

# Elko Roundtable 2018; Water in mining

by Rick Frechette and Greg Nelson

The 2018 Elko Roundtable was held at the Red Lion in Elko, NV on March 15, 2018. The gracious host was once again Knight Piésold. Attendance was robust with representatives from more than 14 mining properties across Nevada representing nine corporations. Total attendance was at its highest in almost a decade. A high level of interest was also gauged by the number of companies with multiple attendees.

The topic of water in mining was clearly a factor in creating the large show of interest. In terms of industry trends that are tracked annually, this topic had been absent from the list for more than 10 years (Deloitte, 2018) but was squarely planted there this year. And deservedly so. Three attending companies are signatories of the International Council on Mining and Metals (ICMM) which espouses a firm stance on water stewardship (ICMM, 2017).

### How's the water?

It is reported that water scarcity affects more than 40 percent of the world's population (Deloitte, 2018). Consumption of water in the United States, based on the last detailed census, entails only 1.5 percent usage by the mining industry. The largest users are reportedly thermoelectric power and irrigation, combining for more than 75 percent of the U.S. consumption. During the prior census period, water usage at mines was up dramatically (USGS, 2014).

Mine water source usage is primarily a mix of ground water and saline or fresh surface water resources. Over the previous period, saline sources experienced the greatest percentage in growth as a mine water source, nearly doubling in use. Nevada ranks second as a state nationally in mine water consumption. California is the leader, and Nevada is immediately followed by Utah and Alaska (USGS, 2014).

Water rights in Nevada and the ongoing litigation at the state level, particularly over the Humboldt River basin, have elevated the concern over the supply of water and have raised the interest regarding the topic of water across the mining industry as well as within other industries.

The Elko Roundtable meeting began with a safety share and introductions, and included each attendee mentioned a water problem or solution that he or she would like to discuss during the day. An interesting list of subtopics was developed from this round robin and yielded

the following most common themes:

- Mine pit dewatering during operation and pit wall stability.
- Draindown from tailings dams and heap leach pads and dealing with this at closure.
- Post closure pit lakes, pit lake water quality and associated water rights.

### It's the pits

Representatives from several well-known Nevada mines shared their pit dewatering practices and challenges. A presentation was given on a horizontal drain program that was used to help stabilize a locally failed pit wall. The drain placement was targeted to structural features, and, once implemented, yielded immediate and measurable positive results in arresting wall movements. Highlighted in this discussion was the dynamic way mine geologists worked with hydrogeologists in siting and targeting the horizontal drains.

Common difficulties associated with pit dewatering were mentioned, including how water quality can vary dramatically from location to location within the same pit, and the end use or disposition for this water can vary accordingly. In some cases (water quality allowing), dewatering water becomes a source for municipal supply. This can bring complications or certainly increase sensitivities regarding the management of this water. It was also mentioned that difficulties often exist in how to actually target the areas that require dewatering. Complex geology or unclear structural boundaries often contribute to this difficulty.

At a number of the mines, dewatering water is recharged back into the river basin via rapid infiltration basins (RIBs). RIBs were highlighted over injection wells due to their better operational efficiencies. In some cases, a pre-treatment step is needed before discharge to the RIBs to meet water quality standards. This good stewardship practice helps minimize impacts to the river basin.

### Modeling isn't always pretty

Some discussion was held on ground water modeling in relation to mine pit planning and development. It was acknowledged that the benefit of long time durations for pit development and associated water-level monitoring allowed the best opportunity to assess, validate



and update the original ground water modeling. In the absence of this reality check, there is little means to evaluate the accuracy and therefore the value of the modeling. It is understood that modeling, in its various forms, helps inform the decision-making process of mine planning and also facilitates the permitting process.

### What is your source?

Sourcing water for mineral processing can be a complicated or even contentious situation. While in some cases mine dewatering water can satisfy processing needs, at other times this is not the case. Water rights issues are increasingly casting concern over sourcing supply for mining and mineral processing needs. Some mines obtain their water from adjacent or nearby municipalities and coexist symbiotically. In other cases, existing water rights are being challenged, and one particular case was cited where access to the water was being rescinded due to historical preservation priorities concerning the access route.

Naturally, not all water sources are suitable for use in processing. This relates primarily to chemistry of the water and tolerance of the

process flowsheet or process equipment. In such situations, pretreatment may be required or else an alternate source identified. In one cited case, the location of a ground water well was found to encounter high carbonate water that was unsuitable for use in processing. A new well in a different location was able to encounter suitable water, and this well, therefore, replaced the existing well.

### You're going down

Draindown for purposes of this discussion is a passive flow source emanating from a tailings dam or a heap-leach pad associated with the timeframe when that facility is no longer being actively operated, meaning new source flows have stopped being added. In the case of the tailings dam, production has ceased, and no new tailings are being deposited. In the case of the heap leach pad, active leaching has terminated.

A great deal of interest in this topic was expressed from many of the attendees. A round robin ensued listing various facilities at the sites that were represented in the meeting that would be subject to draindown management for closure. Several tailings dams were listed as were

**Water in mining was the topic of discussion at the Elko Roundtable 2018.**

several heap leach facilities. Tailings dams were described especially in relation to whether they were lined or not and how the lining system was configured. Lining systems play a significant role in whether or not draindown requires management and can strongly influence how much draindown flow will occur and over what duration.

Water quality is a key aspect of concern with draindown. Of particular interest is what to do with draindown flow during the initial stages of high draindown (e.g. flow is greater than what an evaporation cell can handle).

## Phone home

Evaporation and evapotranspiration cells, more commonly referred to as E cells and ET cells, respectively, were part of a lively discussion concerning how to manage or dispose of draindown. It has become more commonly understood that ET cells are less desirable in that the water consumption relies, in part, on plant transpiration which introduces a more transient element to the equation. If plants die off, that consumption element disappears. Additionally, reliance on plants introduces an ecological component that must also be evaluated and can present a toxicity risk that requires assessment and possibly management. The regulators have generally expressed a lack of interest in approving ET cells versus E cells. The potential promulgation of regulatory guidance on management and closure of E cells, akin to that recently promulgated for bioreactors, bears watching.

A trend is developing regarding the installation of test E cells or pilot scale versions of E cells. These are useful either to provide proven evaporation factors for E cells at a given site to employ in closure plan designs in advance of closure, or else slightly later in the process to validate factors already put forth in closure plans. In the latter case, adjustments to the evaporation factor, if deemed necessary would be employed to optimize the design during or in preparation for closure construction. A number of mines have installed test E cells or are in the process of doing so. A side benefit to this is the education it brings regarding the construction process and most especially with respect to the sourcing of suitable pond backfill material and the manner of carefully placing it to prevent pond-liner damage.

## Lake front property?

Pit lakes are getting more attention than ever before. As mining goes deeper, more and more openpits are penetrating the water table and will, therefore, eventually become pit lakes.

Coupled with the water rights issue previously described, this makes for a much more interesting set of concerns as mines begin to plan for closure with a pit lake. Some of the very interesting subtopics that arose in discussion revolving around pit lakes included:

- How does one best model the development of a pit lake? And how reliable are results?
- How exactly will water rights be applied in relation to a pit lake? How to accurately predict consumption (as evaporation) and how do you measure it for validation? Is the source to the water right reckoned as the ground water inflow, or the rainfall and runoff inflow, or both?
- How do all of these uncertainties impact the commonly rejected uneconomic option of backfilling to eliminate an open-pit lake?
- How does one balance the legal obligations associated with providing access to pit lakes with the risk and likely liability associated with long-term pit wall stability issues and other inherent health hazards?

Project specific pit lake experiences were discussed to edify the group. A case was described in which a mine that was closed many years ago was still retaining its mine permit primarily due to the fact that the pit lake model was significantly in discrepant with the actual situation. The cause for this is unclear but seems to be related to activity at a neighboring underground mine. Another mine, which is currently still operating, recently applied for a water right on its eventual pit lake using the recently promulgated regulatory guidance. The application was based on the predicted ultimate size (area) of the mine pit. It is not confirmed, but this may represent the first water rights application of its kind in Nevada. Given the nature of the application, it could be considered “ground breaking” stuff.

## Adios for now

The event closed with its usual social reception and casual visiting opportunity. Participants expressed gratitude for the opportunity to get together as an industry and appreciation of the topic and content of this particular event. It was mentioned that this ongoing event was really a unique opportunity within this region to share experiences and build on the individual’s knowledge base. Until next time, Elko you rock. ■