DESIGN AND CONSTRUCTION OF AN *IN SITU* ANAEROBIC BIOCHEMICAL SYSTEM FOR PASSIVELY TREATING RESIDUAL CYANIDE DRAINAGE[1]

by

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Abstract. This paper describes the design and construction of an *in situ* anaerobic biochemical system, termed the Biopass system, for passively treating residual drainage from a closed cyanide heap leach pad at the Santa Fe Mine, in Mineral County, Nevada. The approach for dealing with residual seepage or draindown from the spent gold ore leach pad was to convert one of the existing (*in situ*) solution ponds at the base of the pad into a Biopass system capable of passively treating the drainage on an as-needed and long term basis. Design of the Biopass system included determining the chemical constituents in the drainage, long and short term flow rates, volume of residual drainage, retention time, mass of organic matter, hydraulic conductivity of the substrate layer, and maximum consolidation settlement of the substrate layer. The Biopass system was designed for a minimum 20 day retention time and a peak flow rate of 2.8 liters/sec (45.1 gpm). The draindown chemical constituents of concern treated by the Biopass system include weak acid dissociable (WAD) cyanide (CN^-), sulfate (SO_4^{-2}), nitrate (NO_3^-), mercury (Hg), and selenium (Se). Existing facilities and on-site soil construction materials were used to the extent possible to reduce construction costs. The Biopass system was constructed in an emptied double geomembrane lined solution pond and consisted of, from the bottom upward: a seepage collection (influent) layer comprised of gravel and perforated pipe, a substrate layer comprised of a spent ore gravel and composted cow manure mixture, an effluent collection layer comprised of gravel and perforated pipe, a geotextile cushion, a geomembrane liner, and vegetative soil cover. Treated solution flows by gravity through a buried pipeline from the effluent layer to a leach field where it is aerobically treated.

Additional Key Words: closed heap leach pad, Nevada.

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