Proposed Bowdens Mine SSD 5765

Surface Water Submission Report to the

Independent Planning Commission

On behalf of the Lue Action Group

By Shireen Baguley

B.Eng. (Civil) (Hons 1),
M. Eng. Sc (Water Resources),
Dip of Arts (Journalism),
Dip of Conservation and Land Management,
Certified Lead Environmental Auditor
Member of the Macquarie/Cudgegong Environmental Water Advisory Group

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Executive Summary

This Surface Water Submission Report to the Independent Planning Commission (IPC) has been prepared on behalf of the Lue Action Group. This report has been prepared following a review of the Environmental Impact Statement (EIS) and associated documentation, the Submissions Report, reports prepared by the Departmental Planning and Environment's (DPE's) own experts, DPE's assessment report and draft conditions of consent. This submission covers a number of issues which have been identified with the surface water assessment for the proposed Bowdens Mine SSD 5765. These issues relate to both process and technical matters.

Process

In relation to process, the project's Secretary's Environmental Assessment Requirements (SEARs) (revised) were issued on 21 June 2019. These set out a number of specific requirements which the EIS for the development "**must comply with"**. The SEARs requirements included the following in relation to surface water assessment:

- the proposed project's water demand,
- assessing the full impacts of the meeting the water supply requirements of the proposed project,
- demonstrating an adequate and secure water supply,
- a water balance considering quantity, quality and source including water requirements
- a management plan to address spill/leak management

The EIS and associated documentation has failed to meet these critical mine viability-determining aspects of SEARs.

The failure of the EIS and associated documentation to meet the requirements of the SEARs in multiple instances means that:

- the determining body, in this case **the IPC does not have sufficient information to make an informed decision,**
- in making a recommendation for approval, DPE appears to have lowered the standard required to assess the impacts of the project,
- **matters which should be determinative have been conditioned** to be dealt with in post-approval management plans,
- there will be no independent review of any of the post-approval management plans proposed,
- **there is a failure of due process** which undermines the confidence the community has in the decision-making process with regards to planning approvals. No confidence from the local community and stakeholders in the assessment process means **no social licence.**

Technical

It is unclear what the true area of the Mine Site catchment is, as the mine site boundary is approximately 1000ha, significantly more than the 550ha included in the water balance model. This casts uncertainty over the modelled impacts.

There is a high level of uncertainty with regards to the water demand of the project particularly in regards to the dust suppression requirements. The DPE's own expert also repeatedly raised concerns over water requirements for dust suppression. The dust suppression modelling in the low runoff scenario seems particularly unrealistic.

There is a high level of uncertainty with regards to the AWBM water balance model and its sensitivity to key parameters. As such, its ability to reliability predict the likely impacts of the proposed mine is questionable. It also means there is a flawed understanding of the rainfall runoff responses of the upper Lawson Creek catchments and, consequently, how much water is available to be used in mine processing.

The AWBM water balance calibration has been undertaken at an unsuitable location and "excludes recent very dry weather when instream losses appear to be most". There is no verification, it presents only average results, and there is no sensitivity analysis for key parameters such as evaporation and dust suppression requirements. There is no consideration of climate change, despite the proponent admitting the mine intends to be a long term prospect.

The likely impact of the mining operations on the surface water is unacceptable. A close reading and analysis undertaken as part of this submission shows that the "average" annual site water balance removal from the project area catchments is:

- 924 ML/year in rainfall and runoff, and
- 27 ML/year in clean water harvesting

giving **a total of 951ML/year removal from the project area catchments, far more than the than 177 ML/year indicated by the proponent.**

There is not a viable water supply for this mine. When the impact of removing 951ML/year is considered, there is potentially a:

- 44% reduction of flows from Hawkins Creek downstream of the mine site
- 11% reduction of flows from Lawson Creek downstream of the mine site.

The proposed water to be drawn from the catchment due to the mine is estimated to be 2.6ML/d. For 40 percent of the time, flows in Lawson Creek are less than 4ML/day and 30 percent of the time they are 2.4ML/day. **The proposed mine will take 66.1% and 110.2% of these flows respectively**.

There is a flawed understanding of the flow rate of water in Lawson Creek and, consequently, how much water is 'available' to be used in mine processing. On-ground verification undertaken for this submission has shown that the flows in Lawson Creek are just **0.38ML/d. This is less than 2% of the 19.5ML/d that the EIS documentation states the Lawson Creek flows to be. After an extremely wet period, Lawson Creek is currently at a**

'cease to flow' state. This discrepancy between reality and the EIS appears to be due to the flawed calibration of the model.

There are a number of regulatory irregularities that undermine the validity of the proponent's water sources and status thereof. These relate to exemptions claimed in relation to harvestable rights and Water Access Licenses being required. However, criteria clearly have not been met in relation to these exemptions. The proponent's intended water extraction of 295ML exceeds the theoretical harvestable water rights by 109ML. 186.1ML is the maximum volume of dams allowed, however Bowdens' already 59 dams across the 2580ha property. The remaining harvestable right is significantly less than 186ML. Further, harvestable rights dams must be on minor streams. This has been violated in several instances. The EIS is not factual nor fit for purpose in this regard.

There has been a failure to properly address the SEARs in relation to water quality which means that there is an insufficient understanding of the potential impacts and poorly developed mitigation measures. The risk of contamination of the Lawson Creek system is high.

The impact on groundwater dependant ecosystems has not been properly considered. The Montane Peatlands and Swamps EEC is present at numerous locations adjacent to the mine site and there are strong grounds to believe it is present within the mine site, as there is 29 springs mapped across this site. The EIS and its associated documentation is not fit for purpose and the DPE's assessment is flawed as both **fail to consider the potential impact of the proposed project on the Montane Peatlands and Swamps EEC, in relation to the NSW Biodiversity Conservation Act 2016 and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. This means there is a failure to meet the assessment requirements under the Bilateral Agreement EPBC 2018/8372** (Department of the Environment and Energy, 2019).

There have been numerous attempts by the local community, independent reviewers and authorities to have the issues within the EIS and associated documentation addressed. These attempts have largely been dismissed by the proponent or its consultants and by DPE.

Taking all the above matters into consideration, from a surface water management perspective, **the impacts of the proposed project on water resources and groundwater dependant ecosystems are considered to be significant and the proposed project should not be approved**.

Introduction

This submission covers the following issues which have been identified with the surface water assessment for the proposed Bowdens Mine SSD 5765. These issues are:

- It is unclear what the true area of the Mine Site catchment is, which casts uncertainty over the modelled impacts.
- There is a high level of uncertainty with regards to the water demand of the project.
- There is a high level of uncertainty with regards to the AWBM water balance model and its sensitivity to key parameters.
- The likely impact of the mining operations on the surface water is unacceptable.
- There are a number of regulatory irregularities which must be addressed.
- The impact on groundwater dependant ecosystems has not been properly considered.

Each of these issues are discussed in the following sections. Taking all the above matters into consideration, from a surface water management perspective, the impacts of the proposed project are considered to be significant and as such, it is the author's opinion that it should not be approved.

In addition, the project's Secretary's Environmental Assessment Requirements (SEARs) have not been met. The failure of the EIS and associated documentation to meet the requirements of the SEARs in multiple instances means that the:

- the determining body, in this case the IPC does not have sufficient information to make an informed decision
- in making a recommendation for approval, DPE appears to have lowered the standard required to assess the impacts of the project,
- matters which should be determinative have been conditioned to be dealt with in post-approval management plans,
- there will be no independent review of any of the post-approval management plans proposed,
- there is a failure of due process which undermines the confidence the community has in the decision-making process with regards to planning approvals. No confidence from the local community and stakeholders in the assessment process means no social licence.

Author's Qualifications

Shireen Baguley is a civil engineer with nearly 30 years' experience in hydrology, water management and impact assessment. She holds a Bachelor's degree in engineering (Civil) (Hons 1) and a Masters in Engineering Science (Water Resources).

She is a Certified Lead Environmental Auditor and has been approved by the Department of Planning and Environment to conduct independent environmental audits on a range of state significant developments across NSW.

She has also recently been appointed to the Macquarie / Cudgegong Environmental Water Advisory Group.

Secretary's Environmental Assessment Requirements (SEARs) non-compliance

Issue: The project's Secretary's Environmental Assessment Requirements (SEARs) have not been met

a. The Secretary's Environmental Assessment Requirements (revised) were issued on 21 June 2019. These set out a number of specific requirements which the Environmental Impact Statement (EIS) for the development **must comply with.**

b. In relation to water, the SEARs stated the EIS **must address the following specific issues**:

   i. *an assessment of the likely impacts of the development on the quantity and quality of the region's surface and groundwater resources (including, but not limited to, Lawsons Creek and Price Creek), having regard to **EPA, DPI and OEH' requirements** (see Attachment 2A and 2B).*

   ii. *an assessment of the likely impacts of the development on aquifers, watercourses, riparian land, water-related infrastructure, and other water users, including:*

   • *a **detailed site water balance**, including an assessment of the reliability of water supply imported to the site, and management of excess water, **supported by sensitivity analysis**; and*

   • ***an assessment of the water quality** and management of the imported water, including spill/leak management*.

c. As outlined in this submission, it appears that:

- the proposed project's water demand has not been clearly identified,
- the full impacts of drawing both the stated and the actual water supply requirements of the proposed project from the affected catchments have not been assessed,
- an adequate and secure water supply is not available for the project,
- the water balance modelling is not supported by a full sensitivity analysis
- the water balance modelling undertaken is limited to only considering water quantity,
- there is no site water quality model to fully assess potential impacts on receiving waters,
- the water quality monitoring program is so cursory it barely exists, and
- there is no management plan to address spill/leak management

Many of these issues were raised by Earth Systems (2022), DPE's independent reviewer appointed to consider the water balance modelling and surface water management – but have been disregarded.

The Environmental Protection Authority (EPA), Department of Primary Industries (DPI) and Office of Environment & Heritage (OEH) (now DPE) SEARs requirements that have either disregarded or given scant regard by the EIS and supporting documentation are set out below. The current status of how each has been addressed (or otherwise) is noted in **blue text**.

EPA requirements:

3. Provide a water balance for the Project including water requirements (quantity, quality and source(s)) and proposed storm and wastewater disposal, including type, volumes, proposed treatment and management methods and re-use options.

4. Describe the Project including position of any intakes and discharges, volumes, water quality and frequency of all water discharges (e.g., surface water discharge to a river/creek, groundwater, irrigation of wastewater etc).

The water balance modelling undertaken only addresses water quantity. There has been no site water quality model to fully assess potential impacts on receiving waters (e.g. Acid mine drainage seepage from the tailings storage facility).

The requirement regarding the lack of a water quality model has also been consistently raised by Earth Systems (2022), DPE's independent reviewer. This has yet to be addressed and as such, potential water quality impacts are not able to be assessed.

As outlined in this submission, the water demand has not been clearly identified.

The full impacts of drawing the water supply requirements of the proposed project from the affected catchments have not been assessed. These issues were raised by Earth Systems (2022) - DPE's independent reviewers – but have been disregarded.

8. Identify whether any discharge, or the location of the Project, will cause erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.

WRM (2022) says this is covered in Section 8 of its report. However, it does not appear this has been addressed, beyond noting the proposed use of sediment basins.

12. Where the management of sediment basins requires the use of flocculants, the EIS should include information about the type, toxicity and management of flocculants proposed to treat captured water before discharge.

WRM (2022) says this is to be advised; however to date this has not been advised.

19. Assess impacts on groundwater and groundwater dependent ecosystems. The assessment should be guided by the principles in The NSW State Groundwater Policy Framework Document (DLWC,1997). Assessment and Management of Groundwater Contamination (DEC, 2007) provides guidance on assessing and managing groundwater contamination. Assess impacts against relevant water quality guidelines for:

- *potentially impacted environmental values and beneficial uses using local Water Quality Objectives;*

- *contamination, such as investigation levels specified in National Environment Protection Measure Guideline on the Investigation Levels for Soil and Groundwater (EPHC, 1999).*

The probable existence of a groundwater dependent ecosystem which is an Endangered Ecological Community (EEC) listed at both a NSW and Commonwealth level was raised by Baguley (2022) and summarily dismissed. It is considered this has not been met, and further detail is provided within this submission.

20. Provide plans for any proposed relocation/realignment of all creeks and/or drainage lines including design, timelines and completion criteria and sufficient evidence to demonstrate that the proposed plans are achievable/sustainable, reasonable and feasible in the short and the long term.

This is not covered in the EIS or any documentation provided subsequently.

22. Describe how predicted impacts on surface water, groundwater and aquatic ecosystems will be monitored and assessed over time, including monitoring locations, relevant parameters, and sampling frequency. The EIS should:

- *Include a Trigger Action Response Plan, or similar response management plan, to identify appropriate trigger values and criteria and provide appropriate response actions if impacts are identified through the monitoring program.*
- *Identify the process for identifying any trends in the monitoring data obtained.*

Neither point has been met.

Monitoring, Assurance and Reporting Programs

1. The EIS should include a detailed assessment of any noise, air quality, water quality or waste monitoring required during the construction phase and on-going operation of the facility to prevent or minimise any adverse environmental impacts from the development.

2. Appropriate baseline data requirements are to be identified as part of the EIS, to form the basis for baseline and ongoing monitoring of environmental parameters.

3. It must be demonstrated that the proposed methods for baseline and subsequent monitoring are scientifically robust and statistically sound.

4. The EIS must also identify and describe monitoring programs, compliance assurance programs and reporting requirements and arrangements that will demonstrate the effectiveness of proposed management measures in meeting applicable requirements.

5. The EIS must, in addition to outlining proposed programs, clearly identify what is to be monitored and audited and why. This should include identification of monitoring locations, parameters to be monitored, sample analysis methods, the level of reporting proposed. The EIS should also include information on frequency and type of audits proposed to assure compliance with applicable requirements,

6. The EIS should demonstrate that monitoring and audit programs have been designed appropriately, according to best practice, to provide objective evidence regarding activities associated with the development and have regard to whether these activities are adversely impacting on the environment in the short, medium and/or long term.

An outline of the water quality monitoring required is provided in Section 9.2. It states:

> *The existing downstream ambient water quality monitoring program would be retained until the commencement of the site establishment and construction stage. Once operations commence, regular monitoring of Mine Site water storages within both the containment (mine affected) zone and ESC zone would be undertaken to ascertain the characteristics of Mine Site runoff and leachate.*
>
> *Water quality monitoring would be undertaken in a manner that is consistent with the National Water Quality Management Strategy. Samples would be initially collected monthly (in the case of ambient water quality) or during a flow event, where possible. The monitoring program would be implemented in accordance with the Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (EPA). The sample locations, frequency of sampling and analytes tested would be reviewed annually, and the monitoring results would be reported in accordance with the requirements of the EPA and the DPIE.*

This would not appear to meet the requirements, given that the current monitoring of downstream water quality will cease as soon as operations commence.

A water quality monitoring program and response management plan is required

Cumulative impacts

The EIS should provide an assessment of the cumulative impacts of the project during construction and operation of the proposal with regard to noise, air quality, water quality or waste Assessment of cumulative impacts must consider past, current and future activities in the area surrounding the project, impacts associated with internal components of this project (where relevant- e.g. a project involving construction throughout a precinct or similar), as well as the construction impacts of any projects recently completed.

The water quality component of this requirement is not covered by WRM (2022) or any documentation provided subsequently.

DPI's requirements

Specific Issues – Water should also include the following:

- *Identify water demand and determine whether an adequate and secure water supply is available for the project.*
- *Identify water sources (surface and groundwater), water disposal / discharge methods and water storage structures in the form of a detailed and consolidated water balance.*
- *An assessment against the NSW Aquifer Interference Policy (2012) using DPI Water's assessment framework.*
- *Assessment of any potential cumulative impacts on water resources, and any proposed options to manage the cumulative impacts.*

As outlined in this submission, it appears that:

- **the water demand has not been clearly identified, and**
- **an adequate and secure water supply is not available for the project.**

The impacts of drawing the water required for the proposed project have not fully assessed.
An assessment of any potential cumulative impacts on water resources, and any proposed options to manage the cumulative impacts has not been undertaken.

Office of Environment & Heritage requirements.

10. The EIS must assess the impact of the development on hydrology, including:

a. Water balance including quantity, quality and source.
b. Effects to downstream rivers, wetlands, estuaries, marine waters and floodplain areas.
c. Effects to downstream water-dependent fauna and flora including groundwater dependent ecosystems.
d. Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (e.g., river benches).
e. Changes to environmental water availability, both regulated/licensed and unregulated/rules- based sources of such water.
f. Mitigating effects of proposed stormwater and wastewater management during and after construction on hydrological attributes such as volumes, flow rates, management methods and re-use options.
g. Identification of proposed monitoring of hydrological attributes.

The water balance modelling undertaken only addresses water quantity. There has been no site water quality model to fully assess potential impacts on receiving waters (e.g. AMD seepage from TSF).

The requirement regarding the lack of a water quality model has also been consistently raised by Earth Systems (2022), DPE's independent reviewer. This has yet to be addressed and as such, potential water quality impacts are not able to be assessed.

As outlined in this submission, the water demand has not been clearly identified.

The full impacts of drawing the water supply requirements of the proposed project from the affected catchments have not been assessed. These issues were raised by Earth Systems (2022) - DPE's independent reviewers – but have been disregarded.

d. While it was not specifically referenced as an agency in the SEARs, Mid-Western Regional Council (Council) did provide comment in response to the stakeholder consultation conducted by DPE during the development of the SEARs, in its letter

dated 14 February 2013). Council provided the following commentary in relation to water management:

> *Council requests that a moratorium be placed on the sale of high security licenses to the Bowden's Silver Project until detailed assessment of the impact on other water users, such as agricultural users can be modeled and extensive consultation undertaken with existing users. Until such time as it can be demonstrated that the existing and future Water Sharing Plan for the Cudgegong River will provide sufficient protection for town water supplies it is consider irresponsible for further high security licenses to be sold that allow the transfer of water allocations within the catchment. It is considered imperative that the modeling, adjustment of the WSP and extensive consultation be undertaken prior to the sale of the water license.*
>
> ***Council considers that potential impact on water security for both agricultural users and town water supply is a determinative issue.*** *It is considered that the cumulative impact of the establishment of mining projects within the catchment and their water demands needs to assessed. In addition, it is imperative that potential adverse impact on water allocations during periods of drought to other industries, agriculture and the town water supply be considered and that the cost of the development include the potential decline of agriculture and growth of other industries due to the restricted access to water. Council considers that it is critical that a diverse economic base be maintain in the region and the potential threat to that diversity should be fully assessed as part of this application.*

e. The issues raised by Council have not been addressed, and particularly, it is noted that as modelled and reported by the proponent, the potential impact on water security for both agricultural users and town water supply does not accurately reflect the likely impact which will occur.
f. The Council is correct in stating that the impact upon water supply must be a determinative issue and, as shown in this submission, the project:
    i. has not had its true impact on water assessed and as such is not ready for consideration of approval, and
    ii. the likely surface impacts arising from the proposed project are unacceptably high and the project should not be approved.
g. The failure of the EIS and associated document to meet the requirements of the SEARs in multiple instances means the:
    i. the determining body, in this case the IPC, does not have sufficient information to make an informed decision
    ii. in making a recommendation for approval, DPE appears to have lowered the standard required to assess the impacts of the project,

iii. there is a failure of due process which undermines the confidence the community has in the decision-making process with regards to planning approvals.

Bowdens' Response

In its closing oral submission to the Independent Planning Commission (17th February, 2023), Corkery stated that the proponents response had satisfied the concerns raised regarding the SEARs in relation to water quality. This is not true. In its final report, December 2022, Earth System remained convinced that the water quality modelling was required. The extracts from the Earth Systems' (2022) report are summarised in **Appendix A.**

Mine Site catchment areas

Issue: It is unclear what the true area of the Mine Site catchment is, which casts uncertainty over the modelled impacts.

a. In its reporting, Corkery stated the following:

> Corkery (2022a, p.39):
>
> *To establish the Project's impacts on other water users, WRM (2022) assessed the Project's maximum impact on cease to flow conditions by removing the full 5.5km^2* ***(550 hectare) Mine Site catchment*** *from contributing to downstream flow. This 5.5km^2 Mine Site catchment includes the 3.0km^2 Walkers Creek sub-catchment (tailing storage facility) and the 2.5km^2 Blackmans Gully (open cut pit, processing plant) and Price Creek (waste rock emplacement) sub-catchment.*
>
> Corkery (2022a, p. xii):
>
> ***Water from the landscape*** *– It is acknowledged that the Project would capture runoff from within the 5.5km2 Mine Site catchment. This area includes the containment zone, clean water zone and the erosion and sediment control zone and was used to assess impacts to streamflow and downstream water users. Under existing conditions which include a predominantly vegetated landform, an average contribution of 177ML/year to local streamflow is predicted over the catchment area. However, following Mine Site development, the volume of water that runs off this landscape would be higher as the result of disturbance. Therefore, an average of 856ML/year is predicted to run off from these disturbed catchments during the Project-life, with this water predominantly captured in the containment structures.*

b. The proposed project layout is shown in Figure 1, with the proposed Mine Site boundary clearly shown in red.
c. While there appears to be no clear map showing the containment zone, clean water zone and the erosion and sediment control zones, Figure 2 shows the water management layout and supply dams. This shows how the 'Mine Site' catchment areas are either covered by mining operation infrastructure or runoff from these areas is captured by the proposed supply dams.
d. Figure 3 presents the contiguous Bowdens' land holdings (shown in pink), reported to be 2580ha (WRM, 2022), in which sits the proposed Mine Site boundary clearly shown in red, i.e. that understood to have a 550ha catchment.
e. However, when these two areas are overlaid, i.e. the proposed Mine Site boundary within the contiguous Bowdens' land holdings, it can be clearly seen that the proposed Mine Site boundary is greater than 20 percent of the full Bowdens' land holdings.

f. A calculation of the proposed Mine Site boundary using SIX Maps shows this area is actually approximately 1007 Ha, or nearly twice that reported by Corkery (2022) (Figure 4).

Conclusion

g. It is unclear what the true area of the Mine Site catchment is. This lack of clarity casts uncertainty over the modelled surface water impacts.

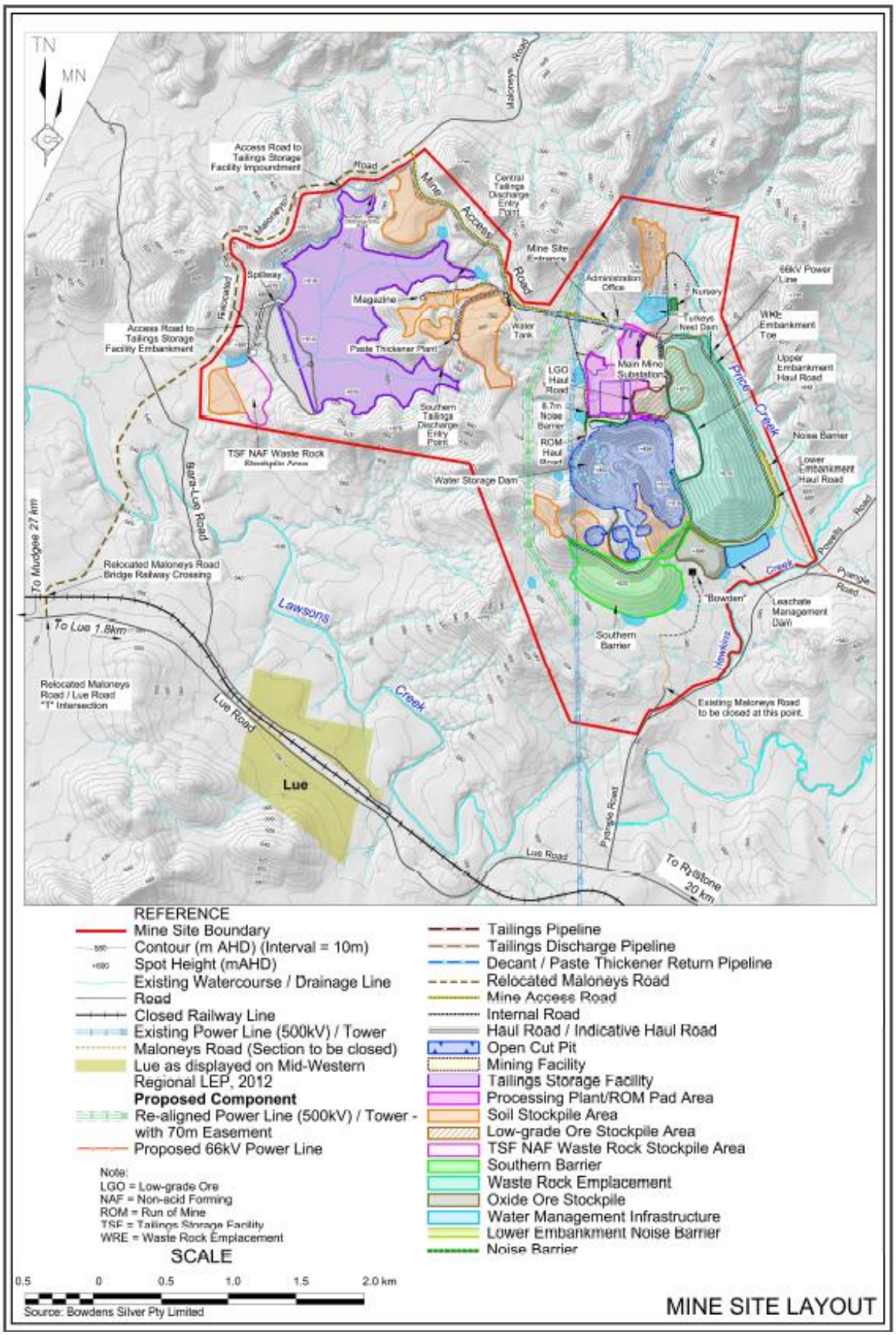


Figure 1 Proposed Project Layout
(Source DPE, 2022)

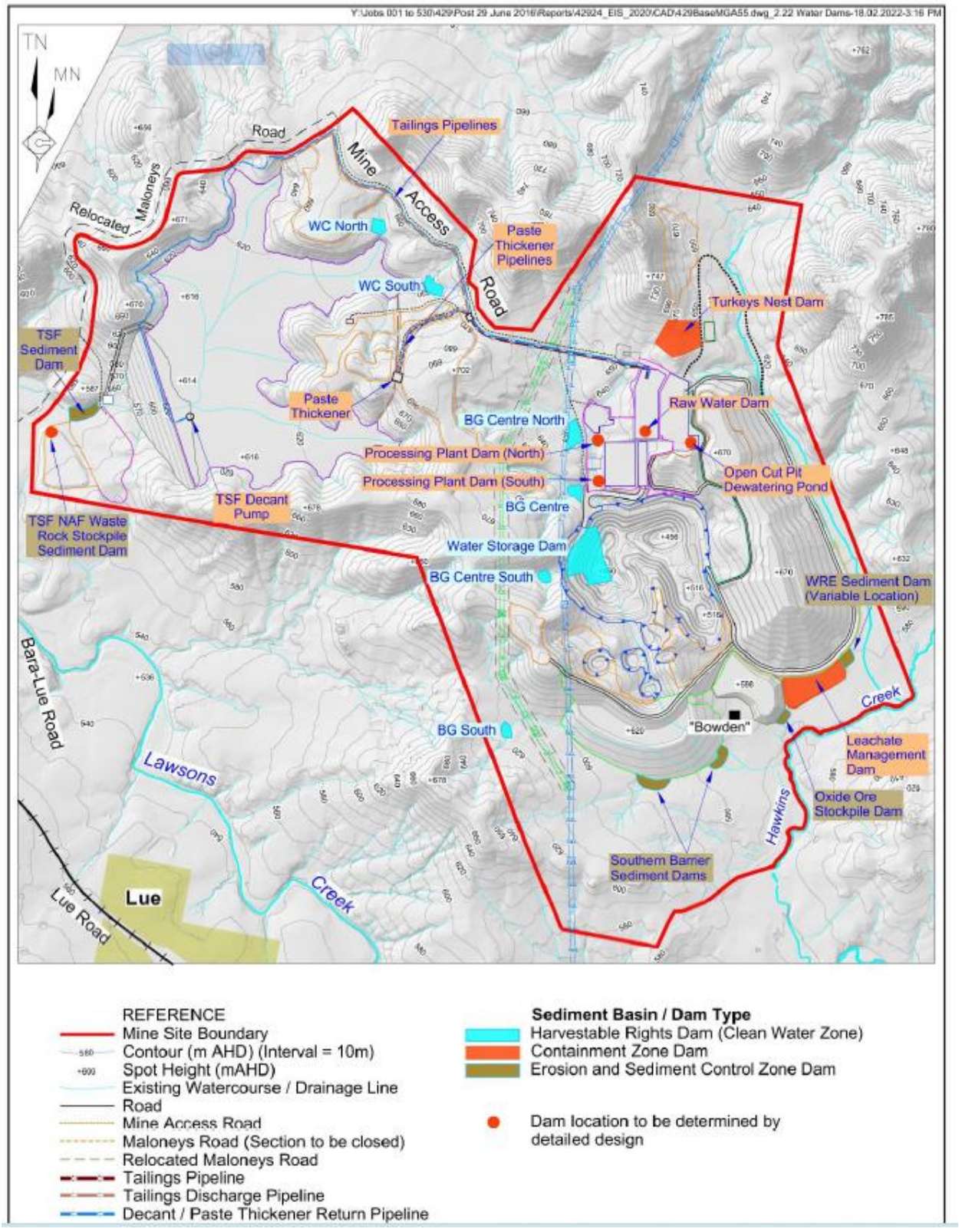


Figure 2 Integrated Water Management and Supply Dams

(Source Corkery 2022)

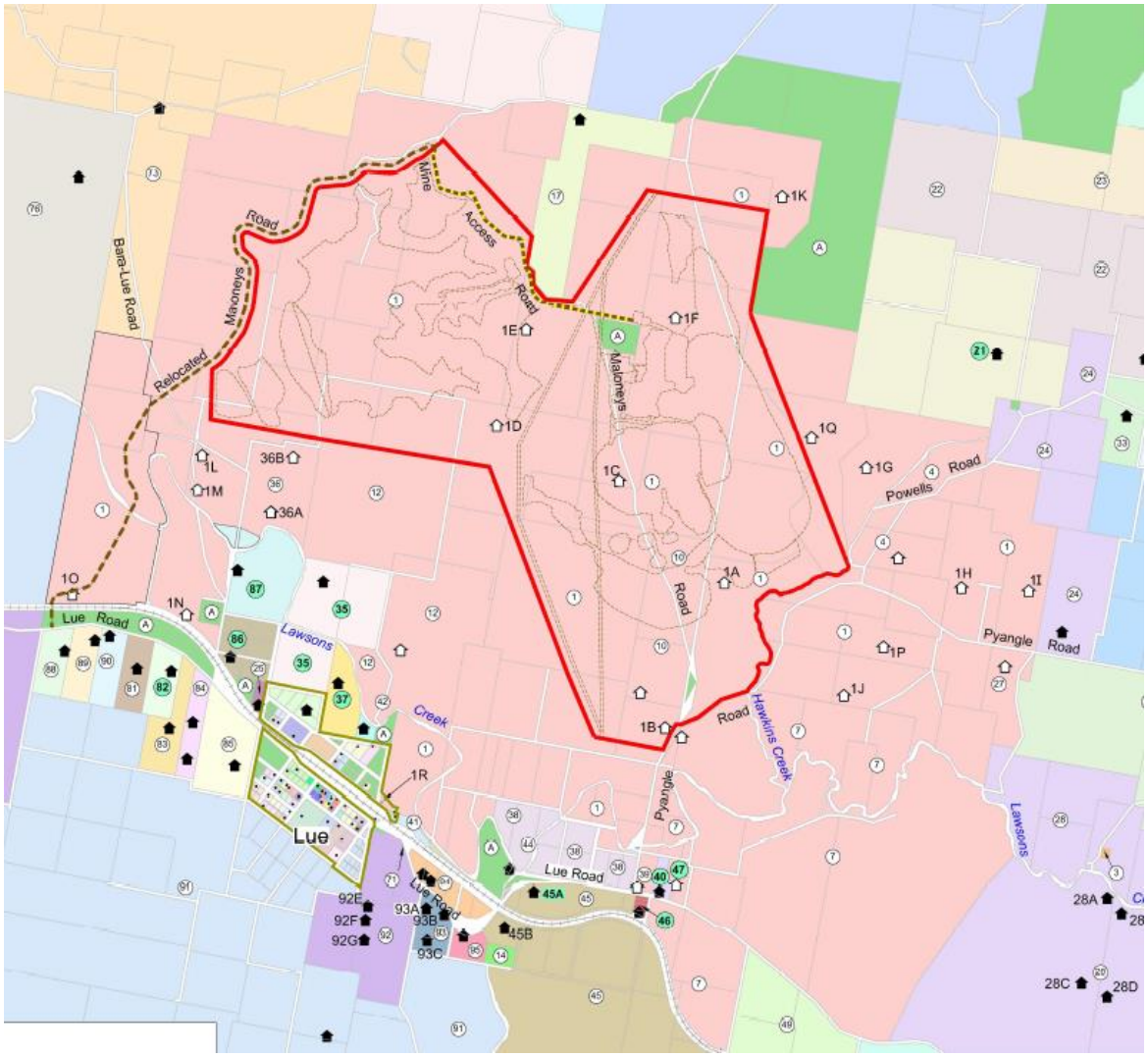


Figure 3 Bowdens Owned Land (pink shading)

(Source DPE, 2022)

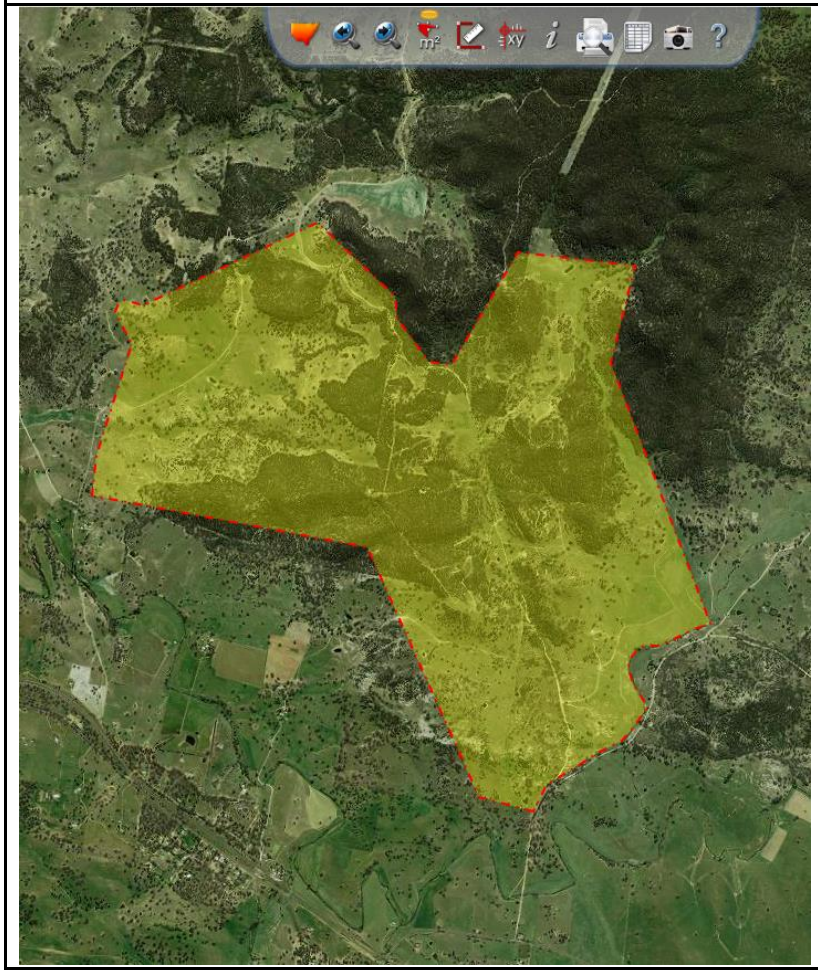
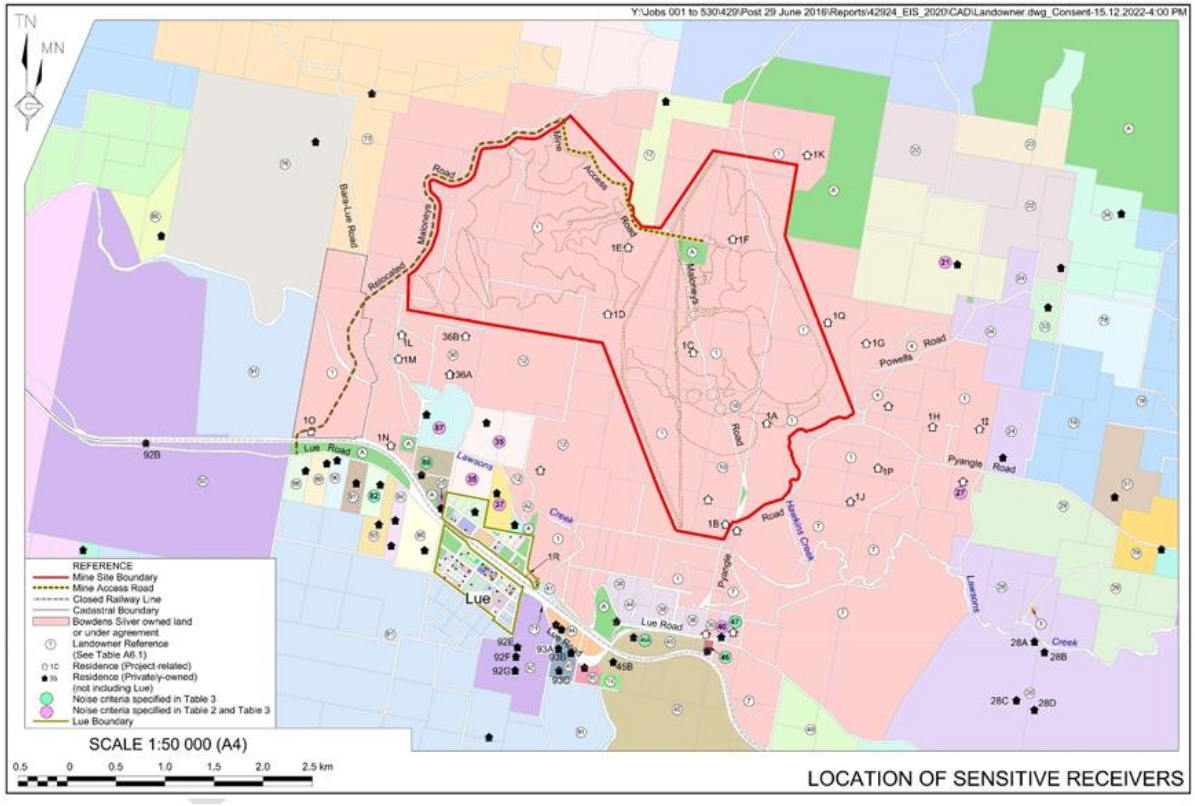
Mine site area – Six Maps – 1007 Ha	DPE Recommended Conditions
	

Figure 4 Mine Site Area calculation

(Source DPE, SixMaps 2023)

Uncertainty of water demand

Issue: There is a high level of uncertainty with regards to the water demand of the project:

a. It remains unclear exactly what the water demand of the proposed project is, as:
    i. The average water requirements for dust suppression were decreased from 204ML/year (WRM 2020) to 131ML/year (WRM 2022) with little explanation; and
    ii. The potable water requirements are estimated to be 14ML/year; however, this has not been included in the Project Water Requirements in the DPE assessment.

b. Corkery (2022) reported that for dust suppression:

    Water would be applied to haul roads to supress dust generation during construction and operations. Haul road water demands would vary throughout the Project life due to the changes in the length of haul roads as operations progress. ***In addition, during dry weather periods, when evaporation is high, more water for dust suppression would be required.*** *Haul road dust suppression demand would be reduced via the use of an approved chemical suppressant / sealant.*

c. WRM (2022) estimated the average annual dust suppression demand would require:

Table 5.3
Modelled Haul Road Watering Demands

Year	Watered Road Area (ha)	Average Annual Demand (ML/a)
0.5-1.5	16.5	121
1.5-2.5	18.2	133
2.5-3.5	19.7	144
3.5-4.5	20.1	148
4.5-5.5	19.2	140
5.5-6.5	16.1	118
6.5-7.5	15.1	111
7.5-8.5	19.6	144
8.5-9.5	28.1	206
9.5-10.5	19.6	144
10.5-11.5	16.2	119
11.5-12.5	13.5	99
12.5-13.5	14.2	104
13.5-14.5	15.1	114
14.5-15.5	16.3	127
15.5-16.5	18.3	135
16.5-17.5	18.3	135

d. Earth Systems (2022) raised its concern regarding the decrease from 204ML/year to 131ML/year for dust suppression. It reported the response by Corkery was *"The*

reduction has been derived from recent usage metering at a nearby upper Hunter Coal mines before and after utilisation of a proprietary dust suppressant."

To this, Earth Systems (2022) noted that there was no supporting data provided, nor were uncertainties in dust suppression requirements considered in the sensitivity analysis of the water balance model.

Earth Systems (2022) recommendation to DPE was that this matter was pending clarification of model sensitivity to uncertainty in water requirements for dust suppression, details on the proposed chemical composition, application rates and toxicity, and implications for the impact assessment. These concerns remain unaddressed and appear to have been dismissed by DPE.

e. As part of this review, the dust suppression calculations have been tested, based on the assumption of 4L/m^2 each day, a figure commonly accepted in the mining industry. This water requirement was assumed to be necessary whenever the evaporation exceeded rainfall during the year. As only monthly figures were provided by WRM (2022, p6-38), and these show that rainfall exceeds evaporation only in June and July, it was assumed that in all other months, water for dust suppression would be required. The results from this analysis show a peak dust suppression requirement of 342ML/year; which is 40% higher than that stated by WRM (2022):

Year	Watered Road Area (ha)	Application (ML/a)
0.5-1.5	16.5	201
1.5-2.5	18.2	221
2.5-3.5	19.7	240
3.5-4.5	20.1	244
4.5-5.5	19.2	233
5.5-6.5	16.1	196
6.5-7.5	15.1	184
7.5-8.5	19.6	238
8.5-9.5	28.1	342
9.5-10.5	19.6	238
10.5-11.5	16.2	197
11.5-12.5	13.5	164
12.5-13.5	14.2	173
13.5-14.5	15.1	184
14.5-15.5	16.3	198
15.5-16.5	18.3	223
16.5-17.5	18.3	223

f. From WRM in Bowdens 2022a, the following average water balance scenario is presented. It is unclear as to why the dust suppression demands supplied are only 128ML/year.

Table 5.5b
Average Annual Site Water Balance – Years 1 to 14 - Revised

Item	Inflow ML/a	Outflow ML/a
Rainfall and runoff	924	
Net groundwater inflows to open cut pit	431	
Advanced dewatering	380	
Clean water harvesting	27	
Ore moisture	83	
Retained tailings moisture		1 143
Evaporation		477
Dust suppression demands supplied		128
Concentrate moisture		6
Other plant losses		19
Dam overflows		0
Annual increase in stored volume		72
Total	1 844	1 844

g. Corkery (2022b p 12) reported the following water balance results for low and high runoff scenarios:

Table 3
Average Annual Site Water Balance – Years 1 to 14 – Low Runoff Scenario
(correction to Table 5.11 of WRM [2022])

Item	Inflow ML/a	Outflow ML/a
Rainfall and runoff	740	
Net groundwater inflows to open cut pit	431	
Advanced dewatering	380	
Clean water harvesting	22	
Ore moisture	82	
Retained tailings moisture		**1,129**
Evaporation		356
Dust suppression demands supplied		131
Concentrate moisture		**6**
Other plant losses		19
Dam overflows		0
Annual increase in stored volume		**14**
Total	1,655	1,655

Table 4
Average Annual Site Water Balance – Years 1 to 14 – High Runoff Scenario
(correction to Table 5.12 of WRM [2022])

Item	Inflow ML/a	Outflow ML/a
Rainfall and runoff	1,109	
Net groundwater inflows to open cut pit	431	
Advanced dewatering	380	
Clean water harvesting	58	
Ore moisture	83	
Retained tailings moisture		**1,146**
Evaporation		614
Dust suppression demands supplied		132
Concentrate moisture		**6**
Other plant losses		20
Dam overflows		0
Annual increase in stored volume		**143**
Total	2,061	2,061

h. From the tables above, it is observed that the:

i. average water requirements for dust suppression are around 131ML/year for both low and high runoff scenario. This seems

counterintuitive, for the reason stated by Corkery (2022) "**during dry weather periods, when evaporation is high, more water for dust suppression would be required**".

ii. The evaporation in the low runoff scenario is only 356ML/year, while in the high runoff scenario, it is 614ML/year. Again, this seems counter-intuitive; as low runoff periods are dry periods, and during these periods evaporation would typically be higher than average.

i. The water requirements documented in Figure 5.1 Average Annual Project Demands (WRM 2022 p6-83) appear to not include the potable water demands.

j. These are estimated to be 14ML/year (WRM 2022 p6 – 82). While initially this demand will be met via delivery to the Mine Site by water tanker, it is intended that a reverse osmosis plant will be installed. At this time, the potable water demand will need to be met by the water resources of the site.

k. There is no indication in the average annual site water balance that this demand has been allowed for and appears to have not been included in the Project Water Requirements assessed by DPE.

Conclusion

l. There is a high level of uncertainty with regards to the water demand of the project. This uncertainty in particular is in regard to the dust suppression requirements and the assumptions relating to evaporation.

m. It is also unclear if potable water requirements have been allowed for. This undermines the confidence of the assessed impacts and the ability of the proposed project to meet its water requirements.

AWBM water balance model issues

Issue: There is a high level of uncertainty with regards to the AWBM water balance model and its sensitivity to key parameters.

Calibration and verification

a. The water balance model which has been developed for the mine's water requirements and to assess the potential impact **has not been properly calibrated** due to a lack of data within the Lawson Creek catchment.
b. The model has excluded any dry periods (i.e. see Figure 5) in what calibration was undertaken and not undertaken any verification using the local stream gauges.
   i. The parameters adopted within the AWBM model were based on a calibration against stream flows in the upper Cudgegong River. It is not clear why this location would have been adopted, given that the Cudgegong River is a permanent water source while the catchments being affected by the proposed mine are ephemeral. Further, WRM (2022, p 6 – 46) stated ***key statistics of the calibration over the period 27/6/2009 to 30/12/2017 (which excludes recent very dry weather when instream losses appear to be most pronounced).***
   ii. WRM (2022, p 6 – 43) presents flow data for Hawkins Creek at Powells Road (Station No. 421195) and Bingmans Crossing (Station No. 421194) (**Figure 5**).
   iii. WRM **did not verify the water balance model**. There is data available for use, with the flow data gathered at Powells Road and Bingmans Crossing. This could have been used to verify the parameters adopted. This is best practice in modelling. It is unclear why this was not done.
   iv. WRM (2022, p 6 – 43, 44) state that there is data missing during the period from mid-2018 through to the end of 2019. In fact, this is because there simply were **no flows** during this period (pers. comm. A. Ireland), as this was during a period of severe drought and the lead up to the Black Summer bushfires. There were no flows in Lawson Creek (further downstream) in 2019 (**Figure 6**), and waterways upstream of Lawson Creek would have dried out earlier. It appears WRM do not well understand the catchments being modelled, which has led to the development of a model which does not reflect the actual catchment behaviour.

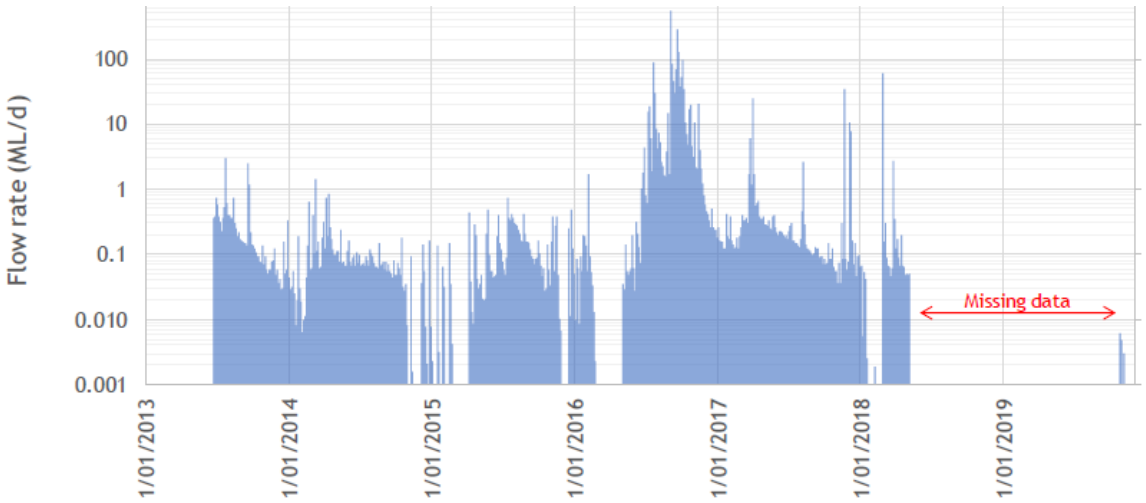


Figure 5 Streamflow recorded in Hawkins Creek at Bingmans Crossing

(Source WRM, 2022)

Figure 6 Lawson Creek, 2019

(Credit T. Combes)

Sensitivity analysis

c. The sensitivity analysis for the water balance model considered two sets of AWBM parameters to reflect "low runoff" and "high runoff" (most recent version of the results presented by WRM in Appendix 2 of Corkery 2022)
d. DPE commissioned Earth Systems to undertake an independent expert review of the water balance modelling on its behalf. Earth Systems (2022) **recommended that sensitivity analysis be conducted on the following key input variables**:
    i. Evaporation rates.
    ii. Dust suppression water volumes.
    iii. Other key model input variables.
    iv. Cumulative sensitivity associated with multiple parameters (not just sensitivity analysis of one parameter at a time).
e. **This sensitivity analysis has not been done**. As such, it is not possible to understand the sensitivity to:
    i. variability in the key parameters if these differ from the assumptions made within the model
    ii. the cumulative sensitivity (multiple parameters)
    iii. the implications for the risk of uncontrolled discharge
    iv. project water supply viability and
    v. most importantly, potential impacts of the project on surface water within the affected catchments and downstream valley.

Use of 'average' results

f. The results of the AWBM water balance are consistently presented as 'average' results. **The use of average results to assess impacts is highly problematic.** If an "average" is a state of mind, one would believe that if you put your feet in a freezer and your head in an oven, on the average you will be very comfortable.
g. The presentation of only average results is highly problematic, as these do not allow for an adequate assessment of the impact of flow during wetter or drier periods. The proposed mine site is in an area which has a high variability in its rainfall, which leads to a high variability in its runoff.
h. As shown in the analysis by Baguley (2022), historically 20 percent of the time, (or one in every five years) the climatic conditions are akin to a **semi-arid environment**, receiving little more than 500mm per annum. It is not clear what happens with mine operations, and more importantly, how the adjacent and downstream water users are impacted in these dry times.
i. The presentation of only average results is highly problematic, as it is unclear how the mine infrastructure will cope during **extreme wet periods, extreme dry periods and how the modelled inputs vary over the years of the mine operating**.
j. In relation to dust, the average annual dust suppression demand of 131 ML/year was modelled over the years 1 – 14 (WBM 2022, p6-87); however the average annual dust suppression demand reaches a peak of 206 ML/year (Table 5.3 p 6 – 82, refer also item c in 'Water Demand section above). There is no understanding of what capacity the mine will have to meet this dust demand.

k. The reliability of the water supply is modelled only on 'average' inputs.

Climate change scenarios

l. A significant deficiency in the water balance is that it has not tested the proposed water strategy under **climate change scenarios.**
m. WRM (2022) does recognise that there will be greater variation in rainfall, and this will in fact impact the modelling it presents in its report - it considers climate change impacts in its modelling of the final void pit lake behaviour. It recognised that there could be decreases of nearly 50 percent in the rainfall (Table 7.2).
n. However, there is no sensitivity analysis of climate change impacts – which are already being felt in this region, through crippling drought followed by extreme rainfall events and flooding through the valley – in the site water balance model used to assess the feasibility of the mine being able to rely on water supplied by the surface and groundwater resources of the site.
o. In the Submissions report (2022a) Corkery said 'Whilst it recognised that climate change is a consideration for the final void pit lake as it would remain in perpetuity, the rainfall variation in the EIS SILO data is considered sufficient to account for any **near-term impacts of climate change**.'
p. However, as Bowdens' advised the Independent Planning Commission in its oral submission (15th February, 2023), there is further resource already being investigated and the mine hopes to be around for much longer than 15 years. Given this, the impacts of the mine on water resources under a changed climate must be considered.
q. Further, as noted by Corkery (2022a), there are elements of this mine which will affect water resources in perpetuity.
r. The high level of uncertainty with regards to the AWBM water balance model and its sensitivity to key parameters means there is a lack of confidence in its ability to reliably predict the likely impacts of the proposed mine.
s. The resistance by the authors of the EIS and associated documentation to take on board the findings and recommendations of both submissions on the water amendment and by DPE's independent reviewer. This serves only to further undermine confidence in this model.
t. Without further modelling and sensitivity testing and subsequent presentation of a broader range of results, all of which would serve to provide the necessary understanding of the likely impacts on the surface water - a critical issue, it is the strongly held opinion that the AWBM water balance model is not yet fit for consideration of approval.

Conclusion

u. There is a high level of uncertainty with regards to the AWBM water balance model and its sensitivity to key parameters. This means there is a lack of confidence in its ability to reliably predict the likely impacts of the proposed mine.
v. Without further modelling and sensitivity testing and subsequent presentation of a broader range of results which would provide the necessary understanding of the

likely impacts on the surface water - a critical issue, **it is the strongly held opinion that the AWBM water balance model is not yet fit for consideration of approval.**

Significant surface water impacts

Issue: The likely impact of the mining operations on the surface water is unacceptable.

a. Setting aside the concern that there is a high level of uncertainty with regards to:
   i. the water demand of the project, and
   ii. the water balance modelling used to assess the impact of the project,

   the project also has not had its true impact on water assessed and as such is not ready for consideration of approval.

Removal of 856 ML/year from the project area catchments

b. DPE (2022) has assessed the project on the basis of 177ML/year being 'lost' to the catchment; however, the true figure is 856ML/year, as confirmed by Bowdens. This is over 380% more rainfall runoff than what the DPE has assessed the project on. The advice from its own experts to assess the project with the 856ML/year impact has been ignored.
c. The impact on downstream water users has been estimated based on 177ML/a rainfall runoff being removed from the catchment.
d. However, during the response to submissions and DPE's independent expert advisor, it has been confirmed that rainfall runoff of 856ML/a is being actually removed from the catchment. This is 480% more rainfall runoff than originally calculated, so the impact assessment is seriously underestimating impacts on downstream water users.
e. From Corkery (2022a, p. xiii)

   Water from the landscape – It is acknowledged that the Project would capture runoff from within the 5.5km2 Mine Site catchment. This area includes the containment zone, clean water zone and the erosion and sediment control zone and was used to assess impacts to streamflow and downstream water users. Under existing conditions which include a predominantly vegetated landform, an average contribution of 177ML/year to local streamflow is predicted over the catchment area. However, following Mine Site development, the volume of water that runs off this landscape would be higher as the result of disturbance. Therefore, an average of 856ML/year is predicted to run off from these disturbed catchments during the Project-life, with this water predominantly captured in the containment structures.
f. From Corkery (2022a, p38)

   Using the Australian Water Balance Model, WRM (2022) established that by removing the Mine Site catchment:
   • at the confluence with Hawkins Creek (Location A on Figure 8.2 of WRM [2022]), streamflow would be reduced by approximately 80.3ML/year (or 1.1%) of the 7,136ML/year average Lawsons Creek streamflow at this location; and
   • at the confluence with Walkers Creek (Location C on Figure 8.2 of WRM [2022]), streamflow reduction would increase by 96.3ML/year to 176.6ML/year that represents 2.2% of the 8,735ML/year average Lawsons Creek streamflow at this location.
g. It is noted that this does not consider what percentage of flow this represents in a dry year. It is misleading to report this only against the average flow. In dry times, when there is very little flow, it is reasonable to expect that 'cease to flow' conditions will be accelerated by a removal of 176.6ML/year.
h. From Corkery (2022a, p39)

   The use of on-site sources for Project-related water supply would not require an increase to the maximum Mine Site catchment assessed for the EIS. As there is no increase to this

catchment, there is no further reduction in streamflow contributions from the Mine Site. Hence, the identical catchment area and streamflow values in both tables.

i. DPE's independent reviewer, providing the following comment in relation to the claim by Corkery. Earth Systems (2022):

It has been confirmed that 856 ML/year of surface runoff would be removed from the Lawsons Creek catchment. This is well in excess of losses presented elsewhere in the EIS (177 ML/year; which relates to surface water runoff losses only). A review of impacts on downstream surface water, baseflow and groundwater is therefore warranted.

j. This was provided by Corkery (2022c) in response:

It is not accurate to state that 856ML/year of surface runoff would be removed from the Lawsons Creek catchment. Not all rainfall becomes runoff. In a vegetated setting rainfall that lands on the landscape may be absorbed by vegetation, evaporate from the surface of the vegetation or may infiltrate the surface, with the remaining water running off. On this basis, the Australian Water Balance Model (AWBM) developed by WRM estimated that the 550 hectare Mine Site catchment currently contributes 177 ML/year of runoff, on average, to Lawsons Creek streamflow. Once the Mine Site is developed, vegetation would be removed, a firm relatively impermeable surface developed or dams such as the TSF would be constructed within the Mine Site catchment causing a much greater proportion of rainfall to become runoff. Therefore, the figure of 856ML/year represents the volume of water that would runoff the developed Mine Site catchment and remain within the Mine Site water storage structures constructed for the Project.

k. Earth Systems(2022), DPE's independent reviewer did not accept this argument. The author of this submission concurs with Earth Systems. It is not plausible to say that the project "creates" 679ML/year of water. The additional volume of water would have also made its way into the environment via different pathways. The proposed mine would be removing this 679ML/year and **it must be accounted for in the assessment of the impacts** so as the impacts can be undertsood.

l. Earth Systems (2022) made the following recommendation to DPE:

Prior to construction:
Re-assess impacts on local surface water, baseflow and groundwater, noting the removal of 856 ML/year from the project area catchments, rather than 177 ML/y based on surface water runoff losses only

m. This recommendation is not satisfactory. At present the proponent has not met the fundamental requirement of the EIS, that is, to assess the likely impacts of the proposed project. **These impacts must be assessed prior to approval,** such that it can be understood if the impacts are considered acceptable. This is particularly so with water, as many of the impacts on water may be highly disruptive to the surrounding water users, adjacent and downstream landholders, many of whom have lived and worked on these properties for generations, and the environment. Further, in some cases the surface water impacts would be permanent. This must be weighed up against the short-term operations of the mine.

n. It is noted that in its draft recommendations, DPE has also ignored the advice of its independent reviewer. There is no direction to the proponent to consider the full impact of the water extraction proposed by the mine on the surrounding environment.

Removal of 951 ML/year from the project area catchments

o. There is also doubt regarding what comprises the 856ML/a figure. Earth Systems (2022) noted:

The water balance outputs indicate "rainfall and runoff " as the primary inflow to the site, averaging 806ML/year between Year 1 and Year 14 of mining operations (WRM, 2020). This was updated to 856 ML/year in WRM (2022).

p. This was in relation to this table, presented in WRM (2022, p 6 – 87)

Table 5.5
Average Annual Site Water Balance – Years 1 to 14

Item	Inflow ML/a	Outflow ML/a
Rainfall and runoff	856	
Net groundwater inflows to open cut pit	431	
Advanced dewatering	380	
Clean water harvesting	40	
Ore moisture	83	
Retained tailings moisture		1 141
Evaporation		448
Dust suppression demands supplied		131
Concentrate moisture		18
Other plant losses		20
Dam overflows		0
Annual increase in stored volume		31
Total	**1 789**	**1 789**

q. Corkery 2022b advised:

*The increase from 806ML/y to 856ML/y is attributed to the TSF liner **and addition of clean water harvesting***

r. However, as can be seen from Table 5.5 above, the clean water harvesting is presented separately to the 856ML/year. Therefore, as it is also being removed from the Mine Site catchment, it should be considered **in addition to** the 856ML/year.

s. In response to the submissions, there was a revision of Table 5.5 (WRM in Bowdens 2022a) and the following average water balance scenario presented:

Table 5.5b
Average Annual Site Water Balance – Years 1 to 14 - Revised

Item	Inflow ML/a	Outflow ML/a
Rainfall and runoff	924	
Net groundwater inflows to open cut pit	431	
Advanced dewatering	380	
Clean water harvesting	27	
Ore moisture	83	
Retained tailings moisture		1 143
Evaporation		477
Dust suppression demands supplied		128
Concentrate moisture		6
Other plant losses		19
Dam overflows		0
Annual increase in stored volume		72
Total	**1 844**	**1 844**

t. From this table, it can be seen that the "average" annual site water balance removal from the project area catchments is:

i. 924 ML/year in rainfall and runoff, and
ii. 27 ML/year in clean water harvesting

giving **a total of 951ML/year removal from the project area catchments**.

u. At this point, it is relevant to reiterate that these volumes are calculated based on a model with questionable calibration, inputs and assumptions.

v. In an attempt to quantify what the true impact of the proposed mine could be, Table 8.1 from WRM (2022, p6 - 127) was updated to assess impacts for the actual proposed volume of water to be removed, and extended, so as the likely impacts on flows during drier periods could be considered. The latter is because the proponent's assessments consistently present impacts against average flows, which does not allow the impacts in dry times or extreme wet times to be assessed. The cells highlighted in blue below are these additions.

w. The data used to complete the low flow impact assessment was drawn from the Figure 8.3, which is the "Effect of Loss on Lawsons Creek Streamflow Frequency - Location C" (WRM 2022, p6 - 129). From Figure 8.3, the daily flow rates for flows the q60 and q70 events were derived. Flows are less than these values 40% and30% of the time, respectively.

x. The updated version of Table 8.1 is presented here:

Table 8.1^: Revised with greater catchment and consideration of lower flow

Impact of Project on Mean Annual Streamflow in Downstream Waters

Reach Number	**Unit**	**Operations**			**Post closure**			**Comment**
		1	**2**	**3**	**1**	**2**	**3**	
Watercourse and reach		Hawkins Creek	Lawsons Creek	Lawsons Creek	Hawkins Creek	Lawsons Creek	Lawsons Creek	
		P - A	B - C	C - D	P - A	B - C	C - D	
Pre-mining catchment area	km2	61	222.3	272.1	61	222.3	272.1	not altered from Table 8.1
Catchment area contained in WMS	km2	not known definitively						
Mean annual flow								
Pre-mining ML/a	ML/a	1958	7136	8735	1958	7136	8735	not altered from Table 8.1
q60 (flows are less than this 40% of the time)	(ML/d)	not available		4	not available			From Figure 8.3 of amendment report
q70 (flows are less than this 30% of the time)	(ML/d)	not available		2.4	not available			From Figure 8.3 of amendment report
Loss due to Mine Site WMS	ML/a	854.7	854.7	**951**	17	17	17	Have added 774.4ML/y, the amount over 176.6, to all operations catchments. It is expected that post closure resullts would be higher as well, once the full affected catchment is considered
Loss due to Mine Site WMS (ML/a)	(ML/d)	2.3	2.3	2.6				
Potential baseflow reduction*	ML/a	9.5	5.1	14	11.2	8	19.3	not altered from Table 8.1
	(ML/d)	0.03	0.01	0.04				
Total change due to the Project	ML/a	-864.2	-859.8	-965	-28.2	-25	-36.3	Assumed to be sum of losses above. Note, numbers in original Table 8.1 didn't add up
	(ML/d)	-2.4	-2.4	-2.6	0.0	0.0	0.0	
Comparison with Mean annual flow								
Percent change due to the Project	%	-44.1	-12.0	-11.0	-1.4	-0.4	-0.4	
Comparison with								
q60 (flows are less than this 40% of the time)	(ML/d)	not available		-66.1	not available			
q70 (flows are less than this 30% of the time)	(ML/d)	not available		-110.2	not available			

y. As shown above, when the impact of removing 951ML/year is considered, there is
   i. **44% reduction of flows from Hawkins Creek** downstream of the mine site - **not** 4.5% as claimed by WRM (2022); and
   ii. **11% reduction of flows from Lawson Creek** downstream of the mine site - **not** 2.2% as claimed by WRM (2022).

z. The proposed water to be drawn from the catchment due to the mine is estimated to be 2.6 ML/day. For 40% of the time, flows in Lawson Creek are less than 4 ML/day and 30% of the time they are 2.4 ML/day. **The proposed mine will take 66.1% and 110.2% of these flows respectively**.

aa. These losses make the likely impact of the mining operations on the surface water unacceptable and it should not be approved.

Ground truthing of Lawson Creek flows

bb. WRM (2022) states *'based on the hydrological modelling outlined in the following section (using parameters' established by calibration to long-term streamflow records in the upper catchment*

of the nearby Cudgegong River), average daily flows in Lawsons Creek downstream from Hawkins Creek are estimated at 19.5 ML/day or 7 136 ML/a'. This does not align with the local knowledge of this waterway.

cc. In an attempt to understand the level of variation between the modelled flows and predictions of flows in the Lawson Creek catchment and the likelihood that the claims in the EIS and associated documentation reflect the on-ground reality, an investigation of the current status of Lawson Creek and its flows was undertaken.

dd. The landholder of Monivae was approached to ascertain if flows in Lawson Creek could be measured at this location, as this property sits just upstream and outside of the proposed mine site, being property #28 in Figure 7, shown shaded in purple and straddling Lawson Creek.

ee. Lawson Creek flows through this property, and it lies just upstream of the Hawkins Creek confluence.

ff. The LawsonCreek catchment is shown in Figure 8. WRM (2022) advises the following catchment areas:

a. Hawkins Creek to Bingmans Crossing: 61 km^2
b. Walkers Creek: 4.9 km^2
c. Blackmans Gully: 2.3 km^2
d. Lawson Creek downstream of the Walkers Creek confluence: 272 km^2

Using Figure 3.5 from WRM (2022), it is estimated that the southern catchment contributing to Lawson Creek between the Monivae property and Walkers Creek is 45 km^2 and between the Hawkins Creek confluence and Walkers Creek is 29 km^2

Based on this, it is estimated that the catchment contributing to flow within Lawson Creek at Monivae is 272 km^2 less the catchment areas for Hawkins Creek, Walkers Creek, and Blackmans Gully, and the southern catchment giving a 'Monivae catchment' of 159 km^2. This overestimates the Lawson Creek catchment at the Walkers Creek confluence, as it does not subtract the areas flowing north to Lawson Creek between Bingman Crossing and the Walkers Creek confluence.

In summary, this gives the following areas:

e. 'Monivae catchment': 159 km^2.
f. Lawson Creek upstream of the Hawkins Creek confluence: 188 km^2
g. Hawkins Creek to Bingmans Crossing: 61 km2
h. Lawson Creek downstream of the Walkers Creek confluence: 272 km2

gg. A temporary v-notch weir was constructed at a suitable location on Lawson Creek. The location had a hard rock crossing to form the base and alluvial clay banks. This formation minimises any seepage losses. The location of the weir is shown in Figure 7 and Figure 8. The construction of the weir is shown in Figure 9. The measurement of the weir is shown in Figure 10. This was taken on 21st February, 2023. This followed a storm event the preceding day, which recorded 9mm at Monivae. The flow rate at this location for the 'Monivae catchment' is 3.1L/s, or 0.27ML/d.

hh. Based on the catchment areas above, it can be understood that Hawkins Creek is approximately 40% of the 'Monivae catchment', so it is reasonable to assume its daily flow rate would be 40% of the flow measured at the v-notch weir in Lawson Creek. This would give a flow rate of 0.11ML/d. Therefore, based on actual data the flows in Lawsons Creek downstream from Hawkins Creek are estimated at 0.38ML/d, **which is significantly less – two orders of magnitude - than the 19.5 ML/day assumed by WRM** (2022).

ii. It is understood that this figure represents a single point in time, but it is noted that this reading is taken in February 2023, following an extremely wet year in 2022. The adjacent property, Lochiely, recorded 1025mm in 2022. Baguley (2022) presented the rainfall percentiles for the Mudgee, Rylstone and Lue region. For easy reference, these are presented again here in Figure 11. This shows that the 2022 rainfall is greater than the 90th percentile. In 2023, there had been 82.5mm recorded for January, and 19.5mm to 21st February. That is, 2022 was an extremely high rainfall year and a reasonable level of rainfall had continued to be experienced in 2023 prior to the weir measurements being recorded. **Nevertheless, at 0.38ML/d, the flow rate in Lawson Creek is less than 2% of that reported to be by WRM (2022).**

jj. WRM (2022) reports that:

> *The Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources states that water must not be taken under a WAL when there is no visible flow or where, a licence permits, take from an in-river pool, when the volume in that pool is less than its full capacity.*
>
> *The principal mechanism by which the Project would affect the quantity of water supplies available to other surface water users in the Lawsons Creek Water Source of the Macquarie Bogan Unregulated and Alluvial Water Sources is by reducing flows such that the frequency and duration of cease-to-flow periods is increased. …….*
>
> *At this location, flows greater than 1 ML/d (approximately 12 L/s) occur about 81.0% of the time. The results show that the impact of the Project on the frequency of flows greater than 1 ML/d is expected to be minimal (flows greater than 1 ML/day would occur for approximately 80.5% of the time, i.e. a reduction of 0.5% of the time or up to 2 days per year on average) and therefore the impact of the loss on the availability of water to downstream water users would be negligible.*

kk. The claim that the flows in Lawson Creek are greater than 1ML/d is patently wrong. This has been proven, with the on-ground assessment showing there would be a flow of only 0.038ML/d in this waterway at the confluence of Hawkins and Lawson Creeks. This is despite the extremely favourable climatic conditions preceding the measurement of flows. There is simply no way that this waterway system has flows of greater than 1 ML/d occurring about 81.0% of the time.

ll. With less than 1 ML/d currently flowing at the confluence of Hawkins and Lawson Creeks, it has been demonstrated that the Lawson Creek would be in this state for the majority of time. **After rainfall in the top 10% of rainfall events within the region, the Lawson Creek is currently at a 'cease to flow' state**.

mm. This was verified through inspection of the Lawson Creek on Monivae just upstream of the confluence with Monivae Creek. At this location, on 21st February, 2023, the Lawson Creek was simply a series of ponds with a trickles running between. Photographs are presented in Figure 12 and Figure 13.

nn. One probable explanation for this vast discrepancy is the flaws in the model calibration and verification identified earlier in this submission. The outputs of a model is only as good as what is put in and how it is set up to synthesise that data. As shown in this submission, the model is not fit for purpose as it can not credibly manage the rainfall-runoff responses within the upper Lawson Creek catchment.

oo. Nevertheless, the results presented here show that the impact of the proposed project on the frequency of flows will be very significant and very detrimental for the affected waterways. There is simply not the water available to take the quantity required to sustainably operate the proposed mining project.

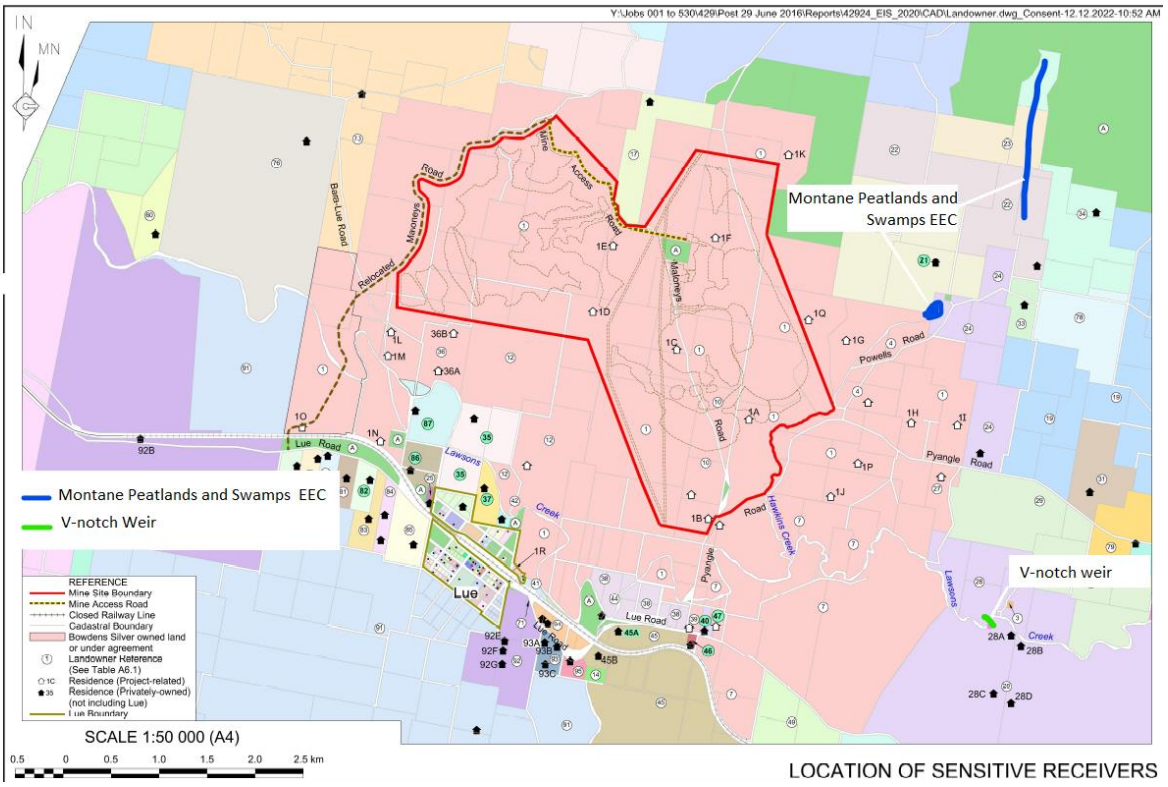


Figure 7 Location of Monivae and v-notch weir

(Source: DPE 2022)

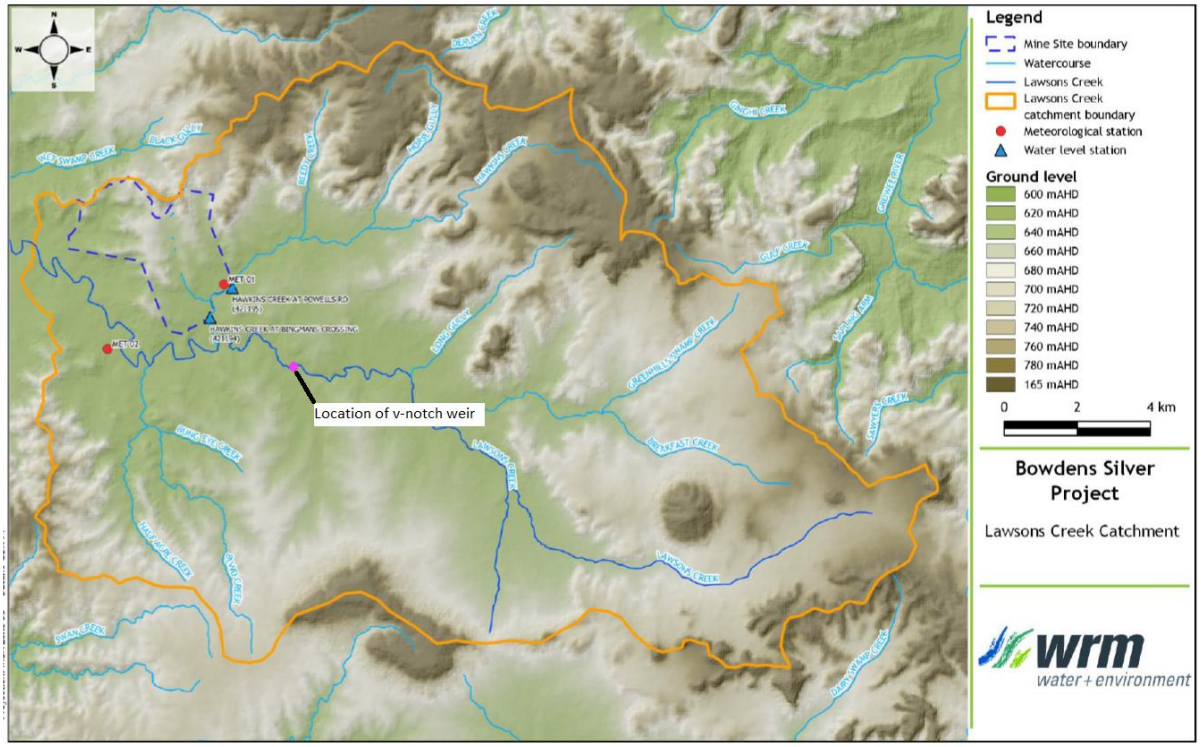


Figure 8 Lawson Creek catchment

(Source: WRM 2022)

Figure 9 V-notch weir construction

Figure 10 V-notch weir measurement

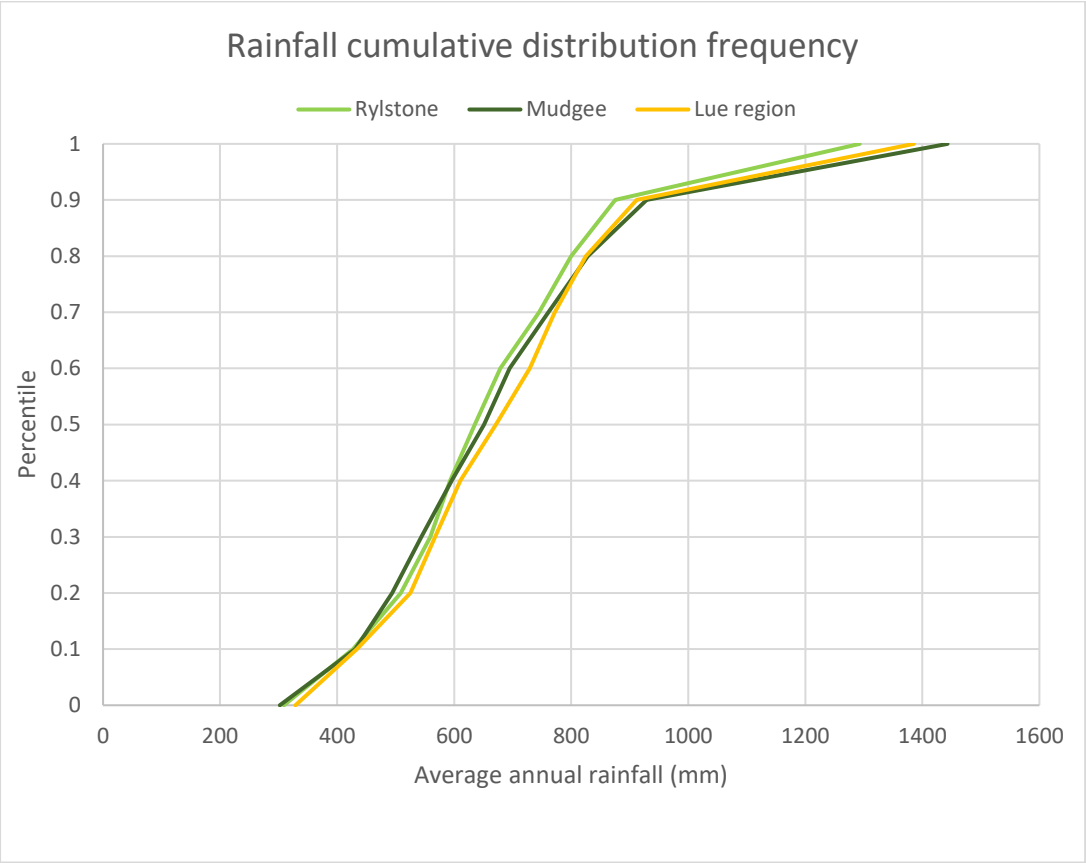


Figure 11 Rainfall cumulative distribution frequency

Figure 12 Lawson Creek at Monivae, 21st February 2023, looking south

Figure 13 Lawson Creek at Monivae, 21st February 2023, looking north

Regulatory irregularities

Issue: There are a number of regulatory irregularities which must be addressed.

a. As it presents, there are clear issues relating to
   i. the quantity and status of water being taken under "harvestable water rights" and
   ii. the stated intention to harvest water from sediment basins.

Incorrect application of WAL exemptions

b. WRM (2022 p 6 – 122n) says the following exemptions under the Water Management Regulation 2018 (the Regulation) may apply:

> *Schedule 5 of the Water Management (General) Regulation 2018 (the Regulation) provides a water access licence is not required for water take that is caused by an "excluded work" as outlined in Schedule 1 of the Regulation. Schedule 1, lists a number of exemptions, two of which potentially apply to this Project:*
>
> > *1 Dams solely for the control or **prevention of soil erosion**—*
> > *(a) **from which no water is reticulated** (unless, if the dam is fenced off for erosion control purposes, to a stock drinking trough in an adjoining paddock) **or pumped**, and*
> > *(b) the structural size of which is the minimum necessary to fulfil the erosion control function, and*
> > *(c) **that are located on a minor stream.***
> > *3 **Dams solely for the capture, containment and recirculation of drainage and/or effluent, consistent with best management practice** or required by a public authority (other than Landcom or the Superannuation Administration Corporation or any of their subsidiaries) to prevent the contamination of a water source, **that are located on a minor stream**.*

c. Bowdens claims it does not need a water licence for water in sediment dams (WRM, 2022 p6 - 123); however, it is uncertain how this claim is arrived at. These dams will be used for water reticulation:
   i. WRM, 2022 p6 – 14 says: *Bowdens may choose to also utilise the water stored in one or more of the sediment dams*.
   ii. WRM, 2022 p6 - 63 says: Bowdens' *long-term objective is to discharge as much water collected within the sediment dams to the downstream environment to assist in maintaining environmental flows. However, the predicted and assessed impacts to downstream flows considers this water as retained within the Mine Site.*

   Further, the dams can not be considered to be used 'solely for the capture, containment and recirculation of drainage and/or effluent. Finally, 'drainage' and 'effluent' are flows from irrigation systems or sewerage treatment plants respectively.

d. The use of the sediment dams as water collection infrastructure is reiterated *by* Corkery (2022, p 11):

> *Whilst Bowdens Silver's **long-term objective** is to discharge water collected within the sediment dams to the downstream environment, **the predicted and assessed impacts in the Updated Surface Water Assessment (WRM, 2022) considers this water as retained within the Mine Site**. Water collected within ESC zone dams, that*

is deemed unsuitable for release, would be pumped to the turkeys nest dam for use in processing operations.

and by WRM (2022):

In the event that (even after the addition of a flocculant) the quality of water captured in the Containment Zone was such that it could not be released it would be contained on site. No sediment dams would be constructed on a major stream. Therefore, these dams would be used "solely for the capture, containment and recirculation of drainage and/or effluent, consistent with best management practice or required by a public authority to prevent the contamination of a water source", and the captured runoff would be exempt from licensing.

e. However, Corkery (2022, p 16) also states:

Runoff collected from disturbed areas within the Mine Site but outside of the containment zone (sediment-laden runoff), including the southern barrier, would be directed to sediment dams.

This would indicate that while the water within the sediment dams would contain sediments, these are not expected to be contaminated – as if it was, the runoff from this zone should be explicitly kept within the containment zone. This also adds weight to the water not fitting a definition of 'effluent'.

f. WRM (2022) also goes on to outline the use of this water onsite:

Processing plant makeup water demands would be sourced from the following locations, in order of priority:

- *Paste thickener reclaim;*
- *WRE leachate management dam;*
- *TSF decant pond;*
- *Open cut pit*
- *Sediment dams; and*
- *Advanced dewatering.*

g. If a sediment dam is a sediment dam, there is no "long-term objective" attached to it. The objective should be to add flocculent, settle the sediment and discharge the water to the environment. Therefore, the purpose of these sediment dams is not "solely for the capture, containment and recirculation of drainage and/or effluent" as stated by WRM (2022) and Corkery (2022).

h. The information presented within Corkery (2022) and WRM (2022) demonstrates there is a clear intention to harvest water from sediment basins during mine production, including those which lie outside of the containment zone, rather than releasing this water into the downstream environment, as is best practice regardless of if the water within these basins is suitable for release.

i. This intention arises from the fact that the water resource within the upper catchments of this low and variable rainfall region is simply not sufficient to supply water for the proposed mine project. Thus, the proponent is planning on making use of these sediment basins as a supplementary water source, hence the "long-term objective" i.e., post-mining operations, will be to allow the water to pass through to the environment.

j. As the purpose of these sediment dams is not "solely for the capture, containment and recirculation of drainage and/or effluent" but rather, to provide a water source for the proposed mining operation, **the captured runoff water within these basins is not exempt from water access licensing requirements**.

k. It is also noted that the two exemptions stated above rely on any dams being located on 'minor waterways'.

l. As per the above WRM (2022) state "*No sediment dams would be constructed on a major stream".* It would appear that the author of this statement did not do a cursory check of the topography of the region or did not understand the definition of a 'major' versus a 'minor' stream. As defined by the Regulation , a minor stream means *(ii) that is identified as a first or second order stream, or part of such a stream, as determined in accordance with the system set out in Schedule 2.* Major streams are third order or higher. Two of the proposed sediment dams are in fact located on 'major streams' (Figure 14).

Exceedance of harvestable rights

m. The project relies on its harvestable water rights (186.1ML) to provide water for mine processing and dust suppression. This is correct, based on the WaterNSW maximum harvestable rights dam capacity calculator for the Bowdens' contiguous land holding of 2580ha.

n. The proponent plans to store the water in sediment dams under this right:

> *Bowdens Silver may choose to also utilise the water stored in one or more of the sediment dams.* ***This water, and that collected for dust suppression, would be stored under the maximum harvestable rights provisions*** (WRM, 2022 p6 – 14).

o. In relation to harvestable rights, there will be 144.8ML collected in clean water dams and 135ML collected in sediment dams, which is 279.8ML. Plus, there is an additional sediment basin of 15ML, that is within the footprint of the WRE. This is reported to be located at variable locations and 15 ML was reported to be needed for containment. **This gives a total water storage of 294.8ML, which exceeds the Bowdens' harvestable water right by 108.7ML**.

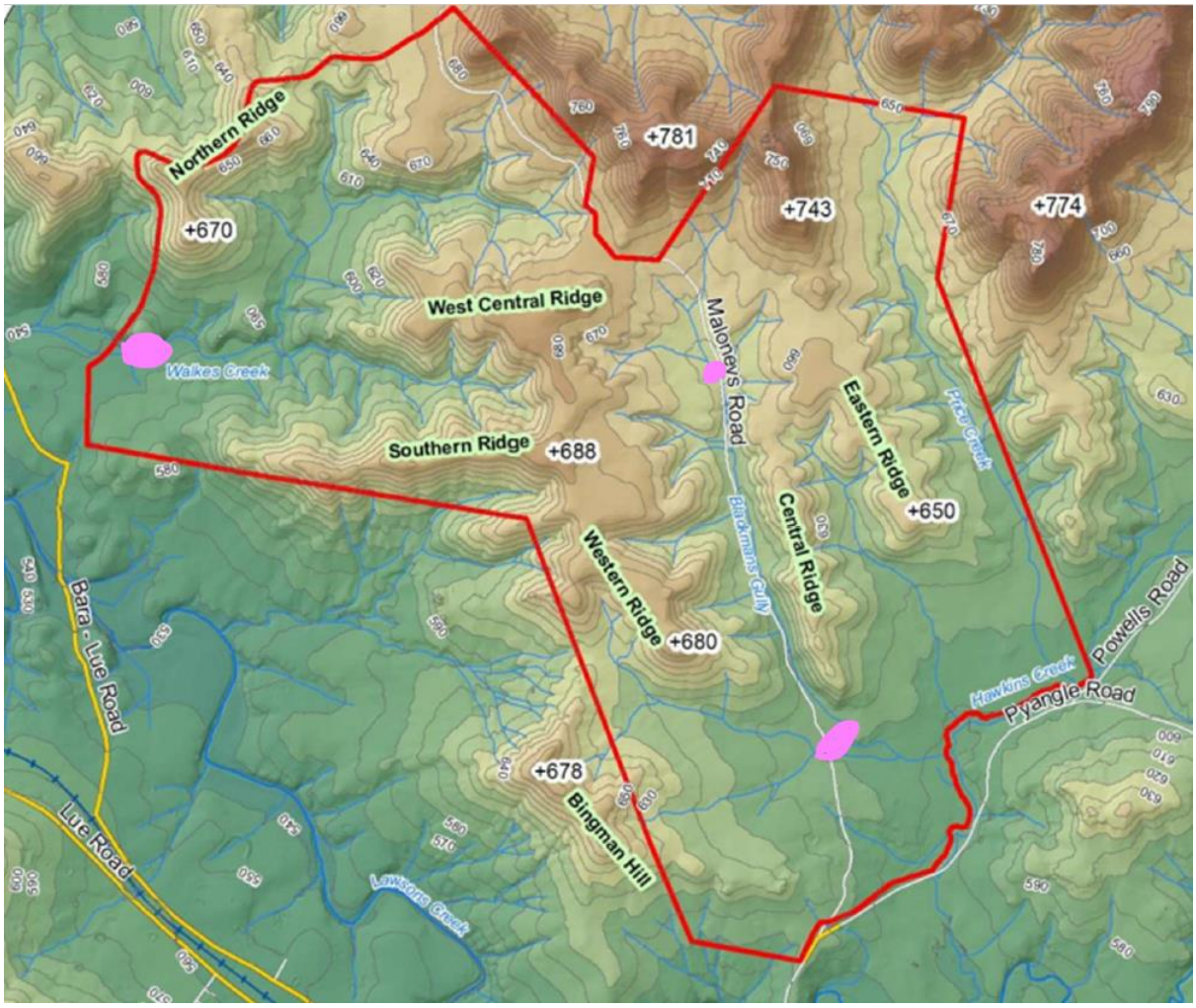
p. It is noted that WRM (2022 6 - 65) also flag that the volume of the sediment basins could be further increased "on the basis of further ongoing geochemical studies, a higher containment standard is required", even though "Under the high runoff scenario, all site water storages (including sediment dams) are able to be operated without any overflows." (6 – 92). One conclusion that can be drawn from this is that the sediment dams are being used as a means of withdrawing water from the catchment without fully accounting for it.

q. There are currently 59 existing dams on the Bowdens' lands, covering an area of approximately 47,783m2. If it is assumed these dams have an average depth of 1.5m, the approximate volume of these dams is 72ML.

r. There is no mention of the existing dams across the 2580ha being removed, therefore the remaining **maximum harvestable rights provision must be reduced by the 72ML** within the existing dams. This leaves a **maximum harvestable rights provision available of 114.1ML** (186.1ML – 72ML) which may be utilised by the Mine Site water requirements.

s. Harvestable rights dams cannot be located on or within 40 metres of a third-order or higher order stream1 (WaterNSW, 2022). Using the mine site topography presented by DPE (2022), at least one harvestable rights dam (BG Centre North – refer Figure 14) is located on a 'third-order or higher' stream.

In conclusion, there are significant regulatory irregularities within the assessment of the surface water impacts of the proposed project. As presented, there are clear issues with the exceedance of harvestable water rights, both in terms of the volume and location of the dams proposed for this purpose. Further, the proponent is claiming that it meets the criteria for an exemption to needing a water access licence for the removal of water proposed to be captured in either harvestable rights dams or sediment dams. However, the water collection infrastructure proposed does not meet the criteria to qualify for these exemptions. The EIS and associated documentation does not present a factual assessment and is not fit for purpose in this regard.



Harvestable rights dams	WC North	2.2 ML
	WC Northeast	2.4 ML
	BG Centre (North)	4.3 ML
	BG Centre	3.0 ML
	BG Centre (South)	1.3 ML
	BG South	1.6 ML
	Water Storage Dam (Clean, Turkey Nest)	130 ML

Sediment dams	TSF embankment sediment dam	9.0 ML (26 ML for containment)	Sized in accordance with Blue Book requirements (unless on the basis of further ongoing geochemical studies, a higher containment standard is required) (refer 4.6.2).
	TSF NAF waste rock stockpile sediment dam	6.5 ML (19 ML for containment)	
	Southern barrier external embankment sediment dams	13.5 ML, 8.5 ML (40 ML, 25 ML for containment)	
	Haul road sediment dam	4.0 ML (12 ML for containment)	

Figure 14 Location of BG Centre North dam and sediment dams (shown in pink), where the waterways are on major (3rd order or higher) streams

(Source DPE 2022, WRM 2022)

Water Quality

a. There has been a failure to adequately address key points in the SEARs:
    i. No water quality model
    ii. No water quality management plan with appropriate triggers for action.
    iii. A two paragraph water quality monitoring plan
b. All of these issues have been raised by DPE's experts but remain unrectified.
c. In addition, there is the uncertainties around Final Void water throughflow and the potential for contamination.
d. In response to concerns raised in the expert review commissioned by Dept of Planning, Bowdens has considered an option to increase the surface area of the final void and the to increase evaporative losses.
e. There has been no impact assessment of this, however it clear it would only exacerbate the water supply issues raised here.
f. In addition, the latest proposal by Bowdens is to increase the surface area of the final void and lake to increase evaporative losses. There is no impact assessment of this, however it would only serve to exacerbate all the water issues outlined herein.
g. What is required here is for the risk to be properly addressed before the project is considered for approval. This is a key mine viability issue and as such, should be treated seriously to ensure that it can in fact be addressed.
h. There are many landholders and water users downstream which rely on a clean, uncontaminated water supply from the Lawson Creek system. This should not be put at risk and as it stands, there has not been sufficient analysis to properly understand the potential impacts on water quality and the mitigation measures proposed do not provide a sufficient level of certainty that the risk would be reduced.

Impact on groundwater dependant ecosystems

Issue: The impact on groundwater dependant ecosystems has not been properly considered.

i. Ground and surface water systems are highly connected and impacted by mining operations. Cardno (2020) presented mapping of springs within the Bowden's study area stated there were 29 springs present within an approximately 320ha area – just under one per every 10ha. These springs are the lifeblood for many (humans, plants, animals) in the area.

j. In Baguley (2022), the issue of the impact of the project on peatland swamp Endangered Ecological Communities (EECs) was raised as a concern. This concern applies not only to springs within the mine site, but also properties both surrounding and downstream of the mine, as under the current mine proposal, these EECs are at risk of impact from the drawdown of groundwater and reduction in surface water from the proposed mine.

k. In the Submissions Report (Corkery 2022), the cursory response did not address the concern raised regarding these EECs and the potential impact of the proposed project on them.

l. As such, this issue is in part reiterated here. In addition, as was noted in Baguley (2022), there is currently work underway to better document and understand these wetlands. Preliminary findings of this work, which confirms the presence of the peatland swamp EECs adjacent to the mine site is presented here.

m. Presence of springs and peatland swamps EECs (Baguley, 2022):

> There is a high number of springs in the Bowden's study area. A preliminary examination of these springs has indicated these are likely to be part of a widespread system of upland swamps, bogs and montane mires in Upper Lawson Creek catchment.
>
> The presence of springs, swamps, bogs and mires was also an issue highlighted in the RRCFC's aquatic ecology report submitted to the recent Preliminary Regional Issues Assessment for Hawkins Rumker This analysis established that there are upland swamps presenting throughout the Upper Cudgegong and Upper Lawson Creek catchments. These are all an important part of the complex of endangered montane mire communities distributed across the tablelands and adjacent ranges of NSW and are referrable to the Montane Peatlands and Swamps Endangered Ecological Community (EEC) listing under the NSW Biodiversity Conservation Act 2016 and the Temperate Highland Peat Swamps on Sandstone EEC Commonwealth Environment Protection and Biodiversity Conservation Act 1999 listing. Information provided by landholders adjacent to the Bowdens site indicates that these areas are present within and adjacent to the Bowdens site (Figure 15) as well in adjacent valleys. Under the current mine proposal, these EECs are at risk of impact from the drawdown of groundwater and reduction in surface water from the proposed mine.
>
> The environmental impact assessment for the Bowdens' project does not acknowledge the presence of these upland swamps within their own site nor in the

adjacent areas. This is likely to be due to the fact that the peatland swamps within these areas are not well documented; nevertheless, the role of these wetlands is critically important in that they act as sponges in the landscape, supporting the surrounding and downstream areas in dry times. This is evidenced in Figure 15 which shows the very parched areas in the background contrasted with the vibrant and verdant areas around the wetland area.

Figure 15 Windmill Paddock Wetland January 2014

(Credit M. Boller)

The extent and the hydrology of these wetlands is not yet well understood. There is currently work underway to better document and understand these wetlands, but knowledge to date is preliminary.

What is well understood is that mining has a severe detrimental impact on these areas. In this case, this impact could reasonably be expected to encompass both the springs within the Bowdens' site as well as those in the adjacent areas will be affected by groundwater drawdown.

Any disturbance from mining activity would reduce the quantity and quality of water within the waterways and groundwater system supporting these wetlands. A mine would both damage any existing water resources within the affected footprint, as well as requiring a significant amount of water to operate. There will be severe and irreversible impacts on surface water including springs, creeks and rivers. These swamps are scarce and already face a rapidly changing climate; the dead swamps of the Newnes Plateau provide clear evidence of the impacts of mining (Gregory, X.

2021). Any mining will lead to the permanent loss of the meadows, sphagnum bogs, wetlands and associated ecosystems which includes a wide range of dependent threatened species, populations and communities. The meadows, sphagnum bogs, wetlands and associated ecosystems of the Upper Lawson Creek are unique, being at lower elevations and the western extents of these endangered ecological communities. The impact of mining cannot just be offset through the Biodiversity Offsets Scheme – these communities are not found anywhere else so cannot be offset.

The impacts to the springs, creeks and rivers in this area and meadows, sphagnum bogs, wetlands and associated ecosystems as well as the wide range of threatened species, populations and communities that are dependent on these features is an unacceptable impact for a short-term mine project.

n. The assessment of these communities is a specialist field of ecology.
o. In 2022, Mid-Western Regional Council commissioned a Preliminary Assessment Report to consider the presence of Newnes Plateau Shrub Swamps (NPSS) in the Mid-Western Regional Council LGA. Raymond Mjadwesch of Mjadwesch Environmental Service Support was engaged to complete this assessment.
p. Mjadwesch Environmental Service Support (2022) primarily considered the NPSS which are a high altitude community listed as an EEC, but also noted that many of the swamps within the eastern part of the Mid-Western LGA that occur:
    a. below 800m ASL fall within the **Montane Peatlands & Swamps** of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands, which is another EEC listed under the NSW Biodiversity Conservation Act, and
    b. at higher altitudes, but below 950m wetland communities grade into *Blue Mountains Sedge Swamps,* which is another EEC listed under the NSW Biodiversity Conservation Act.
    c. Together with the NPSS, these form the *Temperate Highland Peat Swamps on Sandstone* community, which is listed as **ENDANGERED** under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999*.
q. Mjadwesch Environmental Service Support (2022) assessed some of the Montane Peatlands and Swamps adjacent to the Bowdens' site, as shown in Figure 16 (blue shaded areas in valleys). The location of the Montane Peatlands and Swamps EEC within the western valley is shown in proximity to the Bowdens site in Figure 17. **These were confirmed to be EECs under the NSW Biodiversity Conservation Act and Commonwealth Environment Protection & Biodiversity Conservation Act 1999**. A photograph of one of these is shown in Figure 18. The closest of the swamps in Figure 16 lie within 2km of the Bowdens' site. The extract from Mjadwesch Environmental Service Support's 2022 report is included in **Appendix B**, together with written confirmation stating explicitly the conservation status of the of the Montane Peatlands and Swamp EEC adjacent to the Bowdens' site.
r. It is known that additional Montane Peatlands and Swamps EEC exist closer to the Bowdens' site. The location of one of these is shown in Figure 17. Additional Montane

Peatlands and Swamps are known to be on properties within the Bowdens' land holdings. These are unable to be accessed to determine the exact locations; however it is known that there are approximately 29 springs on this property. The potential impacts must be assessed and appropriate protection put in place given the nature of the proposed project here. Further, a review of satellite imagery in and around the mine site suggests more of these swamps exist. For example, likely presence can be detected on Wet Swamp Creek, immediately to the west of the mine site, and the creek name is certainly indicative here. Again, all these swamps must be identified and potential impacts assessed and appropriate protection put in place.

s. This recent work by Mjadwesch Environmental Service Support (2022) has demonstrated that there is a high risk of there being Montane Peatlands and Swamps, which are listed as an EEC under NSW and Commonwealth legislation being impacted by Bowdens' proposed project.

t. The impact on this EECs has been raised with the proponent and has been dismissed. However, as this has been bought to the attention of the proponent prior to the impact assessment being completed, it is a failure of due process to not properly assess the potential impacts on this EEC. These wetlands are fragile in nature and of critical importance, therefore it is imperative that these are protected, as once these are damaged, the damage cannot be undone.

u. The DPE (2022) says the "*Commonwealth determined that the project is a "controlled action" based on there being likely significant impacts on Box Gum Woodland, Regent Honeyeater, Swift Parrot, Koala, and Spotted tailed Quoll. The Commonwealth also considered 14 other species would possibly be at risk of being impacted*." However, what the Commonwealth actually said was the nominated species and communities to be considered was "*Based on the information available in the referral"* that these were the identified matters of national environmental significance the project was likely to impact in the proponent's referral. It should not be taken to have been a complete list, and it went on to say that it was "not limited to" these matters and *"Please note that this may not be a complete list and additional impacts may be identified during preparation of the environmental impact statement. In this regard, the Department considers it the responsibility of the proponent to undertake an analysis of the significance of the relevant impacts and ensure that* ***all protected matters that are likely to be significantly impacted are assessed for the Commonwealths Minister's consideration****."*

v. All Montane Peatlands and Swamps in and adjacent to the Bowdens' proposed mine site must be identified, baseline data gathered, potential impacts assessed and appropriate protection put in place. Given Bowdens' dismissive response to this issue being raised previously, and the inability of its own consultants to correctly identify this EEC, it is recommended this be done by an independent consultant with appropriate expertise.

w. At present, the EIS and its associated documentation is lacking in the following respects:
    a. The EIS fails to identify the location of all Montane Peatlands and Swamps within and adjacent to the proposed mine site,
    b. The EIS fails to assess the impact of the proposed mine construction and operation on the Montane Peatlands & Swamps within and adjacent to the proposed mine site, and

c. The *montane peatlands and swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions* is one of the communities which form part of the Commonwealth listed *Temperate Highland Peat Swamps on Sandstone ecological community* under the Environment Protection and Biodiversity Conservation Act 1999. **This means there is a failure to meet the assessment requirements under the Bilateral Agreement EPBC 2018/8372** (Department of the Environment and Energy, 2019).

d. As it stands, the EIS and its associated documentation is not fit for purpose and the DPE's assessment is flawed as it **fails to consider the potential impact of the proposed project on the Montane Peatlands and Swamps EEC, both in relation to the NSW Biodiversity Conservation Act 2016 and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.**

The 800m contour clip often illustrates high hills and peaks; swamps below this altitude represent other wetland communities, many of which are also endangered

Figure 16 Areas of lower altitude wetlands adjacent to Bowdens' mine site
(from Mjadwesch Environmental Service Support Preliminary Assessment Report 2022)

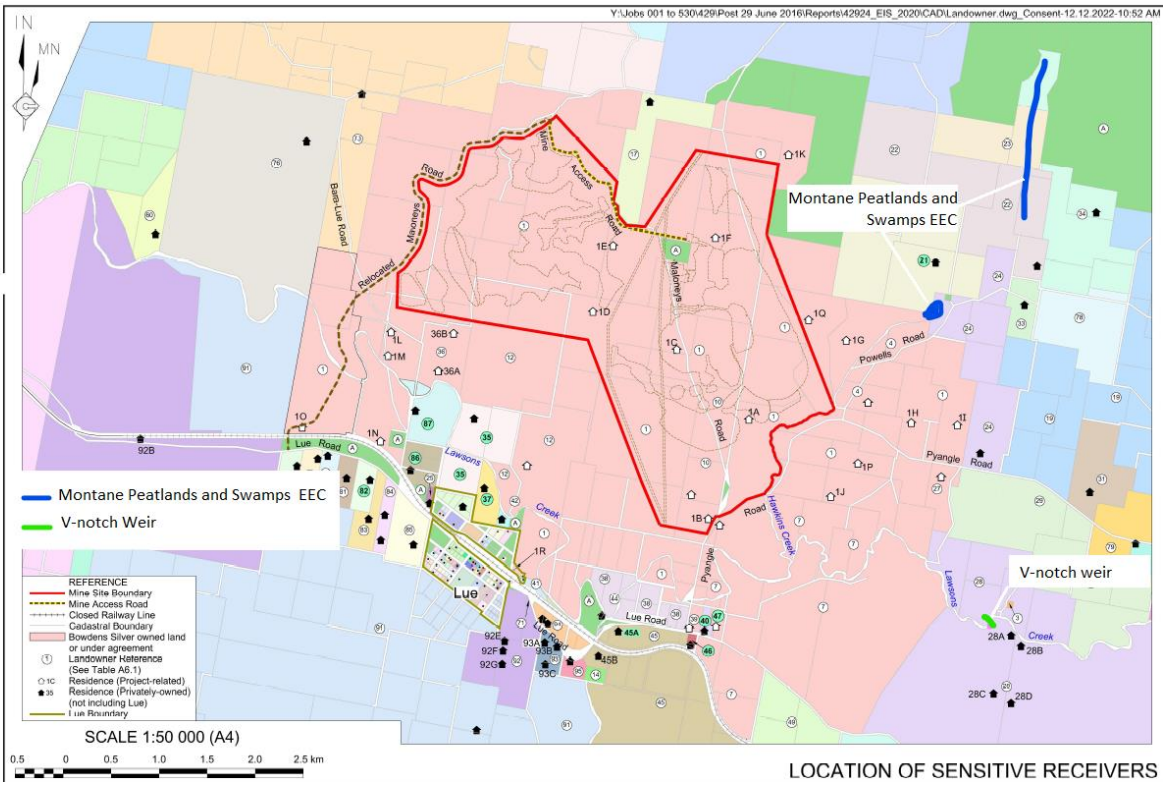


Figure 17 Location of some of the Montane peatlands and swamps EEC in proximity to the Bowdens proposed mine site

(Source DPE 2022)

Montane Peatlands & Swamps often occupy broad valley floors in the district. This image is from Pyangle; the location is indicated in the aerial photograph on the preceding page

Figure 18 Photograph of a montane wetland adjacent to Bowdens' mine site

(from Mjadwesch Environmental Service Support Preliminary Assessment Report 2022)

Figure 19 Photograph of a montane wetland adjacent to Bowdens' mine site

(Credit M. Boller)

Conclusion

a. **The project's Secretary's Environmental Assessment Requirements (SEARs) have not been met.** The Secretary's Environmental Assessment Requirements (revised) were issued on 21 June 2019. These set out a number of specific requirements which the Environmental Impact Statement (EIS) for the development **must comply with.**
b. The SEARs requirements included the following in relation to surface water assessment:
    - the proposed project's water demand,
    - assessing the full impacts of the meeting the water supply requirements of the proposed project,
    - demonstrating an adequate and secure water supply,
    - a water balance considering quantity, quality and source including water requirements
    - a management plan to address spill/leak management
c. The EIS and associated documentation has failed to meet these critical mine viability-determining aspects of SEARs.
d. A water balance model has been presented, but there are significant issues identified with it.
    a. Calibration using inappropriate data and no verification
    b. Use of 'average' results
    c. Lack of sensitivity analysis on key parameters
    d. No consideration of climate change impacts
e. It is unclear what the true area of the Mine Site catchment is, which casts uncertainty over the modelled impacts.
f. There is a high level of uncertainty with regards to the water demand of the project particularly in regards to the dust suppression requirements. It is also unclear if potable water requirements have been allowed for.
g. High level of uncertainty with regards to the AWBM water balance model and its sensitivity to key parameters which means there is a lack of confidence in its ability to reliability predict the likely impacts of the proposed mine.
h. Without further modelling and sensitivity testing and subsequent presentation of a broader range of results, all of which would serve to provide the necessary understanding of the likely impacts on the surface water - a critical issue, **it is the strongly held opinion that this element is not yet fit for consideration of approval.**
i. Uncertainties, inaccuracies and incomplete information, some of which have been outlined in this submission, are presented within the documentation provided by the proponent.
j. There have been numerous attempts by the local community, independent reviewers and authorities to have the issues within the EIS and associated documentation addressed. These attempts have largely been dismissed by the proponent or its consultants.
k. **The likely impact of the mining operations on the surface water is unacceptable.** Earth Systems (2022) consistently made the recommendation to DPE to *Re-assess impacts on local surface water, baseflow and groundwater, noting the removal of 856 ML/year from*

the project area catchments, rather than 177 ML/y based on surface water runoff losses only

l. This advice was dismissed by Bowdens (Corkery 2022b) and unfortunately has also been ignored by DPE.

m. Close reading and analysis undertaken as part of this submission shows that the "average" annual site water balance removal from the project area catchments is:
    i. 924 ML/year in rainfall and runoff, and
    ii. 27 ML/year in clean water harvesting

    giving **a total of 951ML/year removal from the project area catchments, far more than the than 177 ML/year indicated by the proponent.**

n. At present the proponent has not met the fundamental requirement of the EIS, that is, to assess the likely impacts of the proposed project. **These impacts must be assessed prior to approval,** such that it can be understood if the impacts are considered acceptable. This is particularly so with water, as many of the impacts on water may be highly disruptive to the surrounding water users, adjacent and downstream landholders, many of whom have lived and worked on these properties for generations, and the environment. Further, in some cases the surface water impacts would be permanent. This must be weighed up against the short-term operations of the mine.

o. When the impact of removing 951ML/year is considered, there is potentially a:
    i. 44% reduction of flows from Hawkins Creek downstream of the mine site;
    ii. 11% reduction of flows from Lawson Creek downstream of the mine site.

p. The proposed water to be drawn from the catchment due to the mine is estimated to be 2.6ML/d. For 40 percent of the time, flows in Lawson Creek are less than 4ML/day and 30 percent of the time they are 2.4ML/day. **The proposed mine will take 66.1% and 110.2% of these flows respectively**.

q. These losses make the likely impact of the mining operations on the surface water unacceptable, and it should not be approved.

r. There is a flawed understanding of the flow rate of water in Lawson Creek and, consequently, how much water is available to be used in mine processing.

s. This has been verified through on-ground assessment at a property which straddles Lawson Creek just upstream of the proposed location of the mine. This has shown that the flows in Lawson Creek in February 2023, after an extremely high rainfall year, are just **0.38ML/d. This is less than 2% of the 19.5ML/d that the EIS documentation states the Lawson Creek flows to be.** This discrepancy is believed to be due to the flawed calibration of the model.

t. This means that in February 2023, after rainfall in the top 10% of rainfall events within the region, the Lawson Creek is currently at a 'cease to flow' state.

u. This clearly shows there is simply not the water available to take the quantity required to sustainably operate the proposed mining project. If the proposed project were to proceed, the impact on the frequency of flows will be very significant and very detrimental for the affected waterways.

v. The Montane Peatlands and Swamps EEC is present at numerous locations adjacent to the mine site and there is strong grounds to believe it is present within the mine site, as there is 29 springs mapped across this site.

w. At present, the EIS and its associated documentation is lacking in the following respects:
    a. The EIS fails to identify the location of all Montane Peatlands and Swamps within and adjacent to the proposed mine site,
    b. The EIS fails to assess the impact of the proposed mine construction and operation on the Montane Peatlands & Swamps within and adjacent to the proposed mine site, and
    c. As the *montane peatlands and swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions* is one of the communities which form part of the Commonwealth listed *Temperate Highland Peat Swamps on Sandstone ecological community* under the Environment Protection and Biodiversity Conservation Act 1999. **This means there is a failure to meet the assessment requirements under the Bilateral Agreement EPBC 2018/8372** (Department of the Environment and Energy, 2019).
    d. As it stands, the EIS and its associated documentation is not fit for purpose and the DPE's assessment is flawed as it **fails to consider the potential impact of the proposed project on the Montane Peatlands and Swamps EEC, both in relation to the NSW Biodiversity Conservation Act 2016 and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.**

x. The Council noted that the that potential impact on water security for both agricultural users and town water supply is a determinative issue.

y. The issues raised by Council have not been addressed, and particularly, and importantly as is has been modelled and reported by the proponent, the potential impact on water security for both agricultural users and town water supply fails to accurately reflect the likely impacts that would occur.

z. The failure of the EIS and associated documentation to meet the requirements of the SEARs in multiple instances means that:
    i. the determining body, in this case **the IPC does not have sufficient information to make an informed decision,**
    ii. in making a recommendation for approval, DPE appears to have lowered the standard required to assess the impacts of the project,
    iii. **matters which should be determinative have been conditioned** to be dealt with in post-approval management plans,
    iv. there will be no independent review of any of the post-approval management plans proposed,
    v. **there is a failure of due process** which undermines the confidence the community has in the decision-making process with regards to planning approvals. No confidence from the local community and stakeholders in the assessment process means **no social licence.**

aa. Taking all the above matters into consideration, from a surface water management perspective, **the impacts of the proposed project on water resources and groundwater dependant ecosystems are considered to be significant and the proposed project should not be approved**.

References

Baguley, S. 2022. Independent Review of the Bowdens Silver Pty Limited Surface Water Assessment – Updated
(WRM Water + Environment Pty Ltd February 2022)

Cardno (NSW/ACT) Pty Ltd 2020. Bowdens Silver Aquatic Ecology Assessment

Corkery, 2022. Water Pipeline Amendment - Amendment Report (2nd Amendment)

Corkery 2022a. Bowdens Silver Project Water Supply Submissions Report State Significant Development No. 5765RTS

Corkery 2022b. Response to Earth Systems Review – Water Balance Modelling and Surface Water Management . Consultant's report prepared by R. W. Corkery & Co. Pty Ltd. October 2022.

Corkery 2022c. Bowdens Response - Surface Water Expert Review (15 Dec 2022)

Department of the Environment and Energy, 2019. Decision on referral EPBC Ref: 2018/8372

Earth Systems 2022. Independent Review – Water Balance Modelling and Surface Water Management. Bowdens Silver Mine. Technical memorandum prepared for the New South Wales Department of Planning and Environment (NSWDPE).

Gregory, X. 2021. NSW government blamed for destruction of world-renowned ecology by approving coal mines near Blue Mountains https://www.abc.net.au/news/2021-04-30/gardens-of-stone-conservation-proposal/100103246.

Mjadwesch Environmental Service Support 2022. Preliminary Assessment Report for Mid-Western Regional Council.

WaterNSW 2022
https://www.waternsw.com.au/__data/assets/pdf_file/0005/219722/Harvestable-rights-dams-where-can-they-be-built-Fact-sheet.pdfa

WRM 2022. Updated Surface Water Assessment. Consultant's report prepared by WRM Water and Environment Pty Ltd for Bowdens Silver Pty Ltd. February 2022.

APPENDIX A – Earth Systems' Unaddressed Water Quality Concerns

The extracts from the Earth Systems' (2022) report regarding the water quality concerns held in December 2022 in relation to the Bowdens mine. These concerns remain unaddressed.

3. Water balance model results should be provided for all site water volumes, on a daily basis, throughout the mine life. A site water quality model is required to assess whether site water is fit for purpose,	Regarding the first recommendation, the response by Corkery (2022a; Table A1) clarifies that "*Some dams were modelled as lumped storages. These can be remodelled separately but, as the dams have been sized to contain the design rainfall (i.e. fixed ratio to catchment area), the outcomes would be the same.*"	Prior to mining, develop a site water quality model to fully assess potential impacts on receiving waters (eg. from TSF seepage), determine treatment requirements or other site water
to fully assess potential impacts on receiving waters (eg. from TSF seepage) and/or to develop treatment or other site water management strategies.	Regarding the second recommendation, it appears that no further work has been conducted to address this concern. Previous solute transport modelling did not consider the AMD risk from the tailings and was therefore not conservative, yet still indicated a significant risk to downstream water quality.	management strategies beyond those already documented.

And

7. Impacts on mean annual streamflow in downstream waters need to be predicted for the proposed amendment. Implications for WAL requirements may need to be reviewed.	The response provided by Corkery (2022a; Table A1) states: *"The 550 ha is made up of the TSF, Pit and Processing Plant catchments and the "NAF materials" catchments shown on Figure 8.2 of WRM (2022).* *Apart from clean water harvest sub-catchments in Blackmans Gully, runoff from the undisturbed catchment upstream of the Southern Barrier will not be contained on site. Rather it will be allowed to pass through the Southern Barrier via drainage pipes.* *Clean water harvesting is excluded from the catchment loss analysis as it is a basic landholder right under Section 53 of the Water Management Act 2000 with water able to be taken irrespective of Project approval."* Drainage/seepage water quality from "NAF" waste rock in the Southern Barrier may be found to be unsuitable for off site release, and it appears possible that some of this drainage/seepage could report directly to Blackmans Gully. If Blackmans Gully was affected by this seepage it would need to be contained on site, with potential implications for WAL requirements. It is understood that clean water harvesting is a basic landholder right, nevertheless it is relevant to understanding the cumulative impact of the project on downstream water flows and should not be excluded from the impact assessment.	Prior to construction: ► Review Southern Barrier design to ensure that it includes provision for containment of all drainage (runoff or seepage) from the barrier and/or develop a water quality contingency plan for Blackmans Gully. ► Re-assess impacts on mean annual streamflow in downstream waters for the proposed amendment, with consideration of clean water harvesting as well as the provision to contain all drainage/seepage from the Southern Barrier. Also see Item 8.

And

9. Larger sediment dam sizes are supported from both a water quality perspective (lower risk of uncontrolled discharge) and a project water supply reliability perspective. Until a sediment dam sizing is confirmed, water balance modelling should be conducted for both potential scenarios (small versus large sediment dam capacities). A water management strategy is required in the event that Blackmans Gully water is contaminated by acidic runoff or NMD from the southern barrier. Implications for the site water balance, downstream creek flow impacts and WAL requirements and may also need to be considered.	The first recommendation was accepted in the response by Corkery (2022a; Table A1). Regarding the second recommendation, the response by Corkery (2022a; Table A1) infers that only clean water from undisturbed catchments will will enter Blackmans Gully. However, it appears possible that some of the Southern Barrier drainage/seepage could report directly to Blackmans Gully.	As per Item 7.

And

10. A site water quality model is required to assess whether site water is fit for purpose	The response by Corkery (2022a; Table A1) states that: "*Where required, water recovered from water management infrastructure will be treated for use in the processing plant.*	As per Item 3.
and/or to develop treatment or other site water quality management strategies. For further context (Earth Systems, 2022): ► In the SEARs, the EPA requires "a water balance including water requirements (quantity, quality and source(s)) and proposed storm and wastewater disposal, including type, volumes, proposed treatment and management methods and re-use options". ► Water quality has not been included in the site water balance model by WRM. ► Proposed treatment methods have not been documented.	*Should discharge be proposed during operations, it would only occur from the ESC zone where water quality parameters meet those described in the Project's Environmental Protection Licence.*" A site water quality model has not been developed, therefore it has not been possible to provide any detail on water treatment requirements.	

And

21. Conduct a quantitative assessment of the potential impacts of pit lake water migration through groundwater on receiving surface waters. For further context (Earth Systems, 2022): ► There is also a possibility of seepage towards Hawkins Creek post-mining and potential implications for receiving water quality. The sensitivity analysis in WRM (2022) indicates pit lake water levels up to 583.7 m AHD, well in excess of the elevation at which the pit lake would transition from a "sink" to throughflow conditions, which is ~579 m AHD (Jacobs, 2022). Indeed, the Response to Submissions (Corkery, 2021) refers to post mining water table contours (Jacobs, 2021) which indicate a gradient from the pit lake towards Hawkins Creek, with a potential groundwater travel time in excess of 100 years.	The response by Corkery (2022a; Table A1) states that [the possibility of seepage towards Hawkins Creek] has not been ignored and is the subject of the groundwater assessment. A *Final Void Uncertainty Analysis Report* was provided in October 2022 (Corkery, 2022b). Key findings include: ► The updated modelling indicates a "greater than 50% probability of final void lake water levels exceeding 579 m AHD", the level at which throughflow conditions are expected to occur. ► "In the event that the final void is considered likely to develop to a throughflow system, following equilibrium, travel time to Hawkins Creek would be in the order of 100 to 200 years." This is broadly consistent with the groundwater travel time reported by Jacobs (2021).	Conduct pit water quality modelling (taking into account acid, metals, salinity and any other contaminants) and solute transport modelling to assess potential water quality impacts in Hawkins Creek associated with throughflow from the final pit void, with and without implementation of mitigation measures.

And

21. Conduct a quantitative assessment of the potential impacts of pit lake water migration through groundwater on receiving surface waters. For further context (Earth Systems, 2022): ► There is also a possibility of seepage towards Hawkins Creek post-mining and potential implications for receiving water quality. The sensitivity analysis in WRM (2022) indicates pit lake water levels up to 583.7 m AHD, well in excess of the elevation at which the pit lake would transition from a "sink" to throughflow conditions, which is ~579 m AHD (Jacobs, 2022). Indeed, the Response to Submissions (Corkery, 2021) refers to post mining water table contours (Jacobs, 2021) which indicate a gradient from the pit lake towards	The response by Corkery (2022a; Table A1) states that [the possibility of seepage towards Hawkins Creek] has not been ignored and is the subject of the groundwater assessment. A *Final Void Uncertainty Analysis Report* was provided in October 2022 (Corkery, 2022b). Key findings include: ► The updated modelling indicates a "greater than 50% probability of final void lake water levels exceeding 579 m AHD", the level at which throughflow conditions are expected to occur. ► "In the event that the final void is considered likely to develop to a throughflow system, following equilibrium, travel time to Hawkins Creek would be in the order of 100 to 200 years." This is broadly consistent with the groundwater travel time reported by Jacobs (2021).	Conduct pit water quality modelling (taking into account acid, metals, salinity and any other contaminants) and solute transport modelling to assess potential water quality impacts in Hawkins Creek associated with throughflow from the final pit void, with and without implementation of mitigation measures.

And

22. Refer to recommendations in Earth Systems (2022b).	*Refer to Earth Systems (2022b).*	*Refer to Earth Systems (2022b).*
23. A water quality monitoring program and response management plan is required.	A water quality monitoring program and response management plan has not been developed.	Prior to construction, develop a water quality monitoring program and response management plan.
24. An assessment of potential water quality impacts associated with process chemicals is required, with management measures developed accordingly.	An assessment of potential water quality impacts associated with process chemicals has not been conducted, therefore it has not been possible to develop management measures. Impacts of TSF seepage on receiving surface water or groundwater remains a key concern.	Prior to construction, conduct an assessment of potential water quality impacts associated with process chemicals (including impacts associated with TSF seepage) and develop management measures accordingly.

And

25. A strategy for TSF and waste rock dump seepage flow / water quality management post-closure is required.	The response by Corkery (2022a; Table A1) states that: *"ATC Williams prepared preliminary TSF design based on significant consequence category dam due to presence of PAF tailings. Therefore, engineered design accounts for impacted water quality within TSF. Additional TSF design elements proposed in Submissions Report to reduce seepage. Reactive transport modelling report prepared.* *The closure capping design includes measures to prevent ingress of meteoric water entering stored PAF materials. Water quality and flow into leachate management dam is therefore expected to reduce over time. The WRE would be a HDPE lined facility with seepage not anticipated."* It appears that no additional work has been conducted to address the concerns raised. Cover systems and HDPE liners have a limited design life and therefore seepage to surface and/or groundwater will be inevitable in the long term. Furthermore, even if seepage	Prior to construction, develop a strategy for TSF and waste rock dump seepage flow / water quality management post-closure.

And

26. A comprehensive pit lake water quality assessment and management strategy is required. A comprehensive TSF seepage quality management strategy is required.	Regarding the first recommendation, Corkery (2022a; Table A1) states that *"modelling identifies the final void pit lake will remain a groundwater sink with water levels well below the pit rim".* This response does not consider the potential for seepage from the pit lake towards Hawkins Creek. Refer to Item 21. Regarding the second recommendation, Corkery (2022a; Table A1) refers to Item 25. As noted above, no additional work appears to have been conducted to address the concerns raised in Item 25.	Prior to construction, develop: ► A comprehensive pit lake water quality assessment and management strategy. ► A comprehensive TSF seepage quality management strategy. When pit lakes are to be used as groundwater sinks, consideration needs to be given to the behaviour of hypersaline pit water having an impact on the groundwater system as its high density (salinity) overcomes "pit sink" migration controls.

And

29. Seek a detailed independent review of baseline surface and groundwater quality data to ensure that appropriate discharge limits or trigger values are established.	The response by Corkery (2022a; Table A1) clarifies that: *"ANZG aquatic ecosystem trigger values (95% species protection for slightly to moderately disturbed ecosystems) would be adopted for comparison of ambient surface water quality monitoring data."*	Prior to construction, develop a water quality monitoring program and response management plan (as per Item 23), including management responses that would be implemented if ANZG aquatic ecosystem trigger values (95% species
	It is inferred that these trigger values would also be used for identification of potential impacts on receiving groundwater quality as well as surface water quality. If reliable and independently reviewed baseline surface and groundwater quality data are not available, the use of ANZG aquatic ecosystem trigger values (95% species protection for slightly to moderately disturbed ecosystems) is supported.	protection for slightly to moderately disturbed ecosystems) are exceeded in receiving surface water or groundwater.
30. A clear strategy is needed for management of "NAF" waste rock stockpile runoff, as well as sulfidic ore stockpile runoff, and the site water management system updated to reflect this.	The response by Corkery (2022a; Table A1) states that: *"Section 4.6 of WRM (2022) describes the Mine Site water management strategy with NAF and oxide ore stockpiles situated within the ESC zone. The containment zone would also include some NAF that would be used as construction materials. Whilst release of water from the ESC zone has been considered and described in reporting, all site water management infrastructure has been sized to provide containment should quality of stored water be impaired. Table 5.6 of WRM (2022) presents maximum modelled storage volumes that identifies no discharge from site."* This does not address the possibility of some drainage/seepage from the Southern Barrier (which is a "NAF" waste rock stockpile) entering receiving waters beyond the "containment zone" or "ESC zone". The response does not consider sulfidic ore stockpile runoff.	Prior to construction, update the site water management strategy to include drainage/seepage from all "NAF" waste rock stockpile runoff (including the Southern Barrier) as well as sulfidic ore stockpile runoff.

And it was reiterated in the key conclusions:

KEY CONCLUSIONS AND RECOMMENDATIONS

Updated conclusions and recommendations relating to water balance modelling and surface water management for the proposed Bowdens Silver mine are outlined below, and should be read in conjunction with the review of acid and metalliferous drainage (AMD) / geochemical aspects (Earth Systems, 2022b):

- TSF seepage modelling indicates potential surface water quality impacts (eg. copper, zinc, cyanide and phosphorus) in Lawsons Creek, as well as groundwater quality impacts. Such impacts could be further exacerbated by AMD generation from PAF tailings, addition of other contaminants from the mine site / process plant water, or concentration of contaminants due to water re-circulation, none of which were considered in seepage modelling. A comprehensive TSF seepage quality management strategy is required.
- The site water balance model does not incorporate a water quality component. This is required to fully assess potential impacts on receiving waters (eg. from TSF seepage) and to develop treatment or other management strategies.
- Potential water quality impacts associated with process chemicals need to be quantitatively assessed and management measures developed accordingly, taking into account their toxicity / ecotoxicity and chemical behaviour, such as adsorption and decomposition rates.

- Noting a greater than 50% risk of pit lake water throughflow in groundwater towards Hawkins Creek, and the potential for acid, metals and high salinity in pit water, impacts on receiving water quality need to be assessed, with and without mitigation measures. This also needs to consider potential contaminants in pit water from other sources (eg. leachate dam, TSF, process water). A comprehensive pit lake water quality assessment is required to support solute transport modelling and impact assessment.
- Where water management strategies are provided, they are generally focussed on managing water flows, but not water quality. Treatment of contaminated water is occasionally mentioned in passing, but no details are provided. Clear and comprehensive management strategies are required for surface water (and groundwater) to avoid over-reliance on modelling, monitoring and reactive management.

APPENDIX B – Supporting information: Montane peatlands & swamps

Montane peatlands and swamps: Legal Status

Extract from: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=32

The current conservation status of the Temperate Highland Peat Swamps on Sandstone ecological community, under Australian and State Government legislation, is as follows:

National: The Temperate Highland Peat Swamps on Sandstone ecological community is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*.

Swamps:

Swamps that are part of the listed Temperate Highland Peat Swamps on Sandstone ecological community also occur in the following three ecological communities listed under the *Biodiversity Conservation Act 2016* (NSW) (BC Act):

Montane peatlands and swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions, declared Endangered in 2004 (New South Wales Scientific Committee 2004)

shireen_here@live.com

From: Mick BOLLER <mick_boller@hotmail.com>
Sent: Saturday, 18 February 2023 11:30 AM
To: Shireen Baguley; Shireen; shireen_here@icloud.com
Subject: Fw: RM Montane Peatlands and Swamps

From: Ray Mjadwesch <ray@mjadweschenvironmental.com.au>
Sent: Saturday, 18 February 2023 10:52 AM
To: Mick BOLLER <mick_boller@hotmail.com>
Subject: RE: RM Montane Peatlands and Swamps

Hey Mick, sorry for delay in responding but Helen and I are away on our first holiday in 10 years (house sitting for a friend in Arakoon) so I am only getting to my computer intermittently.

Yes I can confirm your swamp is a Montane Peatland / Swamp, as are others like it in the region.

I had a discussion with a mining consultant a few years ago, and pointed out to him that this was what he was looking at (an Endangered Ecological Community, and calling them anything but), and I randomly was later provided an EIS that he had been asked to review, where he annotated in the comments that consultants needed to be aware of Montane Swamp EECs, or someone was going to be tripped up (consultants tend to call them "swampy meadows" or other misnomers, so that they can sidestep assessment).

From: Mick BOLLER <mick_boller@hotmail.com>
Sent: Thursday, 16 February 2023 2:44 PM
To: Ray Mjadwesch <ray@mjadweschenvironmental.com.au>
Subject: Fw: RM Montane Peatlands and Swamps

Hello Ray.
Please see message below from Shireen Baguley.
Obviously, you have seen the swamp.
Are you happy to confirm it is Montane Peatland ?

Not sure if it would be best for you to contact Shireen directly or if you want to send the message via me.

I have forwarded the report you sent me to her.
Regards
Mick

From: Shireen Baguley <shireen_here@live.com>
Sent: Thursday, 16 February 2023 10:12 AM
To: Mick BOLLER <mick_boller@hotmail.com>
Subject: RE: RM Montane Peatlands and Swamps

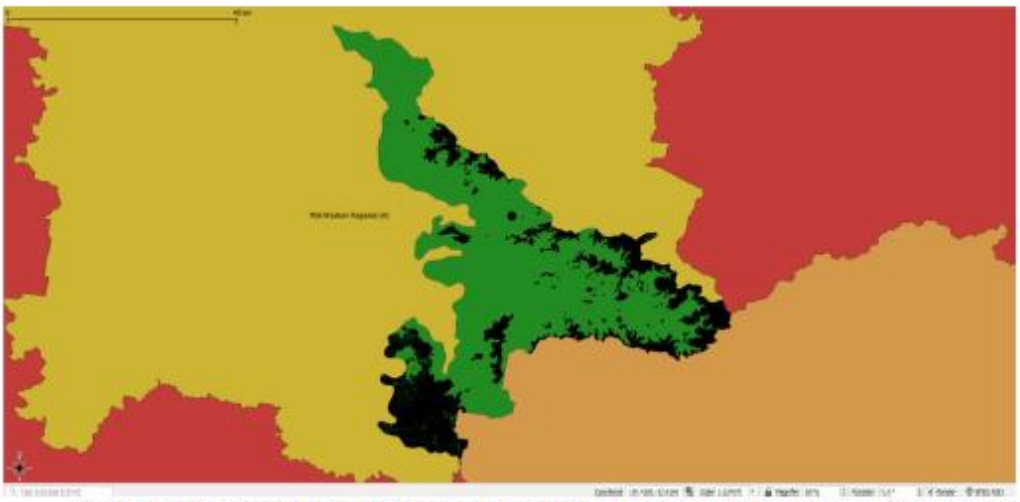
Great, thanks Mick, this has come through.

Can you get anything from Ray saying he's inspected the wetland on your place and that it is a Montane Peatland Swamp?

1

Extract from *Mjadwesch Environmental Service Support (2022) Preliminary Assessment Report for Mid-Western Regional Council*.

In order to refine the search area the Sydney Basin Bioregion X Mid-Western Regional Council area was clipped to 800m, to exclude landscapes below which it would be expected that swamps will fit within other low-altitude wetland assemblages.



Sydney Basin Bioregion X Mid-Western Regional Council LGA (green) with >800m contours (black)

Lower Altitude Wetlands

The 800m contour clip often illustrates high hills and peaks; swamps below this altitude represent other wetland communities, many of which are also endangered

Many of the swamps that occur below 800m ASL fall within the Montane Peatlands & Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and

Australian Alps bioregions, which is another ENDANGERED ECOLOGICAL COMMUNITY listed under Part 2 of Schedule 2 of the NSW *Biodiversity Conservation Act 2016* [3].

Montane Peatlands & Swamps often occupy broad valley floors in the district. This image is from Pyangle; the location is indicated in the aerial photograph on the preceding page

At higher altitudes, below 950m (from the NPSS FINAL DETERMINATION) wetland communities grade into *Blue Mountains Sedge Swamps,* which is also listed as an ENDANGERED ECOLOGICAL COMMUNITY under Part 2 of Schedule 2 of the NSW *Biodiversity Conservation Act 2016.* Together with the Newnes Plateau Shrub Swamps and Montane Peatlands and Swamps (where these occur on sandstone), these form the *Temperate Highland Peat Swamps on Sandstone* community, which is listed as ENDANGERED under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999*.

Many of the swamps of the study area, particularly those in the Coricudgy precinct, fall into this category, being at higher altitude, but not occurring above 950m ASL. These swamps are discussed and described below.

[3] http://classic.austlii.edu.au/au/legis/nsw/consol_act/bca2016309/sch2.html

APPENDIX C – Independent Planning Commission Presentation

Bowdens Mine Proposal: Surface Water Issues

IPC Public Hearing: 15 February 2023

Shireen Baguley

Key issues

1. Secretary's Environmental Assessment Requirements (SEARs) not met
2. AWBM water balance model issues and uncertainties:
   Calibration method and lack of Verification
   Inputs:
   - Mine Site Catchment Area
   - Water demand

   Lack of a sensitivity analysis
3. Significant and unacceptable impacts on the surface water
4. Regulatory irregularities
5. Water quality issues unaddressed
6. Potential impacts on groundwater dependent ecosystems

Secretary's Environmental Assessment Requirements (SEARs) not met

1. Water demand not clearly identified
2. Full impacts of drawing the water supply has not been assessed
3. Adequate and secure water supply is not available
4. Water balance modelling: not accurate and **no sensitivity assessment**
5. **No site water quality model, no water quality treatment methods**
6. **Two paragraph long "water quality monitoring program"**
7. No Trigger Action Response Plan

An assessment of potential water quality impacts associated with process chemicals has not been conducted, therefore it has not been possible to develop management measures. Impacts of TSF seepage on receiving surface water or groundwater remains a key concern.

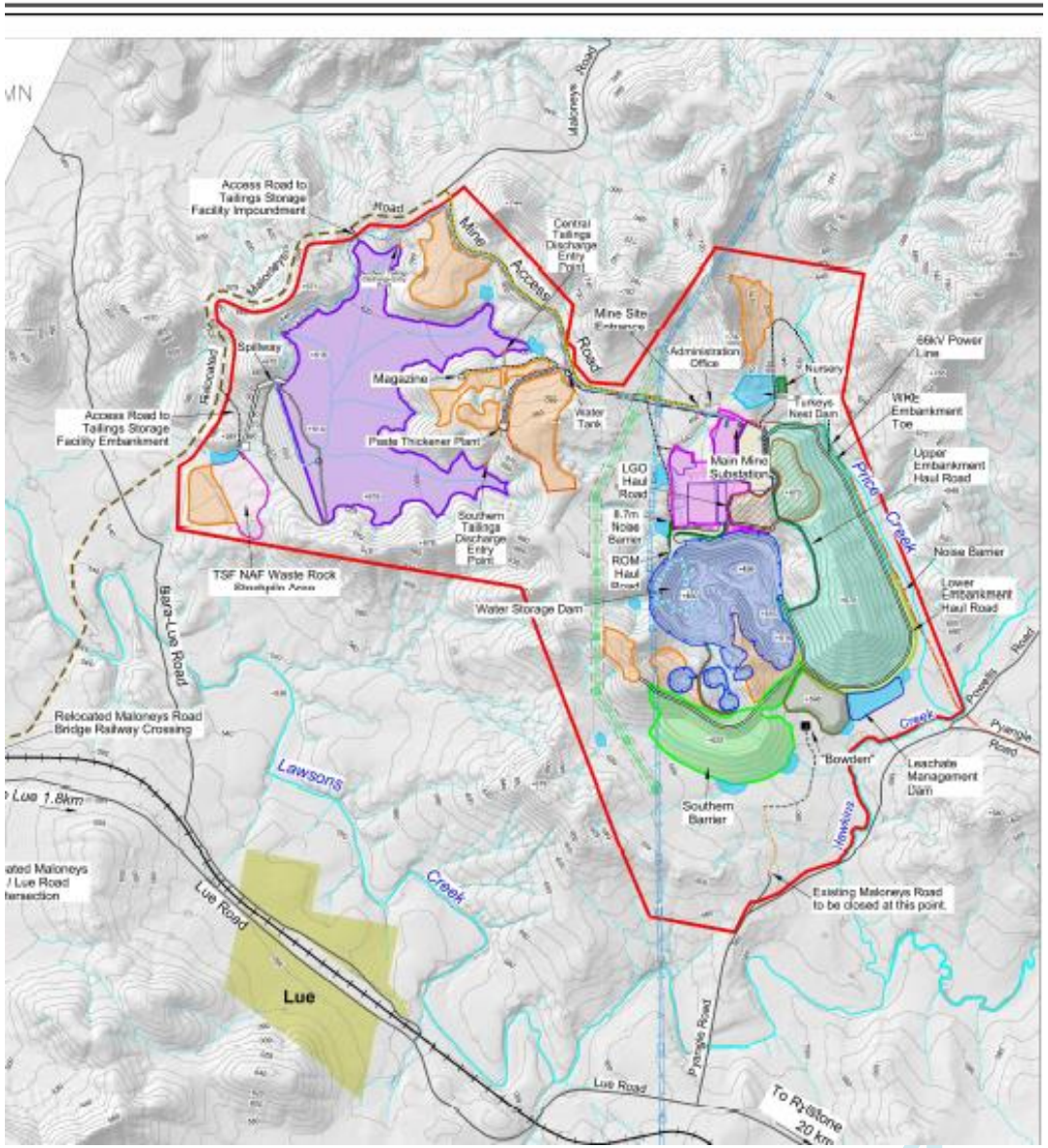
Earth·Systems,·2022¶

Mine Site area unclear

550 ha Mine Site catchment

‘Removed’ in full to assessed the Project’s maximum impact on ‘cease to flow’ conditions

Proposed mining operations cover the majority of the Mine Site boundary (shown in red)

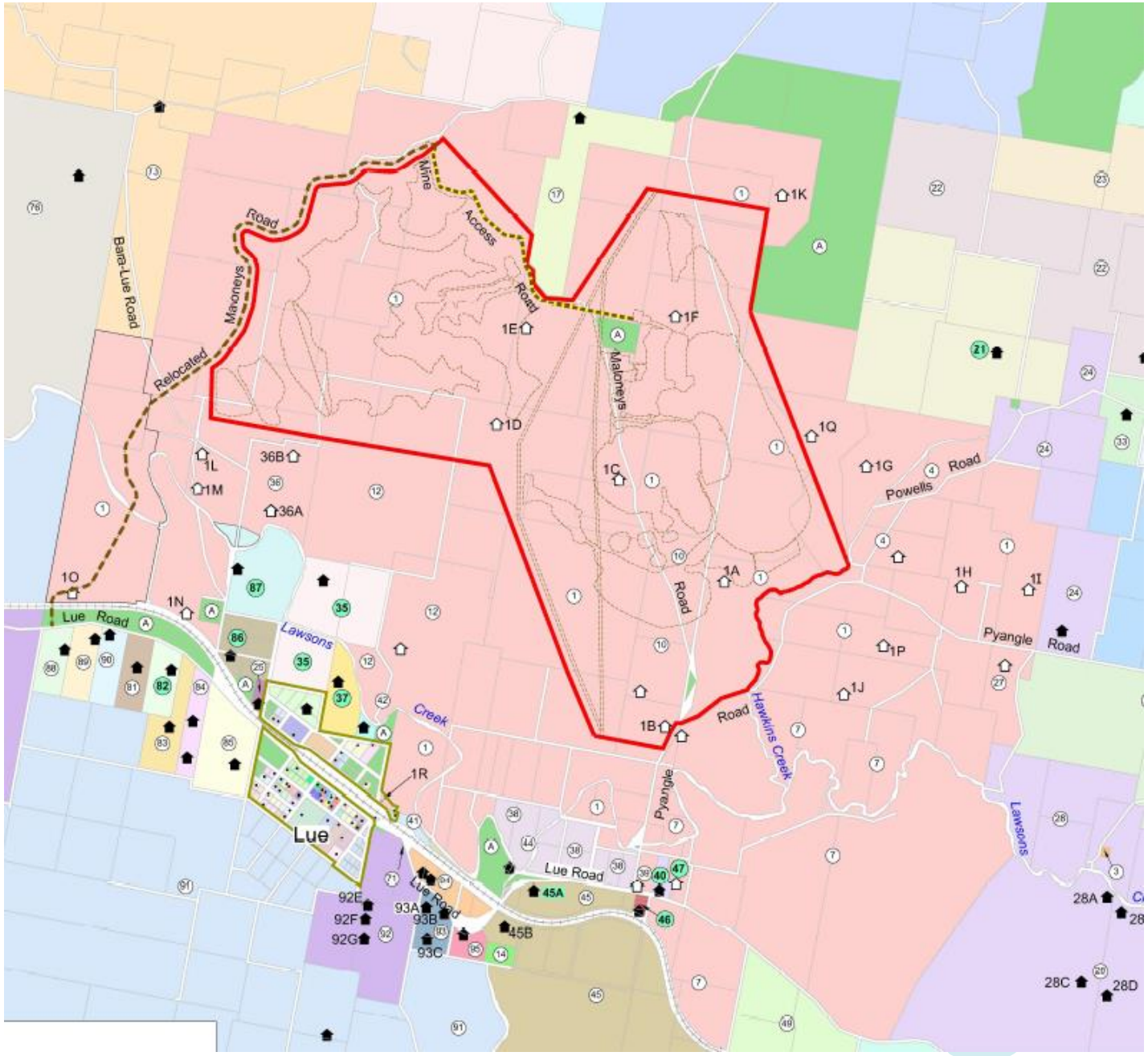


Mine Site area unclear

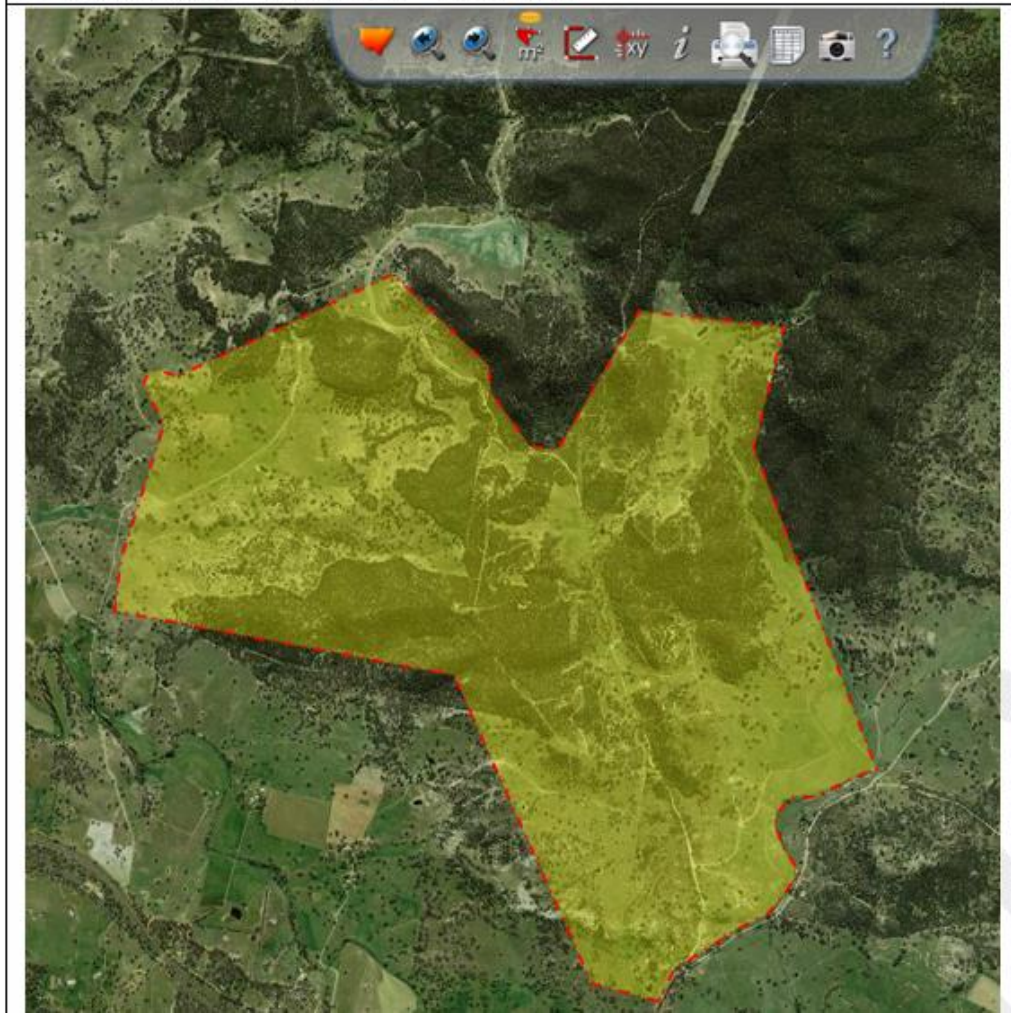
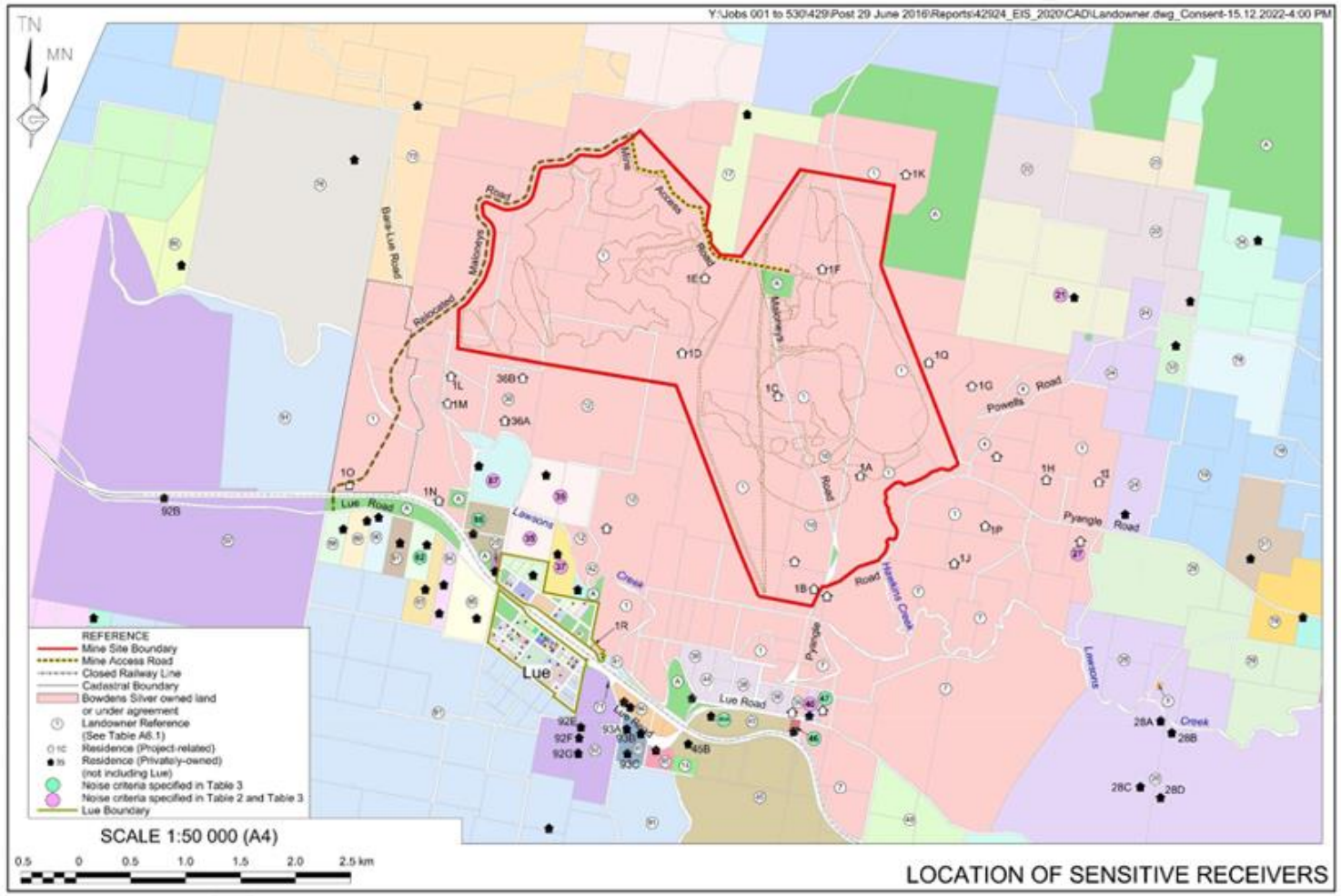
Bowdens states it has contiguous land holdings of 2580ha -

shown shaded pink

Note the proportion between this and the ‘Mine Site’



Mine Site area unclear

Mine·site·area·—·Six·Maps·—·1007·Ha¤	DPE·Recommended·Conditions¤
	

Water Demand Uncertainties

Two inputs:

Potable water:

- 14ML/year
- missing from inputs

Dust suppression water:

- ?? ML/year

Table 5.5b

Average Annual Site Water Balance – Years 1 to 14 - Revised

Item	Inflow ML/a	Outflow ML/a
Rainfall and runoff	924	
Net groundwater inflows to open cut pit	431	
Advanced dewatering	380	
Clean water harvesting	27	
Ore moisture	83	
Retained tailings moisture		1 143
Evaporation		477
Dust suppression demands supplied		128
Concentrate moisture		6
Other plant losses		19
Dam overflows		0
Annual increase in stored volume		72
Total	**1 844**	**1 844**

Water Demand Uncertainties

* Dust suppression: ?? ML/year

Findings & recommendations: Earth Systems to DPE

Seek clarification of the implications of under-estimating water requirements for dust suppression for project water supply reliability.

Supporting data were not provided, nor were uncertainties in dust suppression requirements considered in the sensitivity analysis of the water balance model.

Pending clarification of model sensitivity to uncertainty in water requirements for dust suppression, details on the proposed chemical composition, application rates and toxicity, and implications for the impact assessment.

Water Demand Uncertainties

Table 3
Average Annual Site Water Balance – Years 1 to 14 – Low Runoff Scenario
(correction to Table 5.11 of WRM [2022])

Item	Inflow ML/a	Outflow ML/a
Rainfall and runoff	740	
Net groundwater inflows to open cut pit	431	
Advanced dewatering	380	
Clean water harvesting	22	
Ore moisture	82	
Retained tailings moisture		**1,129**
Evaporation		356
Dust suppression demands supplied		131
Concentrate moisture		**6**
Other plant losses		19
Dam overflows		0
Annual increase in stored volume		**14**
Total	1,655	1,655

Table 4
Average Annual Site Water Balance – Years 1 to 14 – High Runoff Scenario
(correction to Table 5.12 of WRM [2022])

Item	Inflow ML/a	Outflow ML/a
Rainfall and runoff	1,109	
Net groundwater inflows to open cut pit	431	
Advanced dewatering	380	
Clean water harvesting	58	
Ore moisture	83	
Retained tailings moisture		**1,146**
Evaporation		614
Dust suppression demands supplied		132
Concentrate moisture		**6**
Other plant losses		20
Dam overflows		0
Annual increase in stored volume		**143**
Total	2,061	2,061

How could dust suppression water requirements be lower in dry periods?

AWBM water balance model issues

Uncertainties due to the issues already outlined

In addition

- Calibration at irrelevant location and "excludes recent very dry weather when instream losses appear to be most". No verification

- Use of 'average' results – what happens in wet and dry periods?

- **No sensitivity analysis for evaporation, dust suppression water, etc:**

- No consideration of climate change

Not possible to understand likely impacts

Model not yet fit for purpose.

Unacceptable impacts on surface water

Dept of Planning has assessed the project on the basis of 177ML/yr being ‘lost’ to the catchment; however the true figure is at least 856ML/yr

480% more rainfall and runoff than has been assessed

significant impacts to downstream catchments

Earth systems has repeatedly recommended that the 856ML/yr loss be modelling.

> It has been confirmed that 856 ML/year of surface runoff would be removed from the Lawsons Creek catchment. This is well in excess of losses presented elsewhere in the EIS (177 ML/year; which relates to surface water runoff losses only). A review of impacts on downstream surface water, baseflow and groundwater is therefore warranted.

This has not occurred.

This project be considered for approval when the assessment is flawed?

Unacceptable impacts on surface water

However, likely flows are higher:

951ML/year

Advice from Corkery:

The increase from 806ML/y (2020) to 856ML/y (2022) is attributed to the TSF liner and addition of clean water harvesting

However, clean water harvesting is a separate item, and is **also removed from the catchment.**

Must also be considered

Table 5.5
Average Annual Site Water Balance – Years 1 to 14

Item	Inflow ML/a	Outflow ML/a
Rainfall and runoff	856	
Net groundwater inflows to open cut pit	431	
Advanced dewatering	380	
Clean water harvesting	40	
Ore moisture	83	
Retained tailings moisture		1 141
Evaporation		448
Dust suppression demands supplied		131
Concentrate moisture		18
Other plant losses		20
Dam overflows		0
Annual increase in stored volume		31
Total	**1 789**	**1 789**

Unacceptable impacts on surface water

Table 5.5 was updated late 2022.

Now inflows (catchment losses) are:

- 924 ML/year in rainfall and runoff

-27 ML/year in clean water harvesting

951ML/year lost from the catchments… year after year.

Table 5.5b
Average Annual Site Water Balance – Years 1 to 14 - Revised

Item	Inflow ML/a	Outflow ML/a
Rainfall and runoff	924	
Net groundwater inflows to open cut pit	431	
Advanced dewatering	380	
Clean water harvesting	27	
Ore moisture	83	
Retained tailings moisture		1 143
Evaporation		477
Dust suppression demands supplied		128
Concentrate moisture		6
Other plant losses		19
Dam overflows		0
Annual increase in stored volume		72
Total	**1 844**	**1 844**

Unacceptable impacts on surface water

Table 8.1^: Revised with greater catchment and consideration of lower flows

Impact of Project on Mean Annual Streamflow in Downstream Waters

Reach Number	**Unit**	**Operations**			**Comment**
		1	**2**	**3**	
Watercourse and reach		Hawkins Creek	Lawsons Creek	Lawsons Creek	
		P - A	B - C	C - D	
Mean annual flow					
Pre-mining ML/a	ML/a	1958	7136	8735	not altered from Table 8.1
q60 (flows are less than this 40% of the time)	(ML/d)	not available		4	From Figure 8.3 of amendment report
q70 (flows are less than this 30% of the time)	(ML/d)	not available		2.4	From Figure 8.3 of amendment report
Loss due to Mine Site WMS	ML/a	854.7	854.7	**951**	Have added 774.4ML/y, the amount over 176.6, to all operations catchments.
Loss due to Mine Site WMS (ML/a)	(ML/d)	2.3	2.3	2.6	
Potential baseflow reduction*	ML/a	9.5	5.1	14	not altered from Table 8.1
	(ML/d)	0.03	0.01	0.04	
Total change due to the Project	ML/a	-864.2	-859.8	-965	Assumed to be sum of losses above. Note, numbers in original Table 8.1 didn't add up
	(ML/d)	-2.4	-2.4	-2.6	
Comparison with Mean annual flow					
Percent change due to the Project	%	**-44.1**	**-12.0**	**-11.0**	
Comparison with					
q60 (flows are less than this 40% of the time)	(ML/d)	not available		**-66.1**	
q70 (flows are less than this 30% of the time)	(ML/d)	not available		**-110.2**	

The likely impacts of the mining operations on water are unacceptable

The project should not be approved

Lawson Creek, Lue

2019

Regulatory irregularities

Context: Project relies on its harvestable water rights of 186.1ML – Permissible based on 2580 ha contiguous land holding

Volume of the sediment dams (150ML) and clean water dams (145ML) = **295ML**

Exceeds theoretical harvestable water rights **by 109ML**

186.1ML is the maximum volume of dams allowed, however already 59 dams across the 2580ha property. Assumed average of 1.5m = 72ML.

Remaining harvestable right of only **114ML**

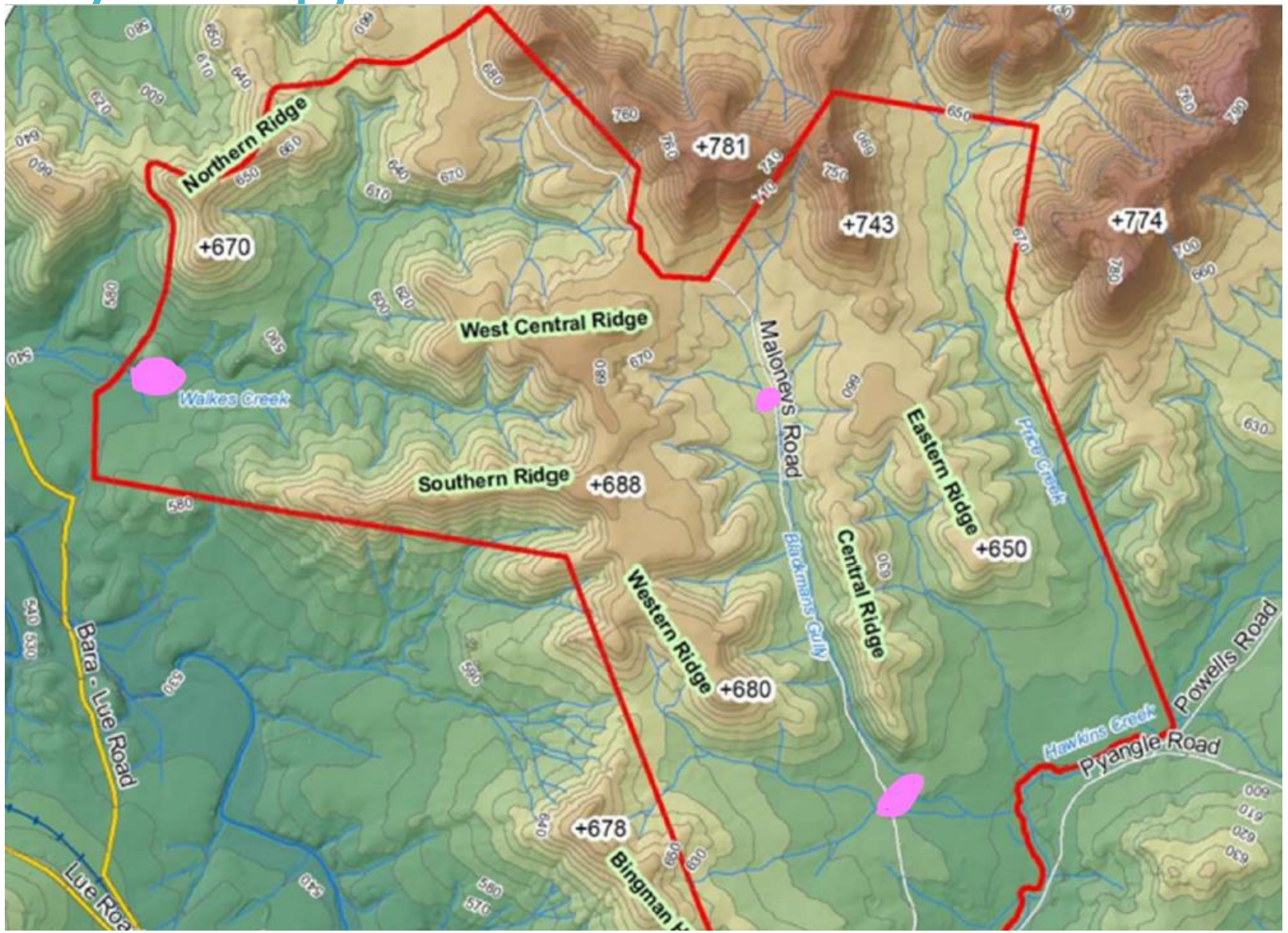
Bowdens intends to harvest more twice its entitlements

Exemptions being relied on for these dams require these to be on minor streams

Violated in a number of instances: affects 70ML of the dam capacity

The EIS and associated documentation does not present a factual assessment and is not fit for purpose in this regard.

Regulatory irregularities



The EIS and associated documentation does not present a factual assessment and is not fit for purpose in this regard.

Water quality

Failure to adequately address key points in the SEARs:

- No water quality model

- No water quality management plan with appropriate triggers for action.

- 2 paragraph water quality monitoring plan

Uncertainties around final void water throughflow - potential for contamination

All these issues have been raised by DPE's experts but remain unrectified.

In addition, the latest proposal by Bowdens is to increase the surface area of the final void and lake to increase evaporative losses

No impact assessment of this yet

This will only exacerbate all the water issues outlined here.

Conduct pit water quality modelling (taking into account acid, metals, salinity and any other contaminants) and solute transport modelling to assess potential water quality impacts in Hawkins Creek associated with throughflow from the final pit void, with and without implementation of mitigation measures.

Earth·Systems,·2022¶

Impact on groundwater dependent ecosystems

High number of springs in and adjacent to the proposed mine site.

Widespread system of upland swamps and mires in Upper Lawson catchment.

Likely referrable to the Montane Peatlands and Swamps Endangered Ecological Community (EEC) and the Temperate Highland Peat Swamps on Sandstone EEC

These peatland swamps in the Mid-Western LGA are not yet well documented

Likely endangered groundwater dependent ecosystems.

The role of these wetlands is critically important. They act as sponges in the landscape, supporting the surrounding and downstream areas in dry times.

The risk of losing these permanently is very high and the loss is irreversible.

Conclusion

1. Water balance model issues and uncertainties:
   Inputs:
      Mine Site Catchment
      Water demand
   Calibration and Verification
   Sensitivity assessment
2. Significant and unacceptable impacts on the surface water
3. Regulatory irregularities
4. Water quality issues remain unaddressed.
5. Secretary's Environmental Assessment Requirements (SEARs) not met

Impact Assessment is not fit for purpose: The IPC should refuse this project.

Conclusion

The failure of the EIS and associated documentation to meet the SEARs in multiple instances means:

- The IPC does not have sufficient information to make an informed decision
- There is a failure of due process
- The standard required to assess the impacts of a project have been lowered
- Determinative issues are being pushed into post-approval stage
- The community confidence in the decision-making process has been undermined.
- No confidence from the local community means = no social license for this mine.

The IPC should refuse this project.