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MEMORANDUM

To: Harry Bronozian, MS; Chemical/Environmental Engineer
From: Ann Maest, PhD; Buka Environmental
Date: 16 October 2017
Re: Initial Comments on Lydian's 2016 Sustainability Report for the Amulsar Project

Overview: Lydian has undertaken a number of commendable efforts in the areas of community development, social investment, and biodiversity related to the Amulsar Project. The primary missing element from their 2016 Sustainability Report (Lydian International, 2017a) is a discussion of the potential to develop acid drainage from mining of the deposit. Acid drainage is the number one environmental sustainability challenge faced by the mine, yet it is not even mentioned in the report. In addition, two water quality claims are questionable: (1) any water that comes into direct contact with project infrastructure will not be discharged unless it is treated or shown to be in compliance with Armenian water discharge quality standards, and (2) discharged and treated waters from the project will have no connection with important water sources in the broader area. Both claims ignore the difficulty of capturing seeps from the unlined waste rock pile and water moving from away from the pit areas along faults or other pathways. Promises should focus on meeting the more protective water quality standards in streams rather than discharge standards. The report should also acknowledge that waters from mine facilities have a clear hydrologic connection to high quality rivers in the project area, as shown in the ESIA (Lydian International, 2016; Chapter 6, Figure 6.9.3), including the Arpa, Darb, and Vorotan rivers. More protective water management, water treatment, financial assurance, and adaptive management measures must be developed and implemented before mining begins to protect the surface water and groundwater relied upon by local residents and ecological systems.

<u>About this Report</u> (p. 6)

- Although water use for operations is not yet reported, the water balance is one of the major shortcomings of the project, and an additional water balance verification study costing $100,000 is proposed (Lydian International, 2017b). An updated and improved water balance for operations and closure should be reported on separately from this document.
- Reporting against targets at the end of the report (starting on p. 56) is a start on adaptive management, but a full adaptive management plan (AMP) for operations should be in place now, with numeric targets and trigger levels, required mitigation measures and plan updates, and evaluations of mitigation effectiveness.

<u>About Lydian and the Amulsar Project</u> (p. 7)

- The fact that the deposit "remains open at depth" implies that future expansions of the project are possible. Are the local communities aware of this? What is the potential mine life

beyond the "initial" 10-year mine life mentioned at the bottom of the page, and how would this affect the closure schedule?

Our Sustainability Approach (p. 10 – 14)

- Creating a Culture of Sustainability
    - Transparency is highlighted throughout the document, including in the Lydian Code of Conduct. How do they explain that appendices to the 2015 Lydian Feasibility Study are only available by visiting their offices on the Channel Islands in Britain? (see Lydian International, 2015, p. 383)
    - The Lydian Code of Conduct (p. 16) includes a commitment to "providing adequate resources to meet its environmental management obligations throughout the design, development, operations and closure of its operations." This should include committed *financial* resources for bonding in the event that the company vacates the site before post-closure is complete. An independent analysis of the appropriate bond amount and type should be conducted by a reputable and experienced international company or consultant.

Our Performance 2016 (p. 15 – 54)

- Environment (p. 16 – 25)
    - The Sustainability Report avoids discussing or even mentioning the high acid drainage potential of the site. This is the most important omission in the document. Public information sessions were held on heap leach technology and responsible cyanide management. Do they plan to address acid drainage issues in a similar public forum? The only mention of acid drainage is the naturally acidic surface water, which is questioned in the ESIA (Lydian International, 2016, Chapter 4.8).
    - What does the participatory environmental monitoring program include? Independent training of community members, with payment for their involvement (because it takes them away from other responsibilities), field supplies, analytical work, and evaluation of results, should be a part of such a program.
    - Jermuk National Part: what is meant by "controlling visitor access to the Park" (p. 20), and how would this affect local access and tourism? The special natural features of the proposed park are never mentioned.
    - Water (p. 21):
        - The principle that "any water that comes into direct contact with project infrastructure will not be discharged unless it is treated and/or tested and shown to be in compliance with Armenian water discharge quality standards" (p. 21) does not address mine contact water that is not captured (e.g., waste rock seeps, mine water flowing in fractures or faults) and does not address the quality of surface water or groundwater. The MAC II surface water quality standards for surface water, as I understand it, are outdated and have been or shortly will be replaced with generally more stringent standards linked to baseline water quality. Does Lydian agree to meet these new water quality standards in any surface water body receiving mine water, whether from a treated discharge or an uncaptured release? Armenia does not have groundwater standards, but if Lydian is agreeing to

meet good international practice, groundwater should be sampled, analyzed, and the results compared to representative international drinking water standards.

- Naturally acidic seeps (p. 22): According to the report, some surface waters exhibit "naturally acidic properties and elevated metal concentrations due to local natural conditions." However, either the statements in the 2016 ESIA (Chapter 4.8) or the spring data are in error. The ESIA states that certain springs are acidic, yet the data show that they are not (ESIA, 2016, Chapter 4.8, p. 4.8.82). The data and the ESIA statements should be rechecked and corrected as necessary.
- The statement that "discharged and treated waters from the project will have no connection with important water sources in the broader area" (p. 22) does not address uncaptured mine water. The statement also inadvertently implies that local, downgradient waters are not important. Diagrams in the ESIA clearly show that releases from the waste rock, pits, and heap leach facilities have a hydrologic connection to the Arpa, Darb, and Vorotan rivers during operations and closure (ESIA, 2016, Chapter 6.9, Figures 6.9.2 and 6.9.3).
- Lydian's commitment to the International Cyanide Code is commendable. The bigger concern at the site is the generation and management of acid drainage. Their Acid Rock Drainage Management Plan has important shortcomings, especially the lack of an active mine water treatment system being installed from Day 1 of mining, and the lack of sulfide separation and management technologies.
- Air Quality, Dust and Noise (p. 25): "Carbon oxide" emissions are the highest on the graph. Are the units in tons of CO or CO_2? If CO, the tons of CO_2 would be lower. Has Lydian explored the use of non-fossil-fuel sources for some of their operations? Does Lydian have a commitment to reducing the release of greenhouse gases over the course of the project?
- Dust suppression using additional water trucks (p. 25) will affect their water balance. Will this increased use be incorporated into their improved water balance calculations?

References Cited

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