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Please see attachment.

South32 Hermosa Mine
Permit No. AZ0026387
AZDES Draft Permit Review Comments

Comment 1- Manganese Effluent Monitoring

The US has no manganese (Mn) reserves and no producing Mn mines at this time. South32 Hermosa mine's Clark deposit will be the first Mn deposit put into production in the next few years.

EPA promulgated the Ore Mining and Dressing Effluent Guidelines and Standards (40 CFR Part 440) in 1975, and amended the regulation in 1978, 1979, 1982 and 1988. The regulation covers wastewater discharges from ore mines and processing operations. The Ore Mining Effluent Guidelines and Standards are incorporated into NPDES permits.

40 CFR Part 440 Subpart J is a regulation under the Clean Water Act that pertains to the Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory. The subpart establishes effluent limitations for discharges from mines and mills that produce copper, lead, zinc, gold, silver, or molybdenum bearing ores, or any combination of these ores from open-pit or underground operations other than placer deposits. The subpart also covers mills that use the froth-flotation process alone or in conjunction with other processes, for the beneficiation of copper, lead, zinc, gold, silver, or molybdenum ores, or any combination of these ores. The effluent limitations are based on the application of the best practicable control technology currently available (BPT), the best available technology economically achievable (BAT), and the best conventional pollutant control technology (BCT).

- <u>40 CRF Part 440 does not address Mn mining or Mn wastewater discharges.</u>

The EPA has developed a health advisory level for Mn in drinking water of 0.3 mg/L. The EPA has also established a secondary water quality standard of 50 µg/L for aesthetic issues related to taste and color. The federal and state secondary or aesthetic standards for manganese are 0.05 mg/L. Health Canada has set a new guideline value for manganese in drinking water of 0.12 mg/L.

The Contaminant Candidate List (CCL) is a list of contaminants that are currently not subject to any proposed or promulgated national primary drinking water regulations but are known or anticipated to occur in public water systems. Contaminants listed on the CCL may require future regulation under the Safe Drinking Water Act (SDWA). With the announcement of the draft CCL 5 on July 19, 2021, EPA provided a period for public comment and consulted with EPA's Science Advisory Board (SAB). Following minor revisions to address public comments and SAB's review, EPA published the final CCL 5 on November 14, 2022.

- <u>Mn is on the final CCL 5.</u>

Manganese is a mineral that is essential for human health, but it can be dangerous in large quantities. According to a report by Harvard Public Health, high levels of manganese in drinking water can cause a variety of behavioral and developmental disorders in children, as well as symptoms similar to Parkinson's disease in adults. The American Water Works Association (AWWA) states that manganese can have neurotoxic effects at higher concentrations, and can discolor water and cause staining at lower concentrations.

Manganism, also known as Mn poisoning, is a toxic condition that results from chronic exposure to manganese. It was first identified in 1837 by James Couper. Chronic exposure to excessive manganese levels can lead to a variety of psychiatric and motor disturbances, termed manganism. Symptoms of manganism include reduced response speed, irritability, mood changes, compulsive behaviors, tremors, stiffness, slow motor movement, depression, anxiety, and hostility. In the early stages of manganism, neurological symptoms consist of reduced response speed, irritability, mood changes, and compulsive behaviors. Upon protracted exposure, symptoms are more prominent and resemble those of idiopathic Parkinson's disease (PD) as which it is often misdiagnosed.

Besides manganism and PD, Mn has also been implicated in other neurological diseases such as Huntington's and prion diseases. Emerging data suggest that beyond traditionally recognized occupational manganism, Mn exposures and the ensuing toxicities occur in a variety of environmental settings, nutritional sources, contaminated foods, infant formulas, and water, soil, and air with natural or man-made contaminations.

Additionally, the impact of environmental Mn exposure on wildlife is still not well understood. A recent study published in Frontiers in Genetics indicates that chronic exposure to Mn can cause behavioral, cognitive, and motor dysfunctions in insects, including foraging activity of important pollinators such as the honey bee. The study also highlights the need for a better understanding of the neuronal, molecular, and genetic processes that underlie the toxicity of Mn and other metal pollutants in diverse animal species, including insects.

- There remain many gaps to be filled regarding Mn kinetics, additional mechanisms of toxicity and its role in triggering and propagating neurodegenerative diseases. The impacts of this metal needs to be further explored and elucidated since its deficiency or excessive levels can cause serious health conditions.

Recommendation

The proposed AZPDES Permit No. AZ0026387 for January Mine Hermosa Project needs to include Mn monitoring. Outfalls 001 and 002 should be monitored for the Mn with the health advisory limit of 0.3 mg/L on a quarterly sampling basis. It would be discreditable not to collect this data for the health and welfare of this environmental system.

<u>Comment 2- Term Definition</u>

From page 1, first paragraph:

"is authorized to discharge (1) treated mine drainage water from historic workings associated with January Adit, stormwater, and drainage water from historic dry stack tailings from the January Mine Hermosa Project to Upper Alum Gulch and (2) **treated mine drainage water**, drainage water from historic and non-historic dry stack tailings, groundwater, core cutting water, drilling water, and stormwater to Lower Harshaw Creek, Protected Surface Waters in Arizona that are Waters of the U.S. (WOTUS) in the Santa Cruz River Basin at:"

"**treated mine drainage water**"- there is no definition within the permit descripting this term in detailed as to what it is or what it contains.

<u>Recommendation</u>

Supply detailed definition.

<u>Comment 3- Outfalls 001 and 002 Effluent</u>

Without further information descripting the water treatment plants, cross-connection controls, short circuiting, mine and mill water balances, chemicals used on property, etc. the following should be added to fully characterize these outfalls:

- Chemical oxygen demand (COD)- In environmental chemistry, COD is an indicative measure of the amount of oxygen that can be consumed by reactions in a measured solution. The most common application of COD is in quantifying the amount of oxidizable pollutants found in surface water (e.g. lakes and rivers) or wastewater. COD is useful in terms of water quality by providing a metric to determine the effect an effluent will have on the receiving body.
- Oxidation reduction potential (ORP)- is a measurement of sanitizer effectiveness in water. It is an electronic measurement in millivolts (mV) of the ability of a chemical substance to oxidize or reduce another chemical substance.
- Dissolved oxygen (DO)- is the amount of oxygen that is present in water. Water bodies receive oxygen from the atmosphere and from aquatic plants. Running water, such as that of a swift moving stream, dissolves more oxygen than the still water of a pond or lake. Healthy waters that can support life must contain dissolved oxygen.
- Total dissolved solids (TDS)- is a measure of the dissolved combined content of all inorganic and organic substances present in a liquid in molecular, ionized, or micro-granular (colloidal sol) suspended form. The principal application of TDS is in the study of water quality for streams, rivers, and lakes. It is used as an indication of aesthetic characteristics of drinking water and as an aggregate indicator of the presence of a broad array of chemical contaminants.
- Forever chemicals- is an informal term the collectively refers to the class of synthetic chemical known as perfluoroalkyl substances and polyfluoroalkyl substances or PFAS. PFAS are a large chemical family of over 4,700 highly persistent chemicals that don't occur in nature. These chemicals are all different and have wide-ranging applications, from being grease-, water-, and stain-resistant to protecting pipes from corrosion.

<u>Recommendations</u>

COD, ORP, DO and TDS analysis should be done monthly and Forever chemicals should be quarterly.

Comment 4- Water Treatment Plant(s) Wastes

PERMIT NO. AZ0026387, page 35, Number 25- Removed Substances - [Pursuant to Clean Water Act Section 301]:

> "Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters."

Fact Sheet, Page 4 and 5:

> "WTP1 will produce residual solids composed of fine particles of minerals removed from the water during treatment. They are not classified as either rock or tailings. The solid residuals will be clarified from solution, filtered (i.e. dewatered by filter press), and deposited at the geomembrane-lined Tailing Storage Facility (TSF), as authorized by the facility's APP.
>
> WTP2 will produce solid residuals composed of fine particles of minerals removed from the water during treatment. They are not classified as either rock or tailings. The solid residuals will be clarified from solution, dewatered by filter press, and deposited at the geomembrane-lined Tailing Storage Facility (TSF), as authorized in the facility's APP."

The AZDES permit and/or the APP permit does not address any long-term reactive chemistry with the WTP1/WPT2 produced residual solids and/or the covered tailings within the lined tailings impoundment. Understanding this long-term system is critical for seepage control and treatment especially for closure.

Recommendations:

The following tests should be added on a semi-annual basis to composited samples:

- **Leaching Environmental Assessment Framework (LEAF) Methods and Guidance**- The Leaching Environmental Assessment Framework (LEAF) is a leaching evaluation system, which consists of four leaching methods, data management tools, and scenario assessment approaches designed to work individually or to be integrated to provide a description of the release of inorganic constituents of potential concern (COPCs) for a wide range of solid materials. The LEAF Methods have been designed to consider the effect of key environmental conditions and waste properties on leaching.
- **Toxicity Characteristic Leaching Procedure (TCLP)**- is a chemical analysis process used to determine whether there are hazardous elements present in a waste. It involves a simulation of leaching through a landfill and can provide a rating that can prove if the waste is dangerous to the environment or not. The TCLP is designed to determine the mobility of both organic and inorganic analytes present in liquid, solid, and multiphasic wastes.
- **Wet cell testing** is a method used to assess the acid-generating potential of sulfide minerals. The humidity cell (HC) kinetic method is widely used to assess acid-generating potential and is the only method normalized by the American Society for Testing and Materials (ASTM). The HC test results can be influenced by complete drying of the sample or by a long water saturation step during weekly cycles, which significantly reduces sulfide oxidation rates, leading to erroneous interpretations. A protocol modification of the HC involves keeping the sample permanently at an optimal degree of saturation, between 40 and 60 %, corresponding to maximal sulfide reactivity, as demonstrated in the literature. This modification leads to optimal sulfide reactivity and higher oxidation rates.