Michael White
20 Yarraman Rd
Wybong 2333
4 April 2022

Reasons for Objections to Bowdens Lead Zinc Silver Project (SSD-5765)

This submission is supplementary to my original submission dated 25 July 2020 and includes comment on the Bowdens Submissions Report and the Amendment Report (2nd Amendment)

This project will cause the creation of large areas of potentially acid forming waste rock and tailings placed in containments using designs that are unproven in long term performance at this scale and appear difficult to construct to design.

The project proposes to store 26 million tonnes of potentially acid forming waste rock in a 77 hectare containment area that sits above the water table and upstream of Lawson Creek.

The project proposes to store 30 million tonnes of PAF tailings in a 117hectare containment that sits above the water table and upstream of Lawson Creek. These tailings will contain most of the 43,700 tonnes of chemicals added during ore processing. Some of these chemicals are highly toxic. The tailings will also contain 17-20% [1] of the lead, zinc and silver mined due to losses during ore processing. Other metals present in the tailings will include arsenic, antimony, fluorine and manganese.

The containment designs are complex and will be difficult to build to design on the uneven natural ground surface.

There is no track record to provide proof these containment designs will work and not leak during operations and for the extremely long term future that the potential for acid mine drainage will continue.

Leaks would only be detected when acid mine drainage has escaped the containments. The location of a leak would not be easy to find and repairs do not appear possible. It would then be leaking forever.

The Tailings Storage Facility

Bowdens continues to attempt to avoid committing to the installation of a minimum 1000mm thick clay base layer at the required EPA impermeability across the full extent of the impoundment area of the proposed Tailings Storage Facility (TSF).

Figure 11 in the EIS Groundwater Assessment[2] shows a major geological fault across the TSF area. Faults can be areas of increased permeability. There is no mention of this in the TSF design document.
The Bowdens Project Tailings Storage Facility has a footprint of approximately 112.5 hectares and the construction of a continuous geosynthetic impermeable liner base over

[1] Feasibility Study, Bowdens Silver Project, 14 June 2018, p.19 ASX release on company web site
[2] EIS Vol 2 Part 5 Groundwater Assessment, Fig. 11, p. 5-57

this large area that will provide full impermeability for centuries seems to be an improbable and unachievable control.
The low permeability (hydraulic conductivity of $1x10^{-9}$ m/s or less) constructed clay liner with at least 1000mm thickness would be simpler to construct, and more robust and more forgiving to minor impacts and minor thickness variations.

This clay liner should be mandatory requirement as the Bowden's TSF impoundment base liner over the entire impoundment area.

Paste Thickening of Tailings

The proponent has now included the addition of a paste thickener plant to the tailings stream to increase water recovery. The amendment states that the paste thickener plant would thicken the tailings stream from the processing plant to produce tailings with a 63% w/w solids content.[3]
The solids content of tailings in the EIS was assumed to be 56% and this was one of the design parameters used in the design of the Tailings Storage Facility (TSF)[4].

7 TAILINGS TONNAGE AND DEPOSITION RATE

The preliminary design has been based on the deposition of 2 Mt of tailings per annum with a total of 30 Mt deposited over the 15-year LOM. A discharge solids content of 56 % for the tailings has been adopted on the basis of the thickener study carried out by mining equipment supplier Outotec on the CT tailings sample produced for testing in February 2017 [Ref. 5].

8 DENSITY

Based on the initial tailings testing [Ref. 3], the tailings parameters adopted for this study are presented in Table 1.

TABLE 1

TAILINGS DENSITY PARAMETERS ADOPTED FOR DESIGN

Discharge Solids Content (%)	Initial Settled Density (t/m^3)	Final Settled Density for Start-up Deposition (t/m^3)	Final Settled Density for after Start-up Deposition (t/m^3)	Over-all Tailings Density at the End of LOM (t/m^3)	Soil Particle Density (t/m^3)
56	1.04	1.35	1.6	1.5	2.7

The solids content of the tailings has increased from 56% to 63%. This 12.5% relative increase in solids content is significant. The impacts of this proposed change do not appear to have been assessed by the proponent. There is no updated information provided regarding the materials handling characteristics, the tailings beach slope predictions, beach slope design or tailings emplacement methodology for the paste thickened tailings.

On that basis this application should be rejected.

[3] Bowdens Water Supply Amendment Report, p.15
[4] Bowdens EIS Specialist Studies Vol 5 Part 16A TSF Design Report, p.5

The New Water Balance

The assumptions made in the Amendment Report regarding the sources and availability of water required by this project require careful and detailed review by independent surface and groundwater experts.

The localised increased water take by the project both from within the mine footprint and on adjacent Bowdens owned agricultural land must increase impacts on other stakeholders.

The validity of the application of averages to assess the project's ability to continue to operate in very dry periods must be carefully assessed for credibility.

Lack of Technical Rigour and basic inaccuracies

Bowdens states in its Submissions Report that[5]:

> *AMC estimated the productivity of the Hitachi EX 1900 in combination with Cat 777 G trucks for handling both oxide and fresh rock material. AMC determined annual productivity to be 4.37 million bank cubic metres (Mbcm) of oxide material (9.77 million tonnes (Mt)) and 4.05Mbcm (9.58Mt) of fresh rock. That is, the equipment would have the capacity to move 19.35Mt per annum.*

This stated output by one 190 tonne excavator (standard bucket size 12 cubic meters) and truck fleet is clearly wrong and massively overstated to anyone experienced in mining with excavator and truck fleets.

For confirmation I personally spoke with a Mine Operations Manager in the Hunter Valley who currently runs Hitachi EX3600 excavators (360 tonne excavators with 23 cubic metre bucket). Maximum annual production rates on these machines are:

Hitachi EX 3600: 1150 bcms/hr at 6500hrs X 2.4 tonnes/bcm = **17.9 million tonnes per annum**

This model is almost twice the size of the EX1900 in the Bowden's fleet. This clearly demonstrates that the stated Bowden's fleet capacity of 19.35 million tonnes per annum is greatly overstated.

If this technical error is indicative of the level of technical rigour in this Project application overall, then the DPIE should refuse this application on this issue alone.

I submit that this Project Application should not be approved

Michael White BE Mining (Hons), MBA, GAICD
4 April 2022

[5] Bowden Submissions Report,,s.5.16.4, p.198