

## Geotechnical monitoring at the Bingham Canyon Mine



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*Above:  
GroundProbe  
geotechnical  
monitoring  
equipment at  
Bingham Canyon  
Mine*

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**Kennecott Utah Copper's Bingham Canyon Mine experienced a slide of its northeast wall on the evening of April 10, 2013. This fact sheet provides an overview of our monitoring systems that help our highly trained geotechnical experts detect, monitor and plan for pit wall movement.**

Pit wall movement is infrequent but something we monitor and plan for on an ongoing basis through sophisticated geotechnical equipment. Proactive monitoring allowed us to take preemptive measures to keep employees safe before, during and after the April 10 slide.

Our monitoring systems includes the trained eyes of more than 800 employees, regular documented inspections of all areas of mining activity by geotechnical engineers, and state-of-the-art equipment.

Proactive monitoring allowed us to take preemptive measures to keep employees safe before, during and after the April 10 slide.



*Above: Slope monitoring with Kennecott's IBIS radar system*

**Kennecott uses real-time data to anticipate slope movement. Our systems are capable of simultaneously monitoring and analyzing thousands of data points to capture movement trends.**

Kennecott used geotechnical monitoring data for short-term and long-term mine planning and to maintain a safe and efficient operation before and after the slide. Our systems are capable of monitoring and analyzing thousands of data points to capture slope movement trends. Mine employees were also trained to competently identify slope stability hazards in their areas of work.

#### **GroundProbe slope stability radars**

GroundProbe radars play a crucial role in slope stability monitoring in open pits. They have been developed to remotely monitor highwall activity. The slope stability radar depends on advanced survey technology and detects movement by comparing successive slope scans. The advanced analysis tool allows detection of both short and long term slope movement. The radars can be programmed with specific alarm settings. If the alarm is triggered, mine personnel are notified of the movement, and rapid evaluation of the surface deformation can take place

GroundProbe radar's accuracy level is up to 1/10th of an inch with a range of 10,000 feet. The radars are very durable and capable of monitoring mine pit slopes in adverse weather conditions and during low visibility (white out conditions or cloud movement). Kennecott uses three GroundProbe radars.

*Right: One of Kennecott's four robotic total stations*

#### **IBIS radar system**

Similar to GroundProbe radar, IBIS radar system also incorporate advanced survey technology to monitor slope movement in open pit mines. The radar scans a portion of an open pit in four to ten minutes. IBIS reports the accuracy level of its radars to be 1/100th of an inch within a range of up to 10,000 feet.

IBIS radars are also equipped with alarming capabilities which notify mine personnel of detected slope movement. IBIS radars also excel at monitoring during inclement weather conditions.

#### **Extensometers**

A wire spans a tension crack to measure displacement across an area of suspected ground movement. The device transmits data automatically and is capable of sending alarms.

#### **Additional equipment**

Kennecott's monitoring system also includes:

- Prism network (220+) being monitored by four robotic total stations
- Time Domain Reflectometry
- Microseismic systems
- GIS (geographic information system) data display
- Piezometers

