CF Pavich Submission – Bowdens Silver SSD 5765 - IPC Determination _ March 2023 - FINAL

CF Pavich Submission – Bowdens Silver SSD 5765 - IPC Hearing 15 February 2023

Dear Commissioners

- My bachelor's degree Macquarie University (1969-73) majoring in Geology / Geomorphology
- In Australia have worked as a Snowy Mtns Authority Trades Labourer, Geo-consultant, Project Officer and Ranger at various levels in the ACT and NSW at Parks and Reserves 1969-75, and 1980-2011 NSW between Tibooburra and Lord Howe Island. Worked 4yrs in UK 1976 -79 as Engineer (Loch Kishorn, Scottish Highlands), Senior Ranger (Croxteth Country Park, Merseyside), and Engineering Geologist (Northern England and Southern Scotland).
- Lived and worked in this Mid-Western Region since 1990, retiring 2011 from NPWS NSW was the ranger for northwest 1/3 Wollemi National Park but continuing consulting in Wollemi since then.
- Memberships of Ulan Glencore Community Consultative Committee, Macquarie-Cudgegong Environmental Water Advisory Group, Geological Society Australia (Associate), and various Australian environmental organisations.

Please also refer to my Bowdens Silver IPC Hearing Presentations – both Powerpoint and oral presentation transcript.

1 SEARS requirements NOT met:

- 1. The SEARs have not been met in key 'mine viability-determining' areas.
- 2. The IPC Commissioners have not been provided with the evidence they need to make a properly-informed decision i.e. it's not approval-ready
- 3. Referring these key unanswered questions to the Conditions of Consent lowers the bar of approval as the revised management plans will not be reviewed by the IPC but rather the Planning Secretary (who may well not request independent review by DPE's external experts)
- 4. This process unfairly gives the mine a 'foot in the door' a foot that may be very hard to remove down the track.
- 5. It would be a failure of due process for the IPC to take this pathway without first seeing these revised management plans and confirming that the SEARs have indeed been met.

2 Lessons from Other Mines

1) Tailings Storage Facility and other water retention dams, waste rock emplacement Failures

"Tailings Storage Facilities (TSF)" and "Waste Rock Emplacements WRE)" around the world are prone to failure. Some events follow natural events such as extreme rainfall events and earthquakes, but many are also due to human factors, including accidents, miner incompetence, industrial and other social issues, financial collapse, geo-political events, corruption, ignorance, and a wide range of other issues.

Clarence Colliery – Newnes Plateau (above Lithgow)<u>https://www.abc.net.au/news/2017-05-08/blue-mountains-</u> coal-mining-waste-dam-collapse-in-court/8506572 and

https://www.dcceew.gov.au/sites/default/files/documents/potential-cumulative-impacts-mining-ouv-greaterblue-mountains-area.pdf - In July 2015, coal fines from the Clarence Colliery spilled into the Wollangambe River. Centennial Coal mining company was required to remediate the damage. Pollution from the mine extends at least 22 km downstream in the Wollangambe River from the outflow of coal mine wastes, impairing the aquatic ecosystem by reducing the abundance and taxonomic richness of all pollution-sensitive life. The company had earlier been advised by a geotechnical engineer that work was needed to stabilise the dam. No company staff or government agency ensured such works happened.

Many similar incidents have occurred in NSW, Australia, and around the world. I have inspected many of these locations. Such mining companies cannot be trusted to follow even their own professional advice without strong government regulatory oversight. Such government agency oversight must be environmentally effective both

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Before this initial Bowdens Silver project is given an approval determination by the IPC, it must be satisfied all such government agency actions have been and onward will without failure be undertaken.

Such government agency actions have been deficient at very many local and worldwide Copper–Gold–Silver-Lead-Zinc, Iron Ore, Coalmining, and most other types of mining operations. Local examples with on-going issues involving tailings dam and waste rock include not only Clarence Colliery, but Glen Davis and Canyon Collieries, Sunny / Dark Corner, and further away Yerranderie, Captains Flat, and many others in Australia. Internationally Australian companies have been implicated recently in such events at Ok Tedi in PNG, Brazilian Iron Ore mines, Peru, and many other locations.

2) Extreme Rainfall and Flood Events - Queensland Coalmines 2010-11

https://en.wikipedia.org/wiki/2010%E2%80%932011_Queensland_floods

http://www.floodcommission.qld.gov.au/ data/assets/pdf_file/0017/11717/QFCI-Final-Report-Chapter-13-Mining.pdf

"Prolonged rainfall over Queensland's mining regions during the 2010/2011 wet season severely affected the industry. Huge volumes of water poured into pits and leaked into underground areas. **Following years of drought, some mines had been designed to catch as much runoff as possible**.¹ Storage facilities and dams became so full that operators were forced to pump excess water into pits.² Access to equipment, storage facilities and monitoring sites was cut.³ Gigantic mining equipment was swamped by floodwaters."

"Eighty-five per cent of Queensland coal mines had to either restrict production or close entirely.⁴ The economic repercussions of these events were a loss of \$5.7 billion⁶ "

https://www.miningreview.com.au/under-the-pump/

The need for the Bowdens Silver project to retain as much rainfall as possible to facilitate its operations means that, as in the above cases, there will likely be very limited flood mitigation capacity at the mine site.

Climate Change and associated increasing severity and frequency of extreme weather events must be adequately incorporated into planning and managing all mining (and other) developments. The Bowdens Silver project does not adequately address this issue. An IPC Approval determination must not be given.

a) Ok Tedi Au Mine– PNG - https://en.wikipedia.org/wiki/Ok Tedi environmental disaster caused severe harm to the environment along 1,000 km (620 mi) of the Ok Tedi River and the Fly River in the Western Province of Papua New Guinea between around 1984 and 2013. The lives of 50,000 people have been disrupted. One of the worst environmental disasters caused by humans, it is a consequence of the discharge of about two billion tons of untreated mining waste into the Ok Tedi from the Ok Tedi Mine, an open pit mine situated in the province. This mining pollution was caused by the collapse of the Ok Tedi tailings dam system in 1984 and the consequent switch to disposal of tailings directly into the river for several decades. It was the subject of class action litigation brought by local landowners naming Ok Tedi Mining and BHP Billiton. In 1984 an earthquake caused the half-built dam to collapse. The company continued operations without the dam, initially because BHP argued that it would be too expensive to rebuild it. Subsequently, the Government of Papua New Guinea decided a dam was not necessary, in the wake of the closure of the Panguna mine.

Company and government profit concerns were considered more important than environmental and health values. Public political pressure required to encourage government to ensure companies place more emphasis on environmental and health values. However in PNG many community members accepted the government action of continuing mining.

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b) BHP Billiton-Vale Iron Ore Mine – Brazil - The Mariana dam disaster, also known as the Bento Rodrigues or Samarco dam disaster, occurred on 5 November 2015, when the Fundão tailings dam at the Germano iron ore mine of the Samarco Mariana Mining Complex near Mariana, Minas Gerais, Brazil, suffered a catastrophic failure, resulting in flooding that devastated the downstream villages of Bento Rodrigues and Paracatu de Baixo (40 km (25 mi) from Bento Rodrigues), killing 19 people. The extent of the damage caused by the tailings dam collapse is the largest ever recorded worldwide, with pollutants spread along 668 kilometres (415 mi) of watercourses. <u>https://en.wikipedia.org/wiki/Mariana_dam_disaster</u> Corrupt government actions, or lack of action, require public political pressure and an equivalent of ICAC to assist better industry regulation

3) Acid Mine Drainage Damage (AMD)

- Yerranderie Ag Mines approx halfway between Oberon and Camden
- Sunny and Dark Corners Au Ag Cu Zn Pb Mines north of Yetholme,
- Captains Flat Cu Au Ag Pb Zn Mine- southeast of Canberra

https://www.aph.gov.au/DocumentStore.ashx?id=1d53f22a-f147-40a9-b86a-3845fd3dcd74&subId=463888

- AMD is worldwide a very serious issue.
- Derelict mines are frequently AMD sources. There are some 7000 derelict mining sites in NSW with about 550 major derelict mines sites across the state that require significant rehabilitation action
- Because no current person and/or company can be held responsible for the rehabilitation derelict mines, any liabilities associated with these sites are the responsibility of the NSW Government.
- The top 50 of these sites are severely adversely impacting the environment and may pose a risk to human safety.
- Sites such as Yerranderie (Sydney Catchment Authority area), Sunny Corner near Lithgow, and Captains Flat (near Queanbeyan) contribute elevated metal and sediments loads to downstream waterways [including respectively Lake Burragorang Warragamba Dam, Turon River tributaries Burrendong Dam, and Lake Burley Griffin]
- Estimated that it would cost \$40- to \$50 Million to address environmental and safety issues at the top 10 worst sites, and \$80 Million to address the top 50 sites
- The Government currently provides for less than \$2 Million annually to the NSW Derelict Mines program. At this rate it will take 25 and 50 years to address the top 10 and 50 sites respectively <u>https://www.smh.com.au/environment/sustainability/108m-set-aside-in-nsw-budget-to-remediatedisused-mines-20210615-p58186.html</u>
- This money allocated does not consider the accelerating need for ongoing maintenance at other sites and sites that have not been sustainably rehabilitated.
- Industry does not contribute financially to fund derelict mines rehabilitation.
- The current funding is only adequate to maintain "band aid fixes" for a few major sites and conduct studies and prepare Remedial Action Plans.

Public political pressure is required to encourage governments to arrange additional funding to address these many legacy issues.

We must be assured the Bowdens Silver project will always have adequate funding to implement full effective rehabilitation and on-going site management for hundreds of years. If not, an IPC Approval determination must not be given.

4) Earthquake activity - level of risk in Australia – Bowdens Silver TSF Faultlines

Mudgee – Lue region has many geological faults, including underneath the Bowdens Silver proposed Tailings Storage Facility. The region experiences minor earth tremors along such faults regularly. Most are unnoticed. **There is no discussion in the Bowdens Silver EIS mine site geology description regarding faulting and associated potential for earth tremors /quakes**.

But as the Newcastle and Tennent Creek events described below demonstrate, we must expect the unexpected.

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"Australia is seismically active and earthquakes pose a substantial risk as demonstrated by the deadly magnitude 5.6 Newcastle earthquake of 1989. This was one of the most serious natural disasters in Australia's history. The earthquake claimed 13 lives

- 160 people were hospitalised
- 50,000 buildings were damaged (approximately 40,000 of these were homes)
- 300 buildings were demolished
- 300,000 people were affected and 1,000 were made homeless
- It left a damage bill estimated to be about \$4 billion
- The effects were felt over an area of about 200,000 sq. km, with isolated reports of movement up to 800km from Newcastle
- Damage to buildings and facilities occurred within a 9000 sq. km region
- Earthquakes offshore south-eastern Australia have exceeded ML=7

"The largest earthquake that can occur in Australia is not yet known but is expected to be above Richter Magnitude 7, roughly similar to large Californian earthquakes. For example, the 1988 Tennant Creek earthquake had a Richter magnitude around 6.9, slightly larger than the 1994 Northridge earthquake near Los Angeles (Magnitude 6.7) that resulted in \$US 15 billion and cost 57 lives." <u>http://www.quakes.uq.edu.au/quakeinfo.html#6</u>

"Prior to this event, the Tennant Creek area exhibited no seismic activity whatsoever despite being well monitored."

https://community-safety-production.ga.gov.au/data-and-products/neac



https://earthquakes.ga.gov.au/#



CF Pavich Submission – Bowdens Silver SSD 5765 - IPC Determination _ March 2023 - FINAL The Cessnock district is a tremor hotspot – many faultlines are recorded there. Southwest of Muswellbrook is another hotspot, where there are also several significant faultlines. But no significant earthquakes have happened at those locations.

Note that in the last 10 years as shown on the above map no urban Newcastle Earth tremors >Richter magnitude 2 have been recorded. But in 1989 the Newcastle earthquake shock measured 5.6 on the Richter magnitude 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 \$8.5 billion in 2018 values. <u>https://en.wikipedia.org/wiki/1989_Newcastle_earthquake</u>

No earth tremors more than R2 have been recorded in the Lue area. Lack of recent activity is no measure of the likelihood of a significant seismic event occurring. <u>https://neotectonics.ga.gov.au/feature/442853</u>

The Bowdens Silver EIS - (2020) Section 2.2.2 Mine Site Geology description does <u>not</u> discuss any faulting or potential impacts. However the **EIS Mine Site Geology** <u>map</u> does show a continuation of the Walkers Lane geological fault up to the vicinity of the edge of the Tailings Storage Facility ("TSF Faultline"):



CF Pavich Submission – Bowdens Silver SSD 5765 - IPC Determination _ March 2023 - FINAL Interestingly, the Figure 11 Surface Geology map below provided by the specialist consultant addressing Groundwater issues – Jacobs Group Australia P/L - shows **the same fault** *extending all the way* **underneath the proposed Tailings Storage Facility** and some distance beyond:



JACOBS - Jacobs Group (Australia) Pty Limited

According to the report "Stratigraphy, Structure and Mineralisation of the Mudgee 1:100 000 Geological Map Sheet" <u>https://search.geoscience.nsw.gov.au/product/731</u> reactivation of old fault lines has occurred at a number of locations in the Capertee Zone, within which the Bowdens Silver project is proposed. As in very many locations locally, in the remainder of Australia, and worldwide, when planning and managing facilities where old faultlines lie earthquake potential exists, and we must expect the unexpected.

Should movement along the existing faultline under Bowdens Silver Tailings Storage Facility (TSF) occur, increased mobilisation of the toxic residues held in the TSF could have very severe water quality and sediment toxicity consequences downstream along Lawson Creek and the Cudgegong River. Should the structure be breached, or the lining is damaged or even just deteriorates with age, security of the TSF is compromised. Other site features including the WRE, leachate ponds, and other infrastructure are also at risk. These have been described in a number of the other submissions discussing water management that this IPC case has received.

The Thirlmere lakes that were apparently significantly drained by distant underground mining reflects the uncertainty of geological factors. Expert advice again reminds us there are many critical geological factors that no-one adequately knows the existence or extent of when planning and managing mining operations.

https://www.ipcn.nsw.gov.au/resources/pac/media/files/pac/project-submissions/2020/10/tahmoor-south-coalproject-ssd-8445/20210224t165746/unsw_kingsford_thirlmere-lakes_may2016.pdf CF Pavich Submission – Bowdens Silver SSD 5765 - IPC Determination _ March 2023 - FINAL There is no expert certainty regarding groundwater movement and following consequences –the models on which groundwater management plans are based are always undergoing constant revision in the light of on-going monitoring and research.

Consequently the planning and management of Bowdens Silver project facilities is of critical significance to all downstream users. Gulgong residents are particularly vulnerable. All their potable water is impacted by any Lawson Creek issues. They are dependent on low levels of river pollution, including that from Lawson Creek.

The Snowy 2.0 tunnelling failure near Tantangara Dam illustrates aspects of this problem. For about a year "Florence" the >100m long boring machine has been stuck underground in the vicinity of mapped faultlines where highly fractured and deeply weathered rock were found: <u>https://www.abc.net.au/news/2023-02-12/snowy-2-0-this-hole-is-above-a-stuck-tunnel-boring-machine/101957418</u>

Snowy Hydro NEWS - June 2018 – Issue 41 <u>https://www.snowyhydro.com.au/wp</u>content/uploads/2020/04/SHLNews_June2018_LR.pdf

"There are around 12 main rock types and eight faults, including the significant Long Plain fault, that would need to be tunnelled through.

"Faults are areas of past movement and are therefore highly fractured rock, generally with low strength and high water inflows, which can be quite difficult to excavate."

The Bowdens Silver EIS does state:

"Major geological structures in the groundwater setting limit but do not prevent groundwater flow while also enhancing localised vertical and lateral groundwater flow parallel to the strike." (Page 4-114)

The Bowdens Silver EIS makes no specific mention of any influence of the faultline that runs below across the Tailings Storage Facility, excepting that the TSF embankment is ... "• To provide a robust and serviceable structure, in particular the embankment, under operational and **earthquake** loadings."

Any movement of the faultline that runs underneath **ALL** of the TSF could cause disastrous failure of the TSF structure.

Fractured, deeply weathered, very wet conditions may prevail at the fault line below the proposed Bowdens Silver Tailings Storage Facility. Any failure of the proposed TSF liner or structure may lead to easy faultline groundwater throughflow or watercourse flow of water with pollutants to Lawson Creek then Cudgegong River. Furthermore, the Bowdens Silver Closure Plan must deliver a sustainable site that has no ongoing maintenance requirements forever.

Has the apparent ignoring of the presence of a fault underlying the TSF and elsewhere on the mine site led to inaccuracies when modelling groundwater movement ?

Five hundred or more years of continuing integrity of this liner and embankment structure is essential but cannot be assured following seismic or extreme rainfall events. The IPC must not approve the Bowdens Silver project.

5) Extreme Rainfall Events

Heavy rainfall such as experienced in Queensland 2010-11, Nyngan 2010, and eastern Australia 2022-may have similar consequences for Gulgong.

https://www.abc.net.au/news/2020-04-23/remembering-nyngans-flood-thirty-yearson/12154408?utm_campaign=abc_news_web&utm_content=mail&utm_medium=content_shared&utm_source=ab c_news_web

Lawson Creek enters the Cudgegong River downstream of Mudgee domestic town water supply intakes. However, the nearby tourist attraction town - Gulgong - draws its domestic town water directly from the Cudgegong River downstream of the Lawson Creek confluence. See page 6, MWRC_water-asset-management-plan <u>https://www.midwestern.nsw.gov.au/files/assets/public/services/water-and-sewer/asset-management-plan/water-asset-management-plan-adopted-rev-6-may-2016.pdf</u>. CF Pavich Submission – Bowdens Silver SSD 5765 - IPC Determination _ March 2023 - FINAL Should Lawson Creek become significantly polluted during an extreme rainfall event, there will probably be no availability of reticulated potable water for Gulgong residents after 3 days of no pumping (pers comm -MWRC). Appropriate Bowdens Silver project infrastructure planning and on-going management is also critical for all other water users downstream.

"2.8.2 Tailings Storage Facility Design

2.8.2.1 Design Objectives include:

• To provide a robust and serviceable structure, in particular the embankment, under operational and **earthquake** loadings

• To provide capacity for the controlled discharge via an emergency spillway in rare and extreme rainfall events whilst maintaining the structural integrity of the TSF embankment."



Adequate measures to satisfy all needs when the now more likely frequent and extreme events occur are not yet apparent. Geological uncertainties remain regarding the impact of faultlines on groundwater movement. The risks are unacceptable. An IPC Approval Determination for this project must not be given now.

Critical Minerals in NSW

Justification for the proposed Bowdens Silver project has included the following NSW strategy:

https://www.nsw.gov.au/criticalminerals

NSW Department of Planning and Environment | Bowdens Silver Project (SSD 5765) | Assessment Report - 3.2 Mineral Resources – Section 18 states:

CF Pavich Submission – Bowdens Silver SSD 5765 - IPC Determination _ March 2023 - FINAL "NSW Critical Minerals and High-Tech Metals Strategy: outlines the NSW Government's vision and commitment to build on the State's potential to become a major global supplier and processor of critical minerals and high-tech metals. This strategy identifies silver and zinc as critical minerals for developing technologies and renewable energy."

However, note that ⁴⁷Ag – Silver, ³⁰Zn – Zinc, or ⁸²Pb - Lead are NOT listed below as a "Critical Mineral".

Australian critical minerals

- 24 critical minerals in Australia
- Balancing the future mineral needs of strategic and economic partners with Australia's potential supply
- Currently produced or with potential in Australia

Antimony	Hafnium	REE
Beryllium	Helium	Rhenium
Bismuth	Indium	Scandium
Chromium	Lithium	Tantalum
Cobalt	Magnesium	Titanium
Gallium	Manganese	Tungsten
Germanium	Niobium	Vanadium
Graphite	PGE	Zirconium





Periodic table of the elements overlain with Australia's mineral production, resources and exploration activities. Critical minerals are shown in red. (Source: Australian Critical Minerals Prospectus 2020)

https://www.resourcesregulator.nsw.gov.au/sites/default/files/2022-11/eitg-2021-03-key-and-critical-minerals.pdf

- Which part of the NSW government provides reliable information ?
- Also apparently inaccurate in the same DPIE report is:

"11. The residents in and around Lue have a strong connection to the agricultural industry, with the majority of people employed in agriculture, **fishing** or **forestry**. Around 12.3% are employed in the accommodation and food services industry."

<u>No</u> occupants of the Lue District are known by LAG and other local residents to have any income related to **fishing** and **forestry**.

• <u>What other flaws could be found following continuing careful review of the DPIE report ?</u> Bowdens Silver Project (SSD 5765) | Assessment) Report

Given the many uncertainties regarding the Bowdens Silver project, the IPC should NOT give its approval.

Thanks to the Independent Planning Commission for considering my Submission. My Regards Chris