

# Field Trips

## Henderson Mine

**Date:** Thursday, February 26, 2009  
**Time:** 6:30 AM – 2:30 PM  
**Departs:** Hyatt Regency at Colorado Convention Center  
**Cost:** \$85  
**Includes:** Transportation, Tour, and Lunch

**Please Note:** Dress for a winter mountain climate that is normally 15°F to 20°F degrees cooler than that of downtown Denver. Comfortable walking shoes/boots, winter gloves, parka and hats are recommended. Henderson will provide hard hats



Climax Molybdenum Co., a subsidiary of Freeport McMoRan, is the world's largest primary molybdenum producer. Climax Molybdenum Co.'s Henderson Operations are located approximately 50 miles west of Denver, CO. It is Freeport McMoRan's only active underground mine.

The Henderson Operation, commissioned in 1976, operates half a mile under the Continental Divide. Henderson currently mines 30,000 tons/day of ore in one of the world's largest block cave operations. The tour will begin with an overview of the mining operation and a safety orientation. Participants will then take the cage from the surface at 10,200 feet in elevation to the 7,500 level elevation of the mine. The steps involved in pannel development will be seen including the development and initial blasting of the cave drawpoints. A variety of drills are used for blastholes. Active drawpoints will then be seen and ventilation will be discussed. Participants will see the geometry used in pulling the ore with CAT Elphenstone 1,700 LHD's.

From the dump chutes ore is transferred to the underground gyratory primary crusher using Supra 80 ton rigid frame five-axle trucks. These unique units have two driven axles and four steering axles. Crushed ore is transported to the mill by three series conveyors that constitute one of the longest conveyor trains in the world.

PC1 is 1.6 km in length from the ore storage pocket to a point near the old haulage level of the mine. PC2 is 16.8 km in length and is reported to be one of the longest single flight conveyor in the world. Approximately 14 km of this flight is underground in the existing railroad tunnel. PC3 is 6.4 km in length and negotiates several vertical and horizontal curves in route to the mill stockpile.

The conveyor design incorporated many interesting features including custom designed idlers and special optimized belt rubber compounding that resulted in 30% less power draw than was originally designed. Other design features include variable frequency drives that allow matching of conveyor speed with tonnage, belt turnovers to mitigate carry back and winch-assisted counterweight take-up systems which automatically lock during emergency stops. Participants will see part of the underground conveyor system, then will head back to the surface. The mill is 15 miles from the mine on the opposite side of the continental divide. The mill will not be included in the tour. After the tour, a box lunch will be provided, and all questions will be answered by Henderson personnel.

## Wellington-Oro (French Gulch) and Argo Tunnel (Clear Creek) Treatment Plants

**Date:** Thursday, February 26, 2009  
**Time:** 8:00 AM – 6:00 PM  
**Departs:** Hyatt Regency at Colorado Convention Center  
**Cost:** \$95  
**Includes:** Transportation, Tour, and Lunch

**Please Note:** Time will also be available to visit the Argo Museum. All safety equipment will be provided, but dress warmly for the potentially cold weather. Comfortable walking shoes/boots, winter gloves, parka and hats are recommended.

The French Gulch site, which includes the former Wellington-Oro Mine, is located approximately 2.2 miles upstream or east of the confluence of French Creek with the Blue River near Breckenridge, Colorado. Extensive underground mining occurred in the valley from the late 1850s to the 1960s. Lode mining recovered lead-zinc-silver sulfide and gold ores from an extensive network of tunnels and adits originating on the steep valley sides. The acid mine drainage from the Wellington-Oro contributes significant levels of cadmium and zinc to the waters of French Gulch and, in turn, the Blue River, impairing the aquatic ecosystem downstream. The goal of the treatment is to clean the water to where the Blue can support a self-sustaining brown trout fishery below its confluence with French Gulch. The construction of an innovative selective cadmium and zinc sulfide precipitation system (BioteQ) was funded by the Town of Breckenridge and Summit County in early 2008 with operation commencing in the latter half of 2008.

Clear Creek is a 400-square mile watershed that extends from the Continental Divide east to Denver. Historic gold mining in the Clear Creek basin contaminated the watershed with acid mine drainage and metals such as zinc and cadmium. EPA placed the Central City/Clear Creek site on the National Priorities List in 1983. Acid water draining from the Argo and Big 5 Tunnels were significant environmental problems on the South Fork of Clear Creek, and discharge from the National Tunnel and the Gregory Incline severely impact the North Fork. The Argo treatment plant began operating in April 1998 to treat the effluent from the Argo tunnel, the Big 5 tunnel, and ground water from Virginia Canyon that is captured and piped to the plant. Local, state, and federal agencies, industry and concerned citizens are working together to improve water quality in the watershed.

Different approaches on treatment of mining influenced water are used at Wellington-Oro in Breckenridge, CO and at the Argo Tunnel in Idaho Springs, CO. Selective sulfide precipitation is used for zinc precipitation at the Wellington-Oro Treatment plant. The sludge is of sufficient quality to be accepted at a conventional zinc smelting facility. In contrast, the Argo Tunnel Treatment plant uses a conventional high-density lime process. The process removes all the metals but produces a significantly higher sludge volume low value for zinc recovery. The review of the two treatment plants presents the opportunity to examine the tradeoffs in cost and water quality improvement of the two different approaches.

This full-day tour will start in Breckenridge at the Wellington-Oro (French Gulch) water treatment. The group will be provided with the mining and reclamation history of the area on the bus ride up followed by a tour the facility. A box lunch will be provided at the Idaho Springs Visitor Center, participants will have time to tour the historical exhibits on display there. After lunch, the tour will visit the Argo Treatment Plant where the group will tour the facility and see the Argo Tunnel discharge.

**Without exception, NO PRIVATE VEHICLES ARE PERMITTED. All participants must sign an Assumption of Risk Agreement prior to departure. To register for a field trip, fill out the Advance Registration Form in this mailer. All trips depart from the Hyatt Regency at Colorado Convention Center.**