Colorado Division of Reclamation, Mining and Safety

Upper Cement Creek Earth Vision Three Dimensional Model OSM TIPS SUCCESS STORY

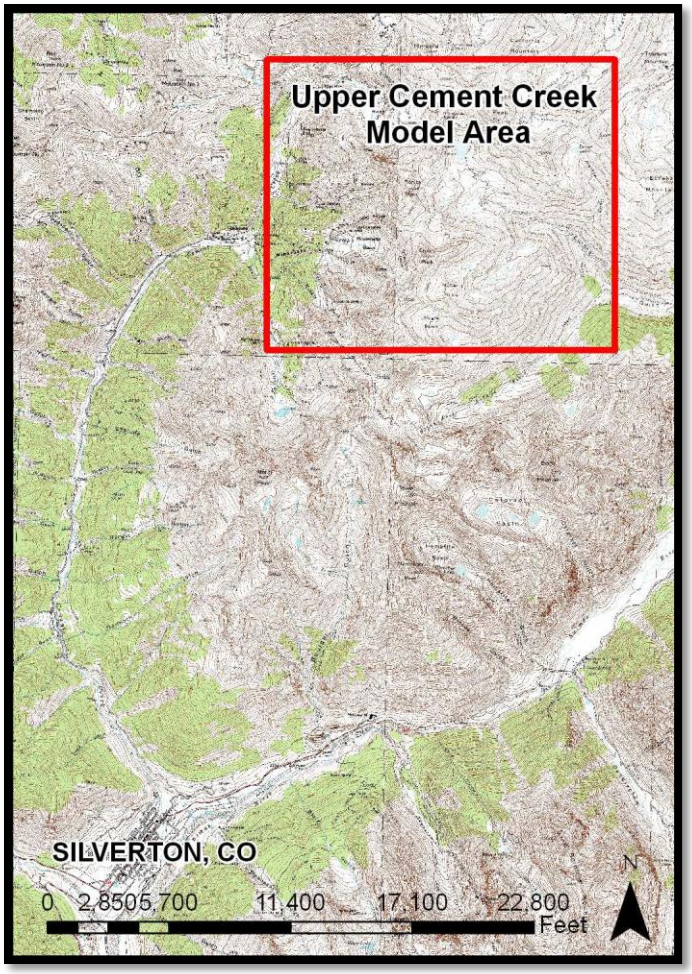
Colorado Division of Reclamation Mining and Safety (CDRMS) and the Office of Surface Mining (OSM) - Earth Vision Software to Model Acid Mine Drainage Issues in Upper Cement Creek, Colorado.

Problem:

Upper Cement Creek was a hardrock gold and silver mining area from the 1870's through 1991. Water Quality in Upper Cement Creek began declining in 2003 when active water treatment ceased and the local groundwater table rose due to installation of bulkheads during decommissioning of the Sunnyside Mine. The rising groundwater table re-entered older mine workings, dramatically increasing acid mine drainage from the historic and abandoned Red and Bonita, Mogul, and Gold King mines.

The complex nature of the Upper Cement Creek mine workings, geologic structure, and the twelve bulkheads located within the workings made the acid mine drainage sources difficult to visualize. So, in 2010 The Bureau of Land Management (BLM) and the Animas River Stakeholders Group (ARSG) consulted with CDRMS to develop a three dimensional model of the Upper Cement Creek mine workings, geology, and groundwater.

The historic and abandoned Red and Bonita Mine drainage increased from 0 gallons per minute to 300 gallons per minute after the groundwater table rose 1,000 feet due to installation of 12 bulkheads during closure of the nearby Sunnyside Mine.



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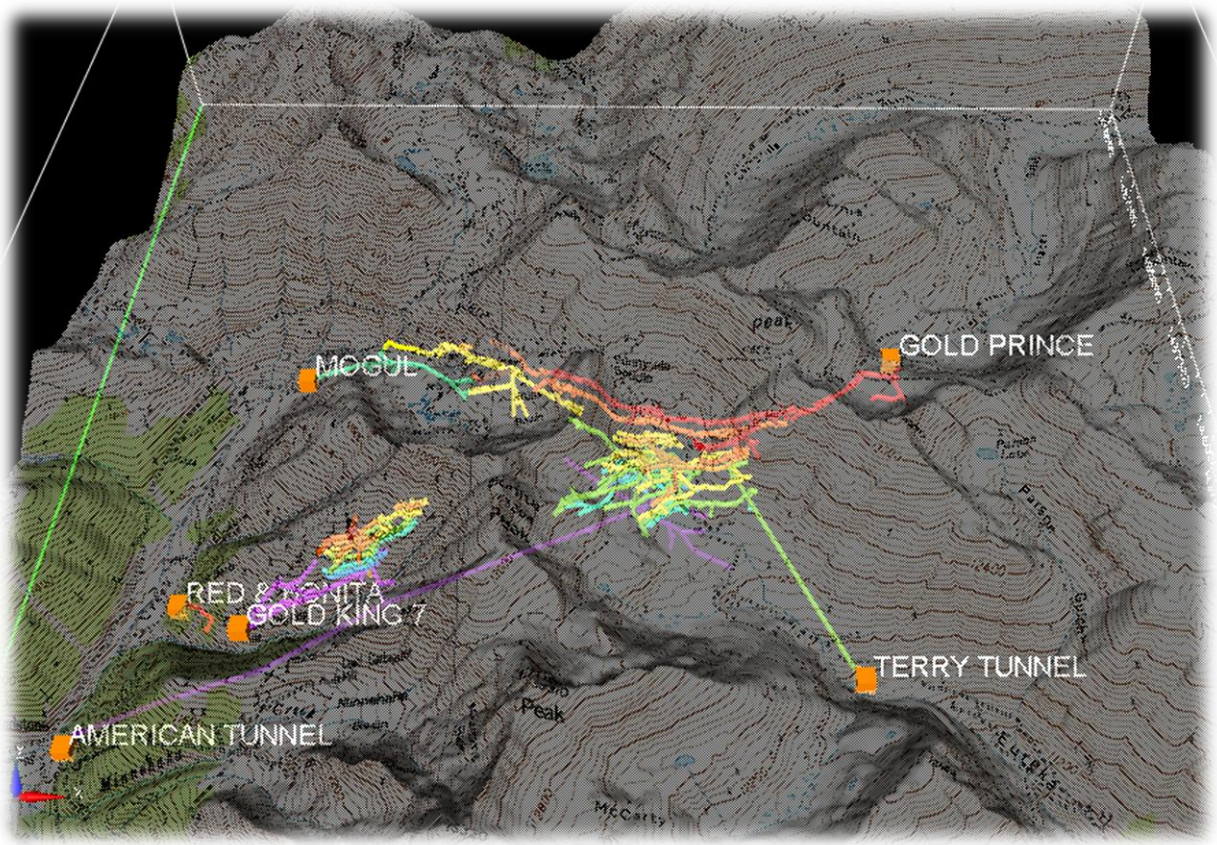
OSM TIPS Software and Technical Support Solution:

In 2010 CDRMS requested a software recommendation for modeling the mine workings in Upper Cement Creek and OSM TIPS staff recommended Earth Vision software. OSM TIPS assisted CDRMS in building an initial model by setting up the coordinate system parameters, georeferencing mine map coordinate systems, and entering the Sunnyside, Gold King, and Mogul mine workings with available mine maps from the National Mine Map Repository and maps collected by BLM and CDRMS.

CDRMS requested on-site training in Earth Vision software and staff from TIPS came to Colorado in February 2012 and taught the Earth Vision TIPS Course to four CDRMS staff and two Colorado OSM staff. CDRMS took the Earth Vision knowledge from the class and added mine workings, created past and current groundwater surfaces with known groundwater elevation points and superimposed geologic structures onto the surface of the model.



Mine workings, digital elevation model, and transparent topography as viewed in Earth Vision.

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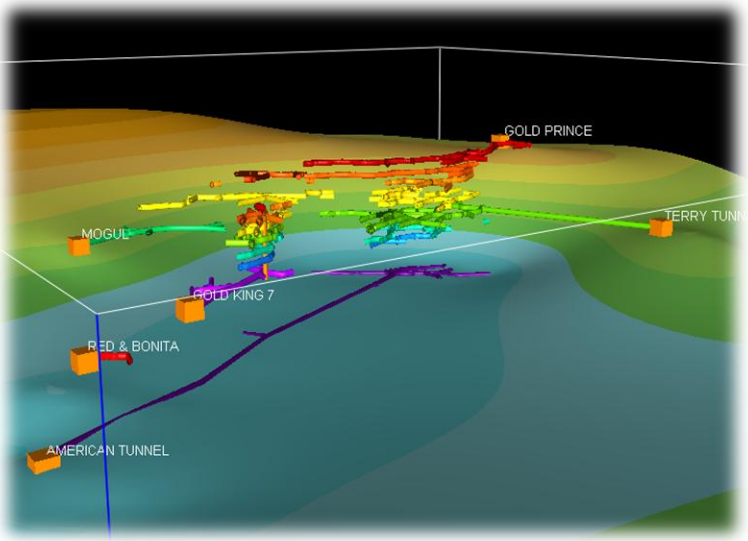
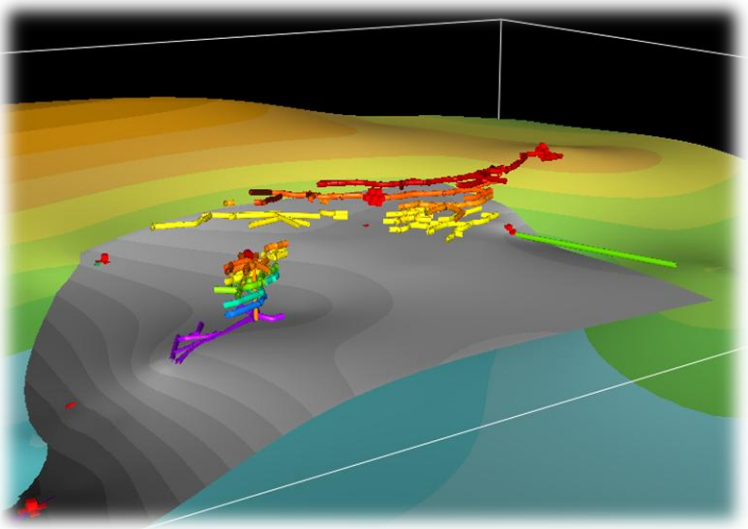
BLM and CDRMS are utilizing the three dimensional model to inform and educate the public and government agencies about the acid mine drainage issues in Upper Cement Creek. The model has been presented to the BLM Colorado State Director, Environmental Protection Agency, United States Geological Survey, San Juan County Commissioners, the Town of Silverton, the Animas River Stakeholders Group, and at two conferences. The model has received many compliments and individuals are astounded at the technology that OSM TIPS and CDRMS are demonstrating with Earth Vision. People are able to understand the source of the acid mine drainage issues and the interconnections between mines and geologic structures. The model is also shaping how the BLM, EPA, and ARSG are approaching reclamation alternatives.



Mine workings and pre-bulkheads hypothetical groundwater surface

The future of the model is to add three dimensional geologic structures, lithology, and bedrock alteration. The ultimate goal is to utilize the model as a reclamation planning tool that can help determine the most effective remediation strategy for the acid mine drainage. The model will be used to simulate different reclamation strategies including removing bulkheads, adding bulkheads, draining mine workings, treating mine pools, and installing underground source controls.



Mine workings, bulkheads, and pre and post-bulkheads hypothetical groundwater surfaces, showing an elevation difference of 1,000 feet.

CDRMS is grateful to OSM TIPS for supplying the technical knowledge of the Earth Vision software. With the support of OSM TIPS, CDRMS can continue to be a leader in mine reclamation technology in Colorado.