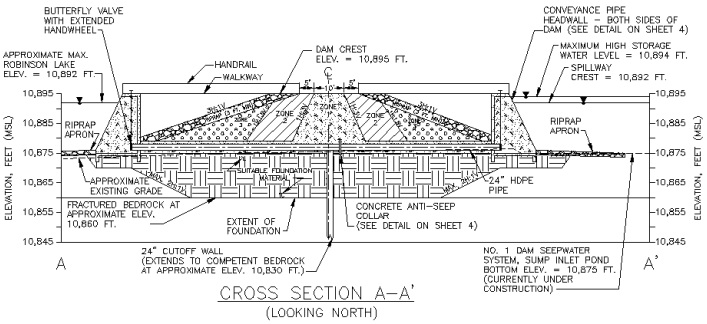
FACILITY OPERATIONS ENGINEERING SUPPORT

EMC^2 staff provide environmental and civil engineering support services to active facility operations. As demonstrated in the following project descriptions, EMC^2 personnel have evaluated existing facilities operations and developed designs, construction plans, specifications and bid packages for new facilities and existing facilities rehabilitation. EMC^2 focuses project planning/scheduling to prevent or minimize impacts to production operations.

Climax Mine Seep Water Impoundment Design - EMC^2 staff developed a design for a 20 foot high, 1,200 foot long, three zone earthen dam with a 20-to-60 foot deep slurry cutoff wall through fractured bedrock to: contain and prevent impacted seep water flows from mixing with a fresh water reservoir down gradient of the dam; and facilitate eventual sale of the clean reservoir water to area ski resorts for snowmaking. Design and project work included: geotechnical evaluations to identify suitable borrow materials for dam/slurry wall design; packer tests, soil permeability and flow net modeling/analyses to evaluate seepage; slope stability analyses considering steady state and rapid drawdown conditions for dam stability with each side of the dam impounding water; filtration analyses to specify gradation requirements for the three dam zones; dam spillway, underdrain and headwall designs; and development of construction plans/specifications.

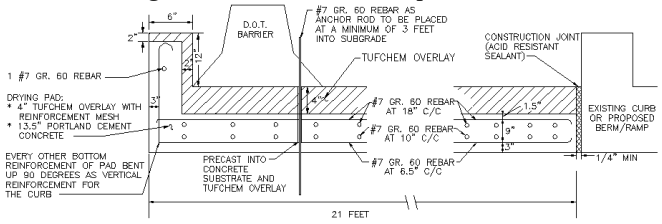


CROSS SECTION A–A'
(LOOKING NORTH)

Miami Mine Pregnant Leachate Solution Conveyance – EMC^2 staff developed a design and construction bid package for a low maintenance, 4,000 gpm gravity flow, 1,000 foot-long inclined borehole conveyance system to connect two pregnant leachate solution ponds and facilitate expansion of copper leaching operations. Design alternatives and cost-benefit evaluations included another gravity-feed pipeline and pressure pipelines with barge pumps. A separate seepage interception basin design was developed as a back-up system to contain potential solution flows along the bedrock interface from an unlined pond.

Morenci Mine Silver Basin Reservoir Seepage Abatement – EMC^2 staff conducted a field investigation program to abate ten-acre-feet-per-day seep losses from a 150 acre reservoir that served as a primary water supply for mining operations. Field investigations undertaken to supplement reservoir data gathered from researching mine archives included: geophysical surveys of the reservoir bottom; piezometer installations to monitor suspected fault locations; and underwater video surveillance of the reservoir bottom to locate high seep zones. Alternative conceptual construction plans to reduce seepage were developed along with associated costs.

Tohono Mine Corporation Agglomeration Plant Containment Structure – EMC^2 staff designed a Turfchem® overlay to refurbish and protect an existing concrete containment pad from further acid degradation. A new reinforced concrete truck loading pad was also designed with the overlay to support 50 ton haul trucks and withstand acid degradation. Construction plans, specifications and scheduling were developed to: phase utilities relocation and site regrading prior to construction; phase construction to minimize impacts to ongoing plant operations; and facilitate future plant maintenance operations by designing an acid resistant sump and clean-out pump and piping for removal of solid/liquid materials washed off the pads during maintenance.



CONTAINMENT PAD DETAIL
(TYPICAL – NOT TO SCALE)

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