

1 December 2022

Stephen O'Donoghue
Director Resource Assessments
Department of Planning and Environment
Level 17, 4 Parramatta Square
12 Darcy Street
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Dear Stephen

Re: Bowdens Silver Project: AMD Independent Review Outcomes

This response to the final conclusions and recommendations of the Earth Systems *Independent Review - Acid and Metalliferous Drainage* is provided recognising the detailed review and response provided to previous comments provided by Earth Systems and that most of Earth Systems' conclusions remain unchanged from that review and the provision of additional information. Of note, the final review report from Earth Systems includes a statement to the effect that methods such as multi-element assay data, hyperspectral scanning, petrological observations, SEM analyses and XRD analysis cannot be used to support Acid and Metalliferous Drainage (AMD) risk classification without the equivalent static geochemistry analyses. This remains a fundamental matter of disagreement given that Bowdens Silver and its consultants have indicated that it is this data that provides the confidence that the sampling completed for the Project is sufficient and that the conclusions of Graeme Campbell and Associates (GCA) are accurate. When many of the recommendations from Earth Systems are considered in light of the disagreement, it is clear why the matters remain outstanding.

Bowdens Silver and its consultants continue to have confidence in the waste classification strategy proposed in the *Response to Earth Systems Review – Acid and Metalliferous Drainage* which was prepared with detailed additional input from GCA. The Company's proposed waste classification strategy is largely unchanged since the publication of the EIS, with further information now available to address uncertainties that were identified in the *Materials Classification Assessment* prepared by GCA (2020). Notwithstanding this, the included table presents the outcomes of a review of the Earth Systems conclusions and a brief response to the recommendations for conditions of consent. Bowdens Silver accepts the additional test work that is recommended by Earth Systems and would use the outcomes of this work to inform the preparation of an AMD Management Plan, which would be submitted to DPE for approval prior to the commencement of mining.

Importantly, it is noted that the matters raised by Earth Systems do not include issues that present risks that are fundamental to the development of the Project. This includes the Company's ability to construct the infrastructure necessary for the Project. Bowdens Silver is committed to managing all environmental risks, including AMD risks. It is accepted that the management of AMD risks and the need for ongoing proactive and reactive management, supported by detailed testing, analysis and monitoring would occur over the life of the Project. These measures would be included in the AMD Management Plan. The measures to be applied would be established and approved prior to the commencement of mining and be adapted over the life of Mine in accordance with the outcomes of Bowdens Silver's management and industry best practice.

Yours sincerely



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Recommendation	Response
<p>Prior to mining, conduct detailed static geochemistry test work including ABA, NAG suite, sulfur and carbon speciation, on at least 1 representative sample per 10,000 tonnes of waste rock material to determine whether a suitable AMD risk classification system can be developed for the northern section of the proposed main open cut pit.</p>	<p>It is noted that Earth Systems do not support the evidence available from multi-element assay data, hyperspectral scanning, petrological observations, SEM analyses and XRD analysis. Therefore, it is agreed that additional work will be required to provide confidence on this matter and to demonstrate that the proposed waste rock classification strategy is acceptable. The question asked by Earth Systems in this recommendation appears not to be whether a suitable AMD risk classification system can be developed but rather whether it is accepted that PZ1 and PZ2 material is Non Acid Forming (NAF). This is the conclusion of the <i>Materials Characterisation Assessment</i> for the Project (GCA, 2020) and the initial response to the Earth Systems review. Additional review of %S_{residual} classification in the northern section of the main open cut pit was also presented as further justification that PZ1 and PZ2 is NAF.</p> <p>It is not agreed that the sampling should require at least 1 representative sample per 10,000 tonnes of waste rock material, noting that this sampling approach is not specifically recommended in any reviewed guidance material. Rather it is preferred that conditions of consent refer to a 'representative sample size' so that a more realistic alternative may be proposed and approved. To that end we are comfortable that the sampling rationale be reviewed and approved by DPE (or other relevant Government agency) prior to it being implemented. Once complete, the outcome would be used in the preparation of an AMD Management Plan that would be submitted to DPE for review and approval prior to the commencement of mining.</p> <p>It is noted that Earth Systems believe there remains a risk that the static geochemistry analysis may produce markedly different results compared to the previous static geochemistry analysis and additional evidence available from the multi-element assay data, hyperspectral scanning, petrological observations, SEM analyses and XRD analyses. Should this be the case and the current design of the Waste Rock Emplacement or other infrastructure is not sufficient to manage AMD risks, Bowdens Silver would redesign these components of the Project and seek to modify the development consent in accordance with Section 4.55 of the <i>Environmental Planning and Assessment Act 1979</i>.</p>
<p>Prior to mining, conduct QXRD test work on sufficient representative samples from the northern section of the proposed main open cut pit to verify suitability of proposed "residual" wt.%S algorithm with a 0.0 wt.% S cutoff value applied to delineate PAF and NAF waste rock.</p>	<p>It is noted that Section 4.4 of the initial response to the Earth Systems review notes that %S_{total} would be used for waste classification as using %S_{residual} is not preferred for management during mining. Therefore, Bowdens Silver will not seek to verify the suitability of the proposed %S_{residual} cut off value. Additional review of %S_{residual} classification in the northern section of the main open cut pit was presented only as further justification that PZ1 and PZ2 is NAF.</p>

Recommendation	Response
<p>For the main pit excluding the northern section, utilise a more conservative Total Sulfur cutoff value (0.2 wt.%S) during the initial stages of mining, with the potential to transition to a 0.3 wt.% S cutoff value if this can be supported by more detailed static geochemistry analysis conducted during mining, including Total Sulfur (by Leco furnace), ANC and/or NAG pH as a minimum.</p>	<p>An initial period during which a Total Sulfur cutoff value of 0.2 wt.%S was applied is acceptable as it would not impair the Project's ability to construct the necessary infrastructure (including long-term landforms).</p> <p>Section 3.5.1 of the initial response to the Earth Systems review recognised that any occurrences %S_{total} <0.3 waste material within the broader %S_{total} >0.3 shell is PAF. That is, the material previously classified as NAF in the main pit (excluding the northern section) was not present in sufficient bulk to be separately mineable. Therefore, for the purpose of classification, all material in the primary zone of the main open cut pit (excluding the northern section) would be treated as PAF. To that end, Bowdens Silver accept the Total Sulfur cutoff value of 0.2 wt.%S for PZ3 material, noting that in practice this would not be needed.</p> <p>Similarly for material classified as PZ1, a low cutoff for Total Sulfur has been applied in the waste classification strategy and therefore would not be affected by a higher cutoff value.</p> <p>A detailed review of the classification of NAF material (WZ1) in the weathered zone in the main pit (excluding the northern section) is presented in <i>Clarification of Key Items in GCA (2020) Report on Environmental Geochemistry and Implications for Mining-Stream Management</i> provided in Appendix 2 to the initial response to Earth Systems. On this basis, the assignation of WZ1 as benign NAF construction material remains and applying a Total Sulfur cutoff value of 0.2 wt.%S would not impair available volumes of this material for construction purposes.</p> <p>It is accepted that the PZ2 material may require specific handling, stockpiling and management prior to use as a construction material. Use of this material may require that the PZ2 material is armoured with WZ1 or PZ1 material. The approach to management of this material would be presented in an AMD Management Plan for the Project and would be informed by the further testing committed to earlier.</p>
<p>Prior to mining, use kinetic test work data to quantify pyrite oxidation / acidity generation rates and the duration of acid generation from PAF waste rock.</p>	<p>Bowdens Silver accepts a condition requiring that additional kinetic test work be undertaken prior to mining. Section 5 of the initial response to the Earth Systems review noted that ongoing field-testing programs would be undertaken, including testing to determine lag phases, and oxidation rates under field conditions and in a controlled environment. It is noted that management commitments on this matter principally involve containment of runoff from mining components until such time as it can be demonstrated that controlled discharge may occur. It is not clear why this matter needs to be resolved prior to mining given these commitments.</p> <p>The work completed to date noted in Section 2.2 of the <i>Clarification of Key Items in GCA (2020) Report on Environmental Geochemistry and Implications for Mining-Stream Management</i> prepared by GCA and included in Appendix 2 of the initial response to the Earth Systems review is considered sufficient to support approval of the Project and that the outcomes of this work would support existing management commitments.</p>

Recommendation	Response
<p>Prior to mining, develop an AMD Treatment Plan, as part of a site-wide AMD Management Plan, noting the potential for immediate / short term AMD generation from PAF waste rock upon dewatering / disturbance.</p>	<p>This recommendation is accepted noting that the current water management approach is to contain all runoff from mining components for use in processing. The storage capacity of water management structures is presented in the <i>Water Supply Amendment Report</i>. It is noted that a discharge strategy may be developed in the future but not for areas where PAF waste rock material is disturbed/emplaced and only once satisfaction of the NSW Environment Protection Authority (EPA) requirements for discharge can be demonstrated.</p> <p>https://www.epa.nsw.gov.au/your-environment/water/managing-water-pollution-in-nsw/environment-protection-licensing/water-pollution-discharge-assessments.</p>
<p>Upon commencement of ore processing, conduct kinetic test work to quantify the rate of pyrite oxidation / acidity generation processes, the “lag time” before acid conditions will develop, and the longevity of AMD generation from PAF tailings.</p>	<p>This recommendation is accepted and would be included in the AMD Management Plan for the Mine.</p> <p>It is noted that seepage rates for the preliminary design of the TSF prepared by ATC Williams were within the bounds specified by the NSW EPA. In addition, Bowdens Silver elected to include a bituminous geomembrane liner over the entire TSF impoundment subject to detailed design outcomes. The TSF would also be subject to monitoring including of groundwater. Therefore, it is considered that Bowdens Silver’s approach to design, construction and management of the TSF is sufficient to address uncertainties relating to acid generation from tailings.</p>
<p>During mining, conduct field-based kinetic test work to develop an understanding of the depth of O₂ diffusion into PAF waste rock and tailings.</p>	<p>The recommendation is accepted noting that PAF waste rock applied to the Waste Rock Emplacement would be placed to provide a bedding layer for a geosynthetic clay liner (GCL) that would provide a barrier that limits oxygen and moisture ingress to the underlying PAF waste material. The effect of the GCL would be taken into consideration in future assessment of O₂ diffusion into PAF waste rock and tailings.</p>
<p>Prior to mining, develop a management strategy for “NAF” mine materials that contain alunite and jarosite, as part of a site-wide AMD Management Plan, noting the uncertainty / inconsistency in information collected to date.</p>	<p>Should the additional assessment recommended by Earth Systems not support the current strategy, a management strategy for “NAF” mine materials that contain alunite and jarosite would be included in the AMD Management Plan for the Mine.</p>
<p>Prior to mining, review static and kinetic geochemistry data, or conduct additional static and kinetic geochemistry test work, to assess the suitability of the suggested method for identifying NMD risk.</p>	<p>This recommendation is accepted, noting that this work has previously been committed to. Any uncertainty concerning NMD would be managed by the current water management approach which is to contain all runoff from mining components within the Mine Site.</p>

Recommendation	Response
<p>Avoid the use of “NAF” waste rock with potential for acidic drainage (associated with alunite and jarosite) or neutral and metalliferous drainage (NMD) for construction purposes, including the southern barrier that encroaches on the current alignment of Blackmans Gully.</p>	<p>A strategy for the use of NAF materials in construction processes would be included in the AMD Management Plan for the Mine. It is noted that Section 4.5 of the initial response to Earth Systems notes that the relative absence of alunite and jarosite is indicated by the results of hyperspectral analysis (questioned by Earth Systems) as well as XRD analysis of drill core and petrological observations and that these all support the use of NAF waste material in construction. It is noted that the high-manganese PZ2 sub-variant may require specific handling, stockpiling and management prior to use as a construction material.</p>
<p>Prior to construction, update waste rock dump design based on large-scale laboratory test work and/or field trials with appropriate instrumentation, to demonstrate that waste rock placement methods will sufficiently limit air entry to PAF waste rock and allow water quality objectives to be achieved.</p>	<p>The design of the Waste Rock Emplacement would be updated should it be required and subject to the outcomes of the final detailed design of the structure. Given the multiple sources of evidence that suggest more NAF can be expected than previously estimated and therefore the likely over-design of the WRE, it is considered that any re-design would be comfortably accommodated within the proposed footprint of the WRE. As noted above, should this not be the case, following detailed design, a modification to the development approval would be sought from DPE in accordance with Section 4.55 of the <i>Environmental Planning and Assessment Act 1979</i>.</p>
<p>As part of the waste rock dump design:</p> <ul style="list-style-type: none"> ▶ Additional management measures are required for the outer layer of PAF waste rock (oxygen diffusion front) that is exposed to air entry during operations / post closure. 	<p>This has been noted previously and would be included in AMD Management Plan.</p>
<ul style="list-style-type: none"> ▶ Avoid near-surface PAF material in the final waste rock dump landform, noting that GCL liners have a limited design life, store-and-release covers are not suitable for AMD control, and the longevity of AMD generation from PAF waste rock is unknown but may continue for hundreds of years. 	<p>The approach to emplacement of waste rock is not consistent with advice from several sources. However, it is noted that the proposed approach and alternative options for the final cover system of the WRE would be tested during development of the WRE to inform Mine closure. The testing of cover options for the WRE and triggers for the implementation of alternative approaches would be described in the Mine’s Rehabilitation Management Plan with commitments to testing and the presentation of outcomes described in the Forward Program and annual Rehabilitation Report.</p>
<ul style="list-style-type: none"> ▶ Provide documentation with detailed supporting data to justify the specific strategies selected (e.g. from INAP, 2020) and the detailed design specifications. 	<p>As noted above, the approach to closure of the WRE would be described and justified in the Mine’s Rehabilitation Management Plan.</p>

Recommendation	Response
Upon commencement of ore processing: ► Develop an AMD management strategy for tailings including the potential need for treatment of AMD / NMD in TSF seepage and decant water, during operations and post closure.	This recommendation is accepted and would be incorporated into an AMD Management Plan. It is noted that seepage rates for the preliminary design of the TSF prepared by ATC Williams were within the bounds specified by the NSW EPA. In addition, Bowdens Silver elected to include a bituminous geomembrane liner over the entire TSF impoundment subject to detailed design outcomes.
► Avoid reliance on TSF covers for long term post-closure AMD control, noting that GCL liners have a limited design life, store-and-release covers are not suitable for AMD control, and the longevity of AMD generation from PAF tailings is unknown but may continue for hundreds of years.	See response above regarding the closure of the WRE. The approach to closure of the TSF would be described and justified in the Mine's Rehabilitation Management Plan.
and, Prior to mining, integrate waste rock and tailings management strategies into a site-wide AMD Management Plan.	This recommendation is accepted.
Prior to mining, conduct an assessment of the potential AMD impacts on pit water quality during operations and post-closure, and integrate pit void water treatment / management strategies into a site-wide AMD Management Plan.	It is accepted that pit void water treatment / management strategies would be required prior to closure of the Mine. However, during mining the open cut pit would be dewatered to permit ongoing operations. Therefore, open cut pit water would present limited risks during operations and would only require treatment / management if needed before use in processing. A separate assessment of the implications of pit void water quality in the final landform has been completed by Jacobs and has been provided to the Department separately.