitive geological sites ... should be monitored on an on-going basis*
- *.... "*

" ... recommended that an annual inspection of representative geological sites be undertaken by an independent geotechnical engineer ... to confirm blast related impacts are being avoided for the Project."

Pre and post blast surveys focusing on other areas with high susceptibility to blast damage recommended be undertaken.

- **It is expected that results of all the above surveys and other environmental checks be made available for public scrutiny.**

B "Att 3: Geotechnical Considerations" - Encompass Mining Solutions

Slope stability analysis taking into consideration the various rock types found within the Coal Measures appear to satisfy stability requirements for the mining operations proposed.

- **The recommendation "*that active and non-active areas are frequently monitored for early detection of potential slope instability*" be undertaken as prescribed.**

REFERENCES:

Young, R. W., Wray, A. L., and Young, A. R. M. (1992). *Sandstone Landforms* Cambridge: Cambridge.

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Anthony J. Crone, Michael N. Machette, and J. Roger Bowman (1992*)*. Geologic Investigations of the 1988 Tennant Creek, Australia, Earthquakes - Implications for Paleoseismicity in Stable Continental Regions *U.S. Geological Survey Bulletin 2032-A*

Mine Safety Investigation Unit – NSW Department of Industry Skills & Regional Development (2015) - *Report into the deaths of James Mitchell and Phillip Grant at the Austar Coal Mine…2014*. NSW Mine Safety Investigation Report, October 2015.

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