Animas River Mine Water Spill
Briefing Report
For the Water and Natural Resources Committee
August 31, 2015
NMED’s Interactive Spill Map

https://www.env.nm.gov/riverwatersafety/

Map of the Spill

USGS Stream Gage

Location: SAN JUAN RIVER AT SHIPROCK, NM
Type: surface water
Longitude: -108.689722°
Latitude: 36.781389°

Legend

- Gold King Mine Spill
- EPA Samples
- NMED Water Quality Stations
- USGS Stream Gauges
- Farmington Utility Wells
- Other Utility Wells
- Artificial Path
- Canal/Ditch
- Connector
- Pipeline
- Stream/River
- Underground Conduit
Governor Martinez has:

- Declared an emergency and authorized up to $750,000 in expenditures;
- Ordered NMED to lead the spill investigation; and
- Created a Long Term Impact Team consisting of NMED, NMDOH, NMOSE, NMDA, and NMDGF.
New Mexico's Response

The following New Mexico organizations are working together to protect water quality, public health and the environment.
• Some metal mining areas contain sulfide minerals like pyrite (fool’s gold).

• Sulfide minerals can oxidize and release sulfuric acid and metals into water.

• Undisturbed ore bodies can generate ARD, and mine workings create more potential for ARD.

• ARD can pollute ground and surface water and kill fish.

• Some ARD sites in New Mexico have been abated.
Iron and other metals in ARD can precipitate and cement near-surface sediments into ferricrete. Geologic deposits of ferricrete in Cement Creek demonstrate that ARD has been occurring in this mineralized area long before mining began in the late 19th century.
Hundreds of miles of mine tunnels in the Silverton area provide even greater opportunity for oxidation of sulfide minerals and release of sulfuric acid and metals. ARD has been seeping out of mine workings and into Cement Creek for more than a century.

A number of mills and smelters in the Silverton area also discharged waste into the Animas watershed.

Significant flood/spill events occurred on October 5, 1911, in June 1975 (tailings pond breach and fish kill in the Animas River), and on June 6, 1978 (Lake Emma drained through mine workings and carried contaminants into Cement Creek and the Animas River).
• Bulkheads installed to plug up ARD caused the impoundment of mine water in abandoned workings, and a 1,000 foot rise in the water table.

• Gold King Mine Adit #7 (mine tunnel entry) had collapsed and impounded water inside the mine.

• An EPA work crew digging into Gold King Adit #7 triggered the blowout and spill.
Aug. 5, 2015 – Mine water began spilling into Cement Creek which flows into the Animas River near Silverton, Colorado

Aug. 6, 2015

• NMED was notified of the spill by the Southern Ute Indian Tribe
• NMED advised public water systems to stop taking water from the river, and provided notice of the spill to public sewer systems, the Navajo Nation, Arizona and Utah
• OSE staff advised ditch users to close river diversions
• NMED mobilized field teams and sampling equipment

Aug. 7, 2015

• Secretary Flynn, State Engineer Blaine, and NMED technical staff arrived on site
• NMED began monitoring and water sampling
• NMED issued additional precautions to stakeholders
• Secretary Flynn authorized up to $500,000 in emergency expenditures
• NMED created a dedicated webpage for spill info and data

Aug. 8, 2015

• Contamination plume entered New Mexico

Aug. 10, 2015

• NMED had 25+ staff on site
• Governor Martinez declared an emergency and authorized up to $750,000 in expenditures
Animas River near Aztec, NM (above Estes Arroyo)

Plume Arrives in NM

TURBIDITY (NTU)
# Heavy Metals in Surface Water

## Total (unfiltered) metals in micrograms per liter (µg/L)

<table>
<thead>
<tr>
<th>µg/L</th>
<th>Drinking Water Standard</th>
<th>8/5/15 Cement Creek</th>
<th>8/5/15 Animas in CO</th>
<th>8/7/15 Animas in N.M.</th>
<th>8/8/15 Animas in N.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>10</td>
<td>8,230</td>
<td>1,080</td>
<td>ND</td>
<td>21</td>
</tr>
<tr>
<td>Cadmium</td>
<td>5</td>
<td>165</td>
<td>28</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Lead</td>
<td>15</td>
<td>179,000</td>
<td>25,600</td>
<td>3</td>
<td>350</td>
</tr>
</tbody>
</table>

Plume Arrives in NM
• Surface water samples near the spill area had high concentrations of metals that exceeded standards for groundwater and drinking water

• Anecdotal report from Colorado of a private domestic well near the Animas River that was pumping water similar in color to the spill

• Concern about a weather system and possible flooding in the Animas River and inundation of private domestic wells near the river

• Concern from technical reports and news stories that the nature of the spill might be different from historical spills and long-term seepage
Precautions Issued on Aug. 6

• NMED advised public water systems to stop taking water from the Animas River.

• NMED and OSE advised all other water users to stop taking water from the Animas River.
NMED advised residents to refrain from:

- Using Animas floodplain level wells for cooking or drinking;
- Drawing river or canal water for domestic supply; and
- Watering livestock with river water.

N.M. Department of Game and Fish also advised anglers not to fish in the Animas River and not to eat fish caught in the watershed.
Public Drinking Water Protection

• NMED was in daily contact with system operators to share information and provide consultation and assistance

• Intakes from the Animas River were closed prior to arrival of the plume

• NMED and water systems conducted extensive testing of public drinking water

• Water storage was calculated and water sharing efforts were initiated

• No customers received contaminated drinking water or lost water service

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1 NMED has been granted primacy by EPA to administer the Drinking Water Program (NM Drinking Water Regulations, 20.7.10 NMAC). The Code of Federal Regulations Part 141 National Primary Drinking Water Regulations and Part 143 National Secondary Drinking Water Regulations are adopted by reference.
NMED tested samples from ~580 private domestic wells during a Water Fair from Aug. 10-15, 2015; elevated specific conductance, iron and manganese detected in some wells; test results have been provided to well owners.

NMED and U.S. EPA sampled 144 private domestic wells located within 500 feet of the Animas River for laboratory analysis of metals and general chemistry; test results will be provided to well owners upon completion of analyses.

Test results to date, and a preliminary hydrogeologic assessment, provide no evidence that any private domestic wells have been impacted by the plume.
Irrigation Water Protection

- Not all irrigation ditch systems could be closed prior to arrival of the plume
- All ditches were flushed with river water for 12 hours, without irrigation diversions, to wash mine water sediment back into Animas River
- Drinking water system intakes on the Animas River were not opened until after the irrigation ditches had been flushed
Fish, Livestock and Wildlife Protection

- No evidence of fish kills; caged fish survived immersion in colored river water.
- No evidence of unusual animal mortality.
- Long term monitoring and assessment is needed.
NMED was onsite, and began testing water, before the plume arrived in New Mexico

Public drinking water supplies were protected and monitored

No evidence private domestic wells impacted by spill

Irrigation ditches have been flushed

No evidence of unusual fish, livestock or wildlife mortality

Long term monitoring and assessment of spill impacts is needed
• Heavy metal concentrations in river water were generally much higher in the suspended solids (mud), not in the dissolved phase.

• High contaminant levels near the spill area decreased downstream.

• Discoloration of river water did not necessarily mean that heavy metals were present at concentrations exceeding public health standards.
Locations of EPA Sampling Stations in Colorado

Cement Creek: CC
Animas River: A
Conceptual Model of the Gold King Mine and Release of Metals to Cement Creek and the Animas River, Colorado

**Acid Mine Drainage**

- **A** During mining, pyrite is exposed to oxygen.
- **B** Ground water seeps into the mine.
- **C** Oxygen, water and pyrite react to form sulfuric acid and in turn dissolve metals from the rocks.
- **D** Water drains out of the mine.
- **E** Dissolved metals react with oxygen and fall out of solution into the stream water, turning a bright color.
- **F** Aquatic animals and plants are killed by the drainage.

**Gold and metal sulfides**

**Mine adit (entrance)**

**Cement Creek**

**Confluence of Cement Creek and Animas River**

Source: Western Pennsylvania Conservancy

Steve Thomas/Post-Gazette
The very high abundance of suspended particles containing iron hydroxide give the Animas River a brown color. Contaminants also dissolve in surface water at lower concentrations compared to suspended particles.
Total and Dissolved Concentrations of Arsenic and Lead in Cement Creek and Animas River, Colorado on August 5, 2015

EPA Drinking Water Standard for arsenic is 0.010 parts per million or milligrams per liter.
EPA Drinking Water Standard for lead is 0.015 parts per million or milligrams per liter
Total Concentrations of Iron, Arsenic, Copper, and Lead in Cement Creek and Animas River, Colorado on August 5, 2015

[Graph showing concentrations of iron, arsenic, copper, and lead in parts per million.]
Data Gaps

• Background contaminant levels in sediment and water caused by natural geologic sources and historical mining and milling
• Distribution and mass balance of contaminants
• Complete characterization of ground and surface water (metal speciation, stable isotopes, microorganisms)
• Aquifer-river hydraulics
• Organism uptake and bio-monitoring of plants, livestock, macro-invertebrates, fish, wildlife and humans
• Toxicological and ecological risk assessment