

**Submission
No 68**

**INQUIRY INTO CURRENT AND POTENTIAL IMPACTS OF
GOLD, SILVER, LEAD AND ZINC MINING ON HUMAN
HEALTH, LAND, AIR AND WATER QUALITY IN NEW
SOUTH WALES**

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Personal submission to:

Inquiry into current and potential impacts of gold, silver, lead and zinc mining on human health, land, air and water quality in New South Wales. Parliament of New South Wales

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My submission addresses several aspects of the Inquiry's terms of reference.

1. Sunny Corner case study: Gold, silver, lead and zinc mines can pollute for more than a century.

I have been investigating contaminated seepage that continues to emerge from mines at the Sunny Corner Mining Area. This is a derelict mining area, located between Bathurst and Lithgow, that included several gold mines and associated metal processing facilities. Most mines closed more than a century ago. As part of previous research project, I sampled water from Daylight Creek. This small creek was downstream the derelict Sunny Corner gold and silver mines, which continuously release contaminated seepage from the mines and associated workings (Wright & Ryan, 2016). Daylight Creek had five metals that were detected at highly dangerous concentrations for aquatic life. The creek water samples were independently tested by a commercial NATA-accredited analytical laboratory. The results from Daylight Creek had the following metal concentrations from sampling conducted in 2009 (Wright & Ryan, 2016):

1. Lead. 1370 µg/L. This is 400 times higher than the ANZECC (2000) guideline for lead, for 95% species protection (<3.4 µg/L).
2. Cadmium. 126 µg/L. This is 630 times higher than the ANZECC (2000) Cadmium 95% species protection (<0.2 µg/L).
3. Copper. 1420 µg/L. This is just over 1000 times higher than the ANZECC (2000) Copper 95% species protection (<1.4 µg/L).
4. Nickel. 273 µg/L. This is 17 times higher than the ANZECC (2000) Nickel 95% species protection (<11 µg/L).
5. Zinc. 32,600 µg/L. This is just over 4000 times higher than the ANZECC (2000) Zinc 95% species protection (<8.0 µg/L).

Metal mines are well known to generate solid and liquid wastes that contain hazardous contaminants. Sunny Corner was principally a gold and silver mine, but liquid leachate from the mine included several other hazardous metals at concentrations that pose both human health and ecological hazards (Wright & Ryan, 2016). In the case of Sunny Corner, the leachate was extremely dangerous more than a century after it has closed.

My publication that included results from Daylight Creek, below Sunny Corner:

Wright, I.A. and Ryan, M. (2016) Impact of mining and industrial pollution on stream macroinvertebrates: importance of taxonomic resolution, water geochemistry and EPT indices for impact detection. *Hydrobiologia*. 772, 103-115.

This publication (Wright & Ryan, 2016) also collected and investigated aquatic invertebrates from Daylight Creek, in order to assess the health of the aquatic ecosystem. Very few invertebrates were recorded, due to the extreme pollutant concentrations. This is of particular concern as downstream Daylight Creek is part of the Turon River, which is popular for observing nature, camping, swimming and fishing.



Figure 1. Picture of Daylight Creek, about 1 km downstream from the derelict Sunny Corner Mining Area (Photo taken in March 2005).

Sunny Corner State Forest covers much of the land surrounding the mine, including the section of creek sampled in 2009 (results quoted previously). The area is very popular for recreation, including bushwalkers,

campers, mountain bike riders and motorbike and four-wheel drivers. The water in the creek looks very clear (Figure 1) and would be very hazardous to human health to consume. I observed a single warning sign near Daylight Creek in 2005 (Figure 2) but none in recent years.



Figure 2. Picture of warning signage near Daylight Creek, about 1.5 km downstream from the derelict Sunny Corner Mining Area (Photo taken in March 2005).

In November 2021 I collected a sample of the leachate emerging from mine workings at Sunny Corner (Figure 3). This was recorded as part of a documentary ('Mining the Blue Mountains' at 12:30-13:30). The video is available on You Tube

https://www.youtube.com/watch?v=vxF5QyqfJM&ab_channel=JamesO%27Connor.



Mining The Blue Mountains - A Documentary

Figure 3. Collecting a sample of leachate seeping from Sunny Corner underground mine workings. November 2021. Video by James O'Connor.

The water leachate sample collected in the video shot in November 2021 (Figure 3) was tested for metals in a commercial analytical laboratory. The sample was collected about 80 m from where the leachate seeped from underground workings (Figure 4). Below I list the most hazardous metals recorded in that water sample, and also compare the concentration to guidelines (ANZECC Australian water quality guidelines) for water quality required for healthy river and stream ecosystems.

1. Lead. 480 µg/L. This is 141 times higher than the ANZECC (2000) guideline for lead, for 95% species protection (<3.4 µg/L).
2. Cadmium. 1100 µg/L. This is 5500 times higher than the ANZECC (2000) Cadmium 95% species protection (<0.2 µg/L).
3. Copper. 13,000 µg/L. This is just over 9200 times higher than the ANZECC (2000) Copper 95% species protection (<1.4 µg/L).
4. Nickel. 260 µg/L. This is 23 times higher than the ANZECC (2000) Nickel 95% species protection (<11 µg/L).
5. Zinc. 240,000 µg/L. This is 30,000 times higher than the ANZECC (2000) Zinc 95% species protection (<8.0 µg/L).



Figure 4. Highly contaminated leachate emerging from underground workings at the derelict Sunny Corner Mining Area (Photo taken in April 2023). Sample collected in Figure 3 is just downstream of this photo. This surface stream drains to Daylight Creek.

Lessons from Sunny Corner.

1. Metal mines can release water containing a large range of metals at very hazardous concentration, not just the ones that are the target of the commercial operation.
2. Contaminated leachate released from operating and closed mines is a worldwide problem. The main Sunny Corner mines closed a century ago and continue to impair ground and surface water quality and damage the biodiversity of surface waterways. They also pose substantial human health risks for visitors undertaking recreation in the area.
3. Remediation of closed mines is very expensive and is often unsuccessful. Sunny Corner received funding for remediation about a decade ago but the area continues to release highly contaminated leachate to surface waters.
4. NSW has very limited funds available for remediating closed mines.
5. NSW EPA has recently (25 August 2023) announced that they will investigate pollution from Sunny Corner:

“The NSW Environment Protection Authority (EPA) will conduct water sampling in the Turon River and its tributaries in the State’s Central Tablelands to provide the community with information about the water quality in the area. This follows claims that pollutants may have spread from the old

Sunny Corner mine into the surrounding waterways. Testing will take place in the coming weeks at recreational spots near Daylight Creek and Turon River”: (<https://www.epa.nsw.gov.au/news/media-releases/2023/epamedia230825-epa-to-undertake-water-testing-around-the-turon-river>)

6. I suspect that this action from NSW EPA at Sunny Corner may be due to heightened media and community concern about pollution generated by metalliferous mines (gold, silver, copper) in Central West NSW (Cadia Gold Mine, near Orange; recent approval of McPhillamys Gold Project, near Blayney and also recent approval of the Bowdens Silver mine, near Mudgee). Sunny Corner is located in between these metal mines. Sydney Morning Herald did a feature article on Sunny Corner pollution in July 2023 (<https://www.smh.com.au/environment/sustainability/sunny-corner-mine-was-abandoned-a-century-ago-it-s-still-a-toxic-deadly-mess-20230704-p5dlkf.html>) and Bathurst 2BS also has been following the story for several weeks (<https://www.2bs.com.au/live-local/>)
7. I am unsure which NSW Government agency is responsible for monitoring and managing ongoing contamination from Sunny Corner. In my experience it is unusual for NSW EPA to investigate water pollution from a closed mine. I am thankful that they are going to do this. The EPA press release on 25 August 2023 mentioned 'Department of Regional NSW' as investing funds for previous rehabilitation at Sunny Corner. I have never heard of this agency before. There are many Government agencies that may be involved. It is hard to keep track of their latest names, roles and responsibilities. They include NSW Department of Mineral Resources, NSW Resource Regulator, NSW Department of Primary Industry, NSW Division of Resources and Geoscience, NSW Resource Regulator, NSW Planning and Environment and NSW Natural Resources Commission.
8. Even if inadequate funding is available for closed, abandoned or derelict mine sites. Regular, even annual, assessment should be made (ie monitor leachate and impact on surface waterways) if they are still caused substantial pollution. This can be used to remind the community of the dangers, and also help document those sites requiring most urgent repair action.

2. Cadia Valley Case study. An emerging contamination case study.

I have been trying to help the community in the Cadia Valley area, south of Orange. My relationship with the community has been developing gradually over 18 months. This community live in the 20 to 25 km radius of the huge Cadia gold and copper mine. I initially helped organise commercial analytical testing of water samples that they collected from their drinking water supplies and passed to me for testing. Their concerns were due to frequent dust emissions observed from the Cadia mine and subsequent observation of fine particulate material settling on cars, garden furniture, veranda's etc. Early samples collected from some water tanks revealed enrichment with hazardous concentrations of metals. Since their water supplies are fed from water harvested from building roofs, they had justifiable concerns that their water tank supplies were enriched with dust containing metals that has dropped out in dust from the mine, or other sources.

One group in the community (Cadia Community Sustainability Network: CCSN) were particularly alarmed by the results of initial tests. They had collected samples, I had them tested, and provided advice. I did not do this on a consulting basis. They then proceeded to organise their own sampling of more tanks and arranged and funded testing with a commercial analytical laboratory with a local branch. In short, they began their own citizen science study of drinking water tanks in the area. I was asked to review their results, which were often collected from the bottom depths of water tanks, in close vicinity to water offtakes feeding into homes.

Here is the advice I provided CCSN in late March 2023:

I have reviewed the results of all water tests from samples collected from water tanks in the Cadia area (In February and March 2023) by your group, using consistent sampling methods. This now represents a total 47 water samples collected from water tanks. They are commercial test results that were conducted impartially by a NATA accredited laboratory. In my opinion, the results indicate that contamination of water tanks by metals, and lead in particular, is likely to be hazardous for people that consume water from the tanks.

*Most of the water samples (83%) were found to contain lead. According to the USA EPA there is no safe concentration of lead in drinking water. The Australian Drinking Water Guidelines recommend that drinking water should contain less than **10 µg/L of lead**.*

*Of the 47 water samples collected from water tanks, in February and March 2023 using comparable and consistent methods, 32 (68%) exceeded the Australian Drinking Water Guideline (Health) for lead (<10 µg/L). Of greater concern is that 13 samples (27.6%) recorded lead concentrations that exceeded the lead guidelines by more than 10 times (**>100 µg/L of lead**).*

The laboratory analysis of the water samples also recorded other metals at hazardous concentrations. For example, the most recent 20 samples that were collected and tested in March 2023, the following results were received.

The Australian Drinking Water Guidelines recommend that drinking water should contain less than 20 µg/L of nickel. 9 of 20 (45%) of the most recent batch of 20 water samples, collected in March 2023, exceeded the nickel guideline.

The Australian Drinking Water Guidelines recommend that drinking water should contain less than 10 µg/L of arsenic. 6 of 20 (30%) of the most recent batch of 20 water samples, collected in March 2023, exceeded the arsenic guideline.

The Australian Drinking Water Guidelines recommend that drinking water should contain less than 2 µg/L of cadmium. 4 of 20 (20%) of the most recent batch of 20 water samples, collected in March 2023, exceeded the cadmium guideline.

The Australian Drinking Water Guidelines recommend that drinking water should contain less than 3000 µg/L of zinc. 10 of 20 (50%) of the most recent batch of 20 water samples, collected in March 2023, exceeded the zinc guideline.

I continue to have substantial concerns that people in the surrounding area may be at risk from consuming tank water with elevated metal concentrations, particularly for the metals lead, arsenic, nickel, cadmium and zinc.

I advised CCSN to report the suspected water contamination to NSW Health and ask them to investigate. NSW Health have a drinking water unit that predominantly works to ensure quality of NSW town drinking water supplies (<https://www.health.nsw.gov.au/environment/water/Pages/drinking-water.aspx>). Water tanks from roof-fed supplies in individual homes are considered to be private water supplies and are the responsibility of the owner. Although I gather somewhat reluctantly, NSW Health did agree to investigate the potential contamination of drinking water in roof-fed water tanks at homes surrounding the Cadia mine. See (<https://www.nsw.gov.au/health/w NSW Health responding to community concern around dust from Cadia Gold Mine>)

NSW Health has since given advice to the Cadia community that their drinking water supplies are mostly compliant (for metals) with the Australian Drinking Water Guidelines. NSW Health have also provided advice to local Medical Practitioners. I remain concerned that NSW Health used inappropriate sampling methods as they mainly sampled kitchen taps, rather than at different depths in water tanks.

People in the Cadia area are very nervous. Both of the health implications of consuming contaminated water, and also nervous about the sources of the contamination potentially coming from a giant and powerful industry in the region, a large gold and copper mine. I have detected signs of anxiety, particularly when children are involved.

I have still seen no firm proof that the potential contamination is coming from the mine. I regard establishing this 'cause/effect' proof as very important. But the first issue is making sure that people have safe drinking water. The secondary issue is what might be causing the contamination recorded in water supplies – that I know that the NSW EPA are working on this right now.

In my opinion, the two top agencies are (1) EPA, who are the lead agency that protects people and the environment from pollution. And I suspect that they have not done this effectively in the Cadia area. (2) Secondly the lead NSW Government agency is NSW Planning and Environment, and ultimately the NSW

Planning Minister. They are the principal consent authority that provide the authorisation for the mine to operate.

NSW EPA are paid by the mine for their role as environment regulator. Currently this is **\$127,500 per year**. This is administered through Environment Protection Licence (EPL) # 5590.

I helped organise a meeting between CCSN and the CEO of EPA (Tony Chappel) on 12 May 2023. Prior to this meeting, the Cadia community was struggling to be heard – by the EPA in particular. They had made several requests for help to the EPA. At this meeting At the May 12 meeting they talked about their concerns about drinking water. They also broke the news to the EPA about excessive metals in local residents blood and hair samples. That meeting changed everything.

In the following weeks the EPA has acted swiftly to address this pollution and help the community. The agency is focusing on a major potential source of the contamination from the mine: dust.

Since late June/July 2023 I have been part of an independent panel to give advice to EPA on the Cadia mine investigation (<https://www.epa.nsw.gov.au/news/media-releases/2023/epamedia230630-in-response-to-epa-cadia-takes-action>). There have since been two meetings and I have been provided with results of sampling undertaken by the EPA. I have voiced my concerns within this panel that EPA sampling has not replicated the depth samples collected by CCSN, which I believe needs urgent validation.

The EPA has now ordered the mine to take all necessary steps to immediately stop releasing excessive amounts of dust, which may include reducing production.

NSW EPA are currently conducting an investigation into the source of the metals. They hold a pollution licence that regulates the release of contaminants from the mine to the air and water. This licence for the Cadia mine (Environmental Protection Licence EPL 5590) appears to have major shortcomings.

Although it requires the mine to collect monitoring results on dust quantity, there are no clearly explained requirements in EPL 5590 for the mine to regularly measure the metal (or other contaminant) contents of dust samples that are collected. In contrast, the mine is required to measure the contaminant content of liquid discharges to waterways, with discharge concentration limits for the metals/metaloids (arsenic, aluminium, copper, iron, lead, manganese and zinc). For example, if the mine releases water to the environment, it much have a copper content of less than 100 µg/L (EPL 5590). I regard this as being dangerously highly elevated, but at least the metal in clearly addressed in the EPL. Many water samples (mostly from water tanks or house water supplies) had copper content higher than 100 µg/L, which is not of human health concern, but is potentially very dangerous to freshwater life in streams, rivers and swamps.

I remain concerned that the current EPL 5590 fails to protect the environment in the local district from air borne metal emissions that are potentially being released from the mine operation. I suspect that the pollution pathway that contributes to metals in the depths of water tanks in the area is associated with dust particles released from the mine. I also believe that it is plausible that this is contributing to atmospheric metal fall-out on local private properties, and this may also be adding to the accumulation of metals washed off roofs into water tanks that are used as household and rural water supplies. There are also potential human health issues associated with inhaling contaminated air and impacts on soil quality, biodiversity and agricultural products.

I have recently started a study of metals in drinking water tanks, and home water supplies, in the Cadia area. I collected the first samples, with cooperation of residents and organised by CCSN (30 and 31 August 2023). This is partly as I have serious concerns that the sampling methods that NSW Health and NSW EPA (and probably others) fail to appreciate that water is extracted from the lower reaches of water tanks and this is where the poorest results from CCSN testing was detected. See Figure 5 (below). These are water samples collected from the bottom depths of a home water tank in Cadia area, compared to from the top layers of the same water tank 'top' and also from the household tap. The discolouration of the sample from the bottom of the tank is clearly visible.

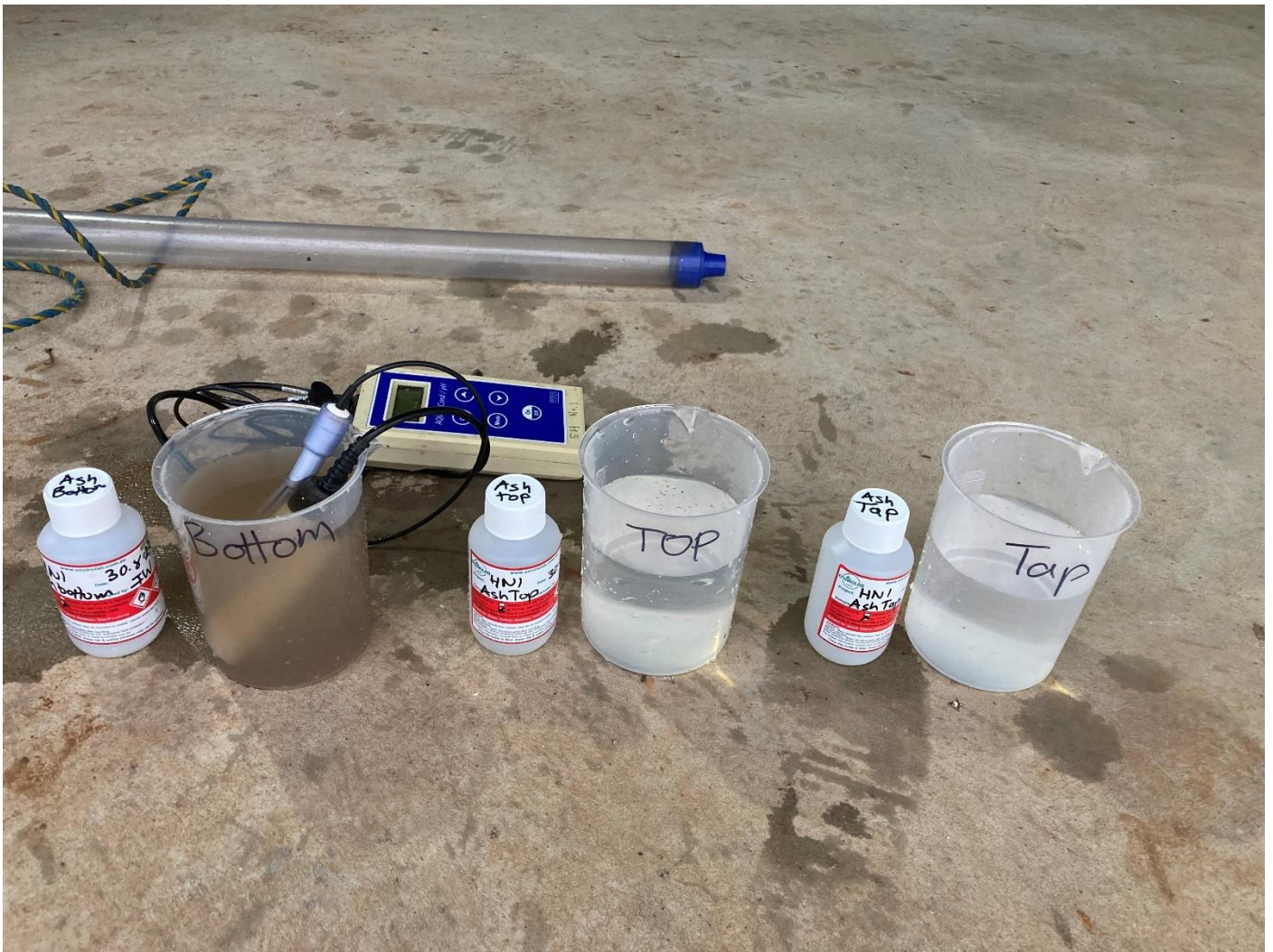


Figure 5. Water samples collected from (left to right) from the (left) bottom depth of a household water tank, from the (middle sample) top layer of the water tank, and (right) from the kitchen tap, fed by the tank. The discolouration of the 'bottom' sample is very obvious.



Figure 6. Most water tanks access water from the lower section of water tanks. Water quality at this 'layer' is critical for household water quality.

Figure 6 shows a typical outlet from a home water tank, very common across regional NSW. This was one of the tanks in the Cadia area. Water is extracted from the lowest depths of water tanks and thus the seriously poor water quality recorded at depth is of substantial concern.

From water samples that were collected by CCSN (most or all were collected from the bottom of tanks, in the offtake zone) in February and March 2023, I made this comment:

Of the 47 water samples collected from water tanks, in February and March 2023 using comparable and consistent methods, 32 (68%) exceeded the Australian Drinking Water Guideline (Health) for lead (<10 µg/L). Of greater concern is that 13 samples (27.6%) recorded lead concentrations that exceeded the lead guidelines by more than 10 times (>100 µg/L of lead).

Lessons from Cadia case study

1. The Cadia mine case study is still an emerging investigation. The outcomes remain unclear. I still have substantial concern that the water tanks in the surrounding area do contain excessive concentrations of metals. I still suspect that metals in dust emissions from the mine has contributed to the accumulation of metals in water tanks. I am glad that the EPA is investigating, but for a very large mine that has been operating for about 25 years, there should not be any uncertainty about its environmental performance.
2. In my opinion, the EPA regulation of this mine has been inadequate. Whilst I am unsure of the full nature and extent of contamination from this mine, I continue to have doubt and uncertainty that the impacts may be substantial. The community had found the EPA very reluctant to visit them, listen to their concerns and appeared to take little or no action to investigate pollution concerns relating to metals and dust that appears to be affecting the local community.
3. This all changed when the EPA CEO met with the community on 12 May 2023. There has been strong action from the EPA at multiple levels since. This has involved improved communication with the community, conducting environmental investigations and tightening the environmental governance of this mine operation.
4. The NSW Planning and Environment agency are the lead agency for approval for this mine to operate. I am puzzled that they have appeared to be silent during the action by the EPA over the last few months. This agency should be working very closely with EPA to improve the environmental performance of the mine, and regularly updating the surrounding community.
5. The Environment Protection Licence 5590 is a key document that the EPA uses to regulate the pollution (noise, air, solid and water) of the mine operation. This licence contains inadequate provisions for monitoring and controlling dust emissions from the mine. It also contains no clear and specific provisions for ongoing monitoring of dust, and the metal content in that dust. The licence also fails to fully document and regulate the fall-out of dust emissions onto the local environment, and also on the local community. I do not see evidence that dust emissions are fully monitored by the mine or by the EPA. The Environment Protection Licence 5590 is a very difficult document to fully understand, particularly for how it protects air quality, and I think this contributes to the current uncertainty about the scale and nature of dust emissions on the local community and environment.
6. Both NSW Health and EPA should revise the protocols for monitoring water quality in household private water tanks. This is a priority for people living on roof-fed water tank systems surrounding metal mines. Water samples should be collected at the same depth of water off-takes, as well as the kitchen tap. A detailed sampling of water tanks in areas surrounding proposed mines should be conducted as part of their preliminary studies.