

# FACT SHEET: Hydraulic Control

## **Controlling and predicting groundwater flow**

Water movement in an aquifer is consistent and predictable. It moves naturally from areas of recharge to areas of withdrawal. Once a well of any kind taps into an aquifer, the gradient and flow of groundwater can be easily altered by either pumping water into or out of the well. Pumping water in (recharge) causes mounding; the water table rises and water moves away from the point of recharge. Conversely, pumping water out (withdrawal) creates a cone of depression; the water table slopes down, most steeply nearest the well and more shallowly furthest from the well, forming an inverted “cone of depression” with water moving into the low point of the cone.

## **Global standard**

Hydraulic control is a common method used throughout the world to control groundwater movement. It is the preferred approach among many regulatory agencies and municipalities for environmental remediation work or managing the quality and availability of water supplies. It also is frequently used as a preferred technique for de-watering construction sites, managing agricultural operations, and maintaining residential water supplies. For example, a regional recharge project along the California coast uses hydraulic control to create a barrier that keeps saltwater from intruding on drinking water aquifers. Hydraulic control at the Gunnison Copper Project will involve pumping water in or out to proactively influence groundwater gradients and prevent solutions from mixing with nearby groundwater systems.

## **Protecting groundwater**

Hydraulic control has been proven to consistently and effectively safeguard the integrity of local groundwater. In many cases it is used to prevent contaminated groundwater from moving off a particular site into nearby groundwater. As part of the in-situ mining process used to extract minerals, such as copper, and prevent mining solution from migrating off the mine site, an in-situ well field consists of a series of recharge and withdrawal wells. For copper mining, a mildly acidic solution is delivered to the deposit under gravity pressure. The acid dissolves the mineral, creating a solution that is then pumped to surface through the recovery wells for processing. Because the volume of fluid withdrawn from the well field is slightly higher than the volume of solutions delivered to the ore body, hydraulic control is constantly maintained from the creation of an inward flow of water that keeps the acidic and mineral-bearing solutions within the well field. This balance between delivery and recovery rates ensures hydraulic control and allows for the capture of all mining solutions. Observation wells located just outside the mining area constantly monitor the effectiveness of the hydraulic control. The same method is used during reclamation of an in-situ operation to rinse the well field with clean water and remove any residual solutions.

## **About Gunnison Copper Project**

Millions of years of geological events have created a unique set of conditions at the Gunnison Copper Project, namely: acid-soluble copper minerals situated below the water table, naturally highly fractured host rock, and most of the copper located on the fracture surfaces. These conditions are ideal for an in-situ copper recovery operation. In-situ recovery will allow for the copper to be extracted with minimal

disturbance to the surface rock. Hydraulic control wells will ensure Gunnison Copper is able to capture all of the copper-rich solution, restrict any acid from escaping beyond the mine area, and prevent the water table from dropping. Gunnison Copper must demonstrate the effectiveness of hydraulic control to state and federal regulators before the project can be permitted.

For more information about Gunnison Copper visit [www.GunnisonCopper.com](http://www.GunnisonCopper.com) or call our toll-free number: 1-844-206-3714.

## **Disclaimers**

*Special Note Regarding Forward-Looking Information:* This presentation contains "forward-looking information" concerning anticipated developments and events that may occur in the future. Forward looking information contained in this presentation includes, but is not limited to, statements with respect to: (i) that the Gunnison Project is ideal for an in-situ copper recovery operation; and (ii) how hydraulic controls will work at the Gunnison Project. Please refer to <http://www.gunnisoncopper.com/index.php/about/disclaimer> for additional information regarding "forward-looking information."

*Additional Information:* Further information about the Gunnison Project can be found in the technical report filed on SEDAR at [www.sedar.com](http://www.sedar.com) entitled: "Gunnison Copper Project, NI 43-101 Technical Report, Prefeasibility Study" dated February 14, 2014.

*Qualified Person:* Excelsior's exploration work on the Gunnison Project is supervised by Stephen Twyerould, Fellow of AUSIMM, President and CEO of Excelsior and a Qualified Person as defined by National Instrument 43-101. Mr. Twyerould has reviewed and approved the technical information contained in this presentation.