

Meeting Summary
Bonita Peak Mining District Community Advisory Group
April 21, 2026, 5:35 - 7:35 pm
Via Computer Conferencing and In Person
at Fort Lewis College Noble Hall
Durango, CO

CAG Members attending: Chara Ragland, Parker Newby, Jason Fast, Susan Livenick, Chris Hill, Helen Mary Johnson, Charlie Smith and David Palmer. Online: Ty Churchwell and Ken Balleweg.

Also in attendance: Kirstin Brown (DRMS), Todd Wang (BLM), Dr. Nate Klema (FLC), Tor Holm (FLC), Mike Boeckman, Mark Pearson, Jeff Schill, Norm Fish, James Livenick and Baylor Gorosk. Online: Rob Runkel (USGS), Mike McKeon (USACE), Jeff Johnson (BLM), Venissa Ledesma (CDPHE), Andrea Kincaid (CDPHE), Lori Nemeth (NMED), David Jamison (NMED), Wyatt Bair (Sen. Bennett's Office), Terry Morris, Tom Schillaci, Jennifer Bennett, Ryan Bennett, David Heinze, Rachel Burmeister, Kaitlin Kukula, Stacey Mulka and Amy Huff.

EPA attendees: Joy Jenkins, Jessica Duggan and Will Folland. Online: Ashlin Brooks, James Hou, Vince Bacalan and Athena Jones.

Introductions and Announcements

Introductions were made around the meeting room and some of the online participants were identified.

Chara announced that the Rocky Mountain Mining and Reclamation Conference (RMMRC) will be held at FLC on August 30 – September 2, 2026. Registration opened on April 10.

Chara announced an 8-hour HAZWOPER refresher course is also scheduled for May 19, 2026 at the Kendall Mountain Community Center in Silverton.

Chara announced that Charlie Smith was appointed the new San Juan County liaison to BPMD.

Joy Jenkins (EPA) announced that Athena Jones is transferring to a new department within EPA.

Presentations

Kirstin Brown introduced Tor Holm and Dr. Nate Klema from Fort Lewis College (FLC). **Tor** presented his work titled, ***Digitally Mapping the Bonita Peak Mining District in Three Dimensions***, which is part of his degree thesis at FLC.

Tor began by introducing two key topics of his presentation:

- 1) *Digitizing San Juan Historical Society (SJHS) archived historical maps allows for modern interpretation of fluid connections*
- 2) *Opportunities for future research made possible by modern mapping techniques*

As background information, Tor discussed the Gold King Mine release in August 2015 of approximately 3 million gallons of acid mine drainage (AMD) to the Animas River watershed. That resulted in EPA establishing the BPMD, installation and operation of the Gladstone IWTP, and ongoing management of bulkheads in several mines (American Tunnel, Mogul, Terry Tunnel, Gold King, etc.).

He then presented his thesis problem statement:

To best manage AMD drainage in the BPMD, the internal workings and connections of the mines, and their geologic context must be understood.

Tor reported that 6,392 historical mine maps have been catalogued by the San Juan Historical Society. Of those, 3,530 are maps of the Sunnyside, Mogul, Gold King, Red and Bonita, and Gold Prince mines. To prepare maps in three dimensions, he first identified features on the surface that are found on the historical maps. Those features were then matched to real-world locations by georeferencing. He used GIS software to create a polygon of each mine level. He used real world elevations and estimates of tunnel height to convert 2D polygons to 3D layers for the Sunnyside Mine, Mogul Mine, Gold King Mine, Gold Prince Mine and Red and Bonita Mine. The resulting 3D model of all five mines as well as individual models for each mine were displayed in an animated sequence that rotated the mine workings to allow viewing from all angles.

He then presented details for each mine that affect water drainage within Bonita Peak:

Mogul Mine - the Brennaman shaft connects the Mogul Mine to the Sunnyside Mine at three levels. Bulkheads installed in the 1990s at B level and F level direct water flow away from the Sunnyside Mine toward the Mogul Mine.

Gold Prince Mine – this mine is connected to the upper Sunnyside Mine. Bulkheads in this mine direct flow into the Sunnyside Mine pool.

Sunnyside Mine – bulkheads in this mine direct water to the center of the complex and to the Washington vertical shaft that takes water down to the American Tunnel. He noted that water from the bulkheaded Terry Tunnel portal is chemically different from the rest of the Sunnyside pool. The pool was saturated at a level just above the Terry Tunnel in the 1990s, and the tunnels above are not filled with water at this time.

Gold King Mine – this mine does not appear to be connected to any other mine, and not to the American Tunnel. Mapping shows a 370 foot minimum distance between the Gold King Mine and workings at the Sunnyside F level. Gold King and Sunnyside may be connected by fractures, joints and faults that have been mapped in the mines.

Red and Bonita Mine – No connection was identified between the Red and Bonita Mine, the Gold King Mine and the American Tunnel. He estimated a 1,023 foot horizontal distance and a 454 foot vertical distance between workings.

Tor halted his presentation while several comments and related discussions took place.

Joy (EPA) and **Kirstin** (DRMC) commented that they had several recent water levels to share at Sunnyside F level and at Gold King.

Tom (online) mentioned that Sunnyside may have drained a bit when the Gold King release occurred.

Helen Mary asked if there is a geologic connection between Sunnyside and Gold King.

Kirstin commented that there was a 200 foot head difference in 2015.

Joy indicated the potential for fault connections because the Bonita fault has 75° dip and there are lots of fractures at 61°, plus recorded vein structures.

Tor mentioned the Red and Bonita Mine has one bulkhead and there is no connection shown via the workings to other mines.

Joy reported that water is currently measured at 180 feet above the floor and it is plateauing. Fractures are likely the only cause of the increase after closure of the bulkhead. She mentioned that the Gold King zinc load is 157 pounds/day, and zinc is most polluting up to a pH of 9. The Red and Bonita zinc load is 60 pounds/day.

Tor resumed his presentation with a discussion of possible errors in the data mapping, and followed with a list of future work related to the 3D mapping.

Using the current georeferencing process, error near the surface can be limited to within a few meters. Vertical and lateral error scales with interior distance from surface features are increased in this current model, and could be +/- 20 feet off.

Suggestions for future work included:

- 1) Correcting errors using various alternative mapping methods for better resolution.
- 2) Geologic fault mapping in 2D and 3D.
- 3) Geologic structural analysis of fractures and joints
- 4) Evaluating historical data on chemical and rock composition
- 5) Groundwater analysis
- 6) Geologic history – use detailed geophysical reports available in SJHS archives
- 7) Engineering – bulkhead systems, tracer studies, 3D models for fluid analysis
- 8) Guidance for planning further reclamation

Comments and Questions:

Susan mentioned that engineering would be needed to understand the bulkheads.

Tor said the pressure gauges would be useful for future work; use tracer studies to help mitigate leak points.

Chara asked what would be his next move.

Tor plans on working with Kirstin to continue the study, prepare a paper on the study, and work with Dr. Klema to get it in the public forum.

Dr. Klema suggested it is an opportunity for further work. He gave a pitch for more student studies.

Susan asked for more details on how he conducted the project.

Tor described how he digitized the maps from 2D to 3D, then added elevations to connect tracings and polygons. He identified and connected reference points, then did much troubleshooting to make sure it all made sense. There were differences between 1970s and 1980s maps that had to be reconciled.

Parker asked if he used any historical surveying field notes.

Tor said data were available from notes on maps and documents that helped his work.

Chara introduced Will Folland (EPA Toxicologist) who gave a presentation on ***Bioavailability of Lead***.

Bioavailability is a fundamental concept in toxicology. It follows a four-part acronym: ADME – Absorption, Distribution, Metabolism and Excretion

Absorption is a measure of the fraction absorbed versus the total amount of lead ingested. Lead that is not bioavailable cannot be absorbed; thus, there is no exposure without absorption. The physical and chemical properties of lead affect its bioavailability. It is dependent on particle size, mineralogy and binding affinity, and it must be separate from a bound molecule to be absorbed.

EPA uses an in-vitro bioaccessibility assay (IVBA) method to assess risk. The method measures soluble lead available for absorption; that fraction is then used to estimate bioavailability. Example results:

Low Bioavailability – anglesite (PbSO_4), Galena (PbS), Pb and Fe oxides, Fe sulfate.

Medium Bioavailability – Pb phosphate, Pb oxide

High Bioavailability – Cerrusite (PbCO_3), Mn oxide

EPA then uses uptake models to assess blood levels of lead:

Integrated Exposure and Uptake Biokinetic Model (IEUBK) for children <7 years

Adult Lead Model (ALM) for women of childbearing age

All Ages Lead Model (AALM) for any age, for both acute and chronic exposures

The default bioavailability assumption is 60%.

BPMD-specific bioavailability was accounted for in the 2019 BPMD Human Health Risk Assessment. Samples were sieved to an ingestible fraction (<250 μm).

Results for campsite soil (54%), roadway soil (20%), and waste rock (23%) were below the default assumption. Supplemental bioavailability data collection is ongoing.

Questions followed his presentation.

Ken asked if there is a human health hazard, and he referenced a Telluride study of lead levels in residents' blood related to the Smugglers Mine.

Will knew of the study and disagreed with those results. He stated that a child's blood lead level is hard to predict, and it is more for an overall population. He noted that it is rare to just have one form of lead. It would need a detailed bioavailability study, and use of the models discussed in his report are important now that they are available.

Ken mentioned that a San Juan County study of galena was by X-ray fluorescence (XRF). It is useful for rough site characterization.

Joy commented that XRF is used for confirmation only. Will noted that EPA uses analytical methods, which are more accurate than XRF.

EPA Update

Jessica reported the following EPA updates.

- Work on the repository will start up on May 11 and last into November. The focus will be on moving sludge throughout most of the summer starting in June. About 25,000 cubic yards of sludge need to be moved. They notified the county

looking for a possible bypass to downtown to avoid Memorial Day traffic, which has yet to be determined.

- Other site work is to be determined, and may include site inspections for possible repairs and installing a leachate pond.

A question was asked about dust mitigation.

EPA commented that the trucks will be marked with an **EPA** placard to monitor activity. Someone suggested using magnesium chloride on the road surface to suppress dust.

Administrative Items

Chara announced the next meeting will be in May at Silverton Town Hall, with the date to be determined in an email announcement.

7:35 pm

Adjourn