



## START 4 - REGION 8

### DRAFT TECHNICAL MEMORANDUM

**TO:** [REDACTED] EPA Region 8, On-Scene Coordinator  
**FROM:** [REDACTED], Superfund Technical Assessment and Response Team (START)  
**DATE:** August 12, 2015  
**SUBJECT:** Gold King Mine Investigation and Blowout Event

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The United States Environmental Protection Agency (EPA) tasked the Weston Solutions, Inc., (WESTON) Superfund Technical Assessment and Response Team (START) under Technical Direction Document (TDD) #1408-01 to support U.S. EPA's efforts at the Gold King Mine site near Silverton, San Juan County, Colorado. The EPA was investigating the mine due to its proximity and potential for increased flows in relation to the bulkheading of the Red and Bonita Mine located on the same mountain (Bonita Mountain).

#### 2015 Field Activities Prior to Blowout

START [REDACTED] the EPA On-Scene Coordinator [REDACTED] and EPA's Emergency and Rapid Response Services (ERRS) contractor Environmental Restoration, LLC [REDACTED] visited the Gold King Mine on June 24, 2015 to document current flows and seek a viable path to pipe water from the Gold King to the Red and Bonita water treatment system. Gold King Mine discharge flow measured 31 gallons per minute (gpm). START planned to collect Gold King discharge water quality data and a sample on June 25, 2015, but due to deteriorating snow pack, no safe path existed to reach the site and no sample was collected from the Gold King mine discharge.

START [REDACTED] remobilized to the Red and Bonita and Gold King sites on July 13, 2015. On July 15, Gold King Mine discharge flow and water quality parameters were measured and a water sample was collected from the discharge. Gold King Mine discharge flow measured 69 gpm. Samples were not delivered to the laboratory by FedEx until July 20 and the temperature of the samples exceeded the hold requirements. The sample results are pending.

On July 23, 2015 START visited the Gold King Mine to measure discharge flow in the existing flume and discuss installing a sump basin to treat water that would be pumped from the mine for work scheduled to begin in August. It was decided a 5 foot or 6 foot HDPE pipe would be set on end in the ground and a 12 inch HDPE pipe would be used to allow flow to follow the natural flow path over the eastern end of the mine dump when water treatment was unnecessary. On July 24, the ERRS contractor began grading the mine dump and excavating a trench to install the sump basin. START brought a transit on site to verify elevations. Gold King Mine discharge flow measured 69 gpm.

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By July 28, 2015 the sump basin and outflow pipe were installed and connected and work on the filter bag alternative for Gold King was being discussed and outlined.

On July 29, 2015 the pipeline and pump supplier visited the site to discuss options for pumping water from the Gold King to the Red and Bonita treatment ponds. Various options were considered and the vendor planned to supply the ERRS contractor with options. That afternoon the ERRS contractor removed some loose material from above the assumed portal location in an attempt to find native bedrock.

On July 30, 2015 the ERRS contractor had removed material above the collapsed pipes to the back of them, leaving the top of the top pipe covered and ceased investigation. Grading for the filter bag setup began.

On July 31, 2015 the ERRS contractor began laying out the manifold system for the filter bag system to provide backup water filtration at the Gold King Mine during the anticipated 2015 mine work.

On August 3, 2015 the ERRS contractor continued work on the filter bag manifold and grading to allow the filter bags to drain into the half channel at Gold King.

On August 4, 2015 EPA OSC [REDACTED] arrived on site at 08:45 and [REDACTED] from Colorado Division of Mining Reclamation and Safety (DRMS) arrived at the Gold King Mine at 09:45. [REDACTED] discussed how to proceed with the site. Per their instruction, the ERRS contractor began excavating the collapse area while minimizing water discharge at 10:30. At 14:00 the excavation was proceeding slowly, and at 16:00 a set of collapsed timbers with what appeared to be an opening was uncovered. The situation was left to be considered overnight.

#### **Field Activities on the Day of the Gold King Mine Blowout – August 5, 2015**

*Below is a summary of the START field notes and recollection of site activities at the Gold King the day of the mine blowout.*

09:00 EPA OSC [REDACTED] and ERRS contractors were up at the Gold King Mine. Due to excavation activities, the GSA Suburban was parked at the toe of the mine dump.

09:30 DRMS personnel [REDACTED] and the EPA OSC [REDACTED] discussed the mine adit situation and determined that excavation should be continued. DRMS said due to the severity of the collapse a series of plates might need to be used to build the 10 foot culvert further back into the mine beyond the collapse to allow dewatering and water treatment.

10:30 (approximate) DRMS left the site to investigate the bulkhead in the nearby Mogul Mine.

10:51 A small leak was observed approximately 15 to 20 feet above the anticipated elevation of the floor of the adit. Work stopped and the excavator moved back from the excavation area.

10:54 The hole had begun to enlarge and water was pouring out.

10:58 The hole had expanded significantly, later measured at about 10 feet wide by 15 feet high. Portions of the mine tailings dump and access road had begun to wash away. At this time START realized that the GSA Suburban had been parked at the toe of the mine tailings dump where much of the

discharged water had flowed. The vehicle was later found it to be water damaged, would not start, and was un-drivable.

11:33 pH testing (using pH indicator paper) of mine discharge water showed a pH of approximately 4.5.

11:40 Mine discharge flow had slowed enough to be safely diverted into the existing culvert system.

11:45 DRMS personnel reported by radio that they were out of the Mogul and left the site to notify local resources and the EPA.

11:50 [REDACTED] and the ERRS contractor manager [REDACTED] left the Gold King on foot to get picked up and driven to an area with phone reception to notify authorities. The START contractor [REDACTED] stayed at the mine adit area to monitor the mine for additional surges of water and to provide support to the ERRS operator rebuilding the road.

12:20 The ERRS contractor began reconstructing the exit road from the site to help demobilize the equipment, vehicles, and personnel.

12:30 According to radio communications, ERRS personnel working at the nearby Red and Bonita site submitted a call for Flight for Life assistance because a tourist had injured themselves on Corkscrew Pass. This call was not related to the Gold King Mine incident.

13:30 An unknown visitor drove up the Gold King Mine Road and viewed the site for 15 minutes then left.

14:00 The discharge water flow steadily declined until this point and then appeared to stabilize.

14:15 The flight for life helicopter flew by the site.

15:00 The pH of the discharge still measured approximately 4.5 on pH indicator paper.

15:05 DRMS personnel returned to the site.

15:20 The ERRS contractor had reconstructed a temporary road for all equipment and personnel to be moved off site.

15:30 – EPA, DRMS, ERRS, and START viewed the portal area. DRMS measured the width of the portal to be approximately 10 feet.

17:00 – The water treatment system at Red and Bonita was decontaminated and stored for the evening.

18:00 – The ERRS contractor gave the START contractor a ride to his lodging.

### **2015 Field Activities Post Blowout (Through 8/8)**

START has been monitoring flow rates, checking pH of the mine discharge, and assisting with water treatment. The Gold King Mine discharge pH has been approximately 3 (as measured by a Horiba water quality meter) and the flow rate decreased from 748 gpm to 587 gpm as of August 8.

Water treatment consisted of adding sodium hydroxide (25% solution) at a rate of 2 liters/minute and adding approximately 10 ounces of powdered Brennfloc every 10 minutes to the half pipe channel outside the Gold King Mine. A treatment option including lime for pH adjustment was being considered.



# PHOTOGRAPH LOG

<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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**Photo No.**  
**1**

**Date:**  
08/04/2015

**Direction Photo Taken:**  
  
North

**Description:**  
Beginning investigation into collapsed adit.



**Photo No.**  
**2**

**Date:**  
08/04/2015

**Direction Photo Taken:**  
  
North

**Description:**  
Excavated next to DRMS-installed culvert, water muddy from soil disturbance.





<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.:</b> <b>3</b>	<b>Date:</b> 08/04/2015
<b>Direction Photo Taken:</b>  Down	
<b>Description:</b> Seepage from soil next to piping.	



<b>Photo No.:</b> <b>4</b>	<b>Date:</b> 08/04/2015
<b>Direction Photo Taken:</b>  Down	
<b>Description:</b> Seepage next to the pipe is clear until entering disturbed soil.	



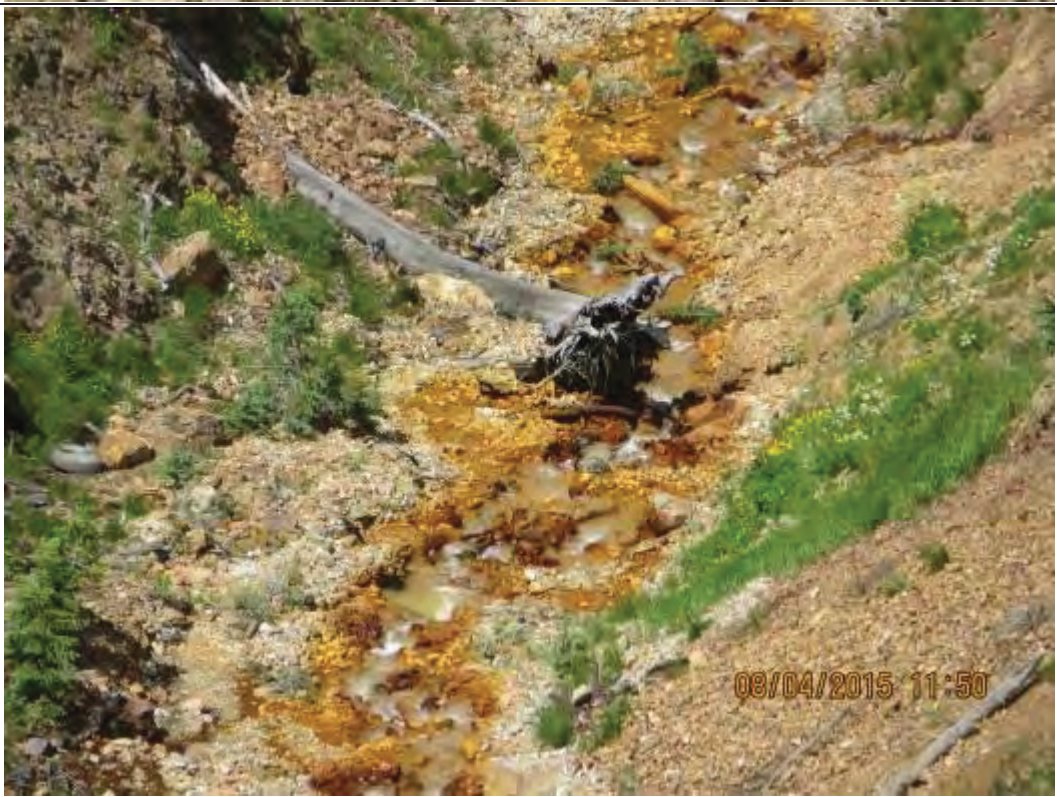


<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.</b> <b>5</b>	<b>Date:</b> 08/04/2015
<b>Direction Photo Taken:</b>  North	
<b>Description:</b>  DRMS looking at adit excavation progress.	



<b>Photo No.</b> <b>6</b>	<b>Date:</b> 08/04/2015
<b>Direction Photo Taken:</b>  West	
<b>Description:</b>  Water minimally murky from disturbed soil and water entering the North Fork from site.	





<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.</b> <b>7</b>	<b>Date:</b> 08/04/2015
<b>Direction Photo Taken:</b>  South/Down	
<b>Description:</b> Hay bales installed as filter for sediment in North Fork.	



<b>Photo No.</b> <b>8</b>	<b>Date:</b> 08/04/2015
<b>Direction Photo Taken:</b>  Northwest	
<b>Description:</b> Continuing excavation at the collapsed adit, no solid bedrock found for tunnel support.	







<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.:</b> <b>9</b>	<b>Date:</b> 08/04/2015
<b>Direction Photo Taken:</b>  Northeast	
<b>Description:</b> First signs of adit, support pillar with lagging.	



<b>Photo No.:</b> <b>10</b>	<b>Date:</b> 08/04/2015
<b>Direction Photo Taken:</b>  East	
<b>Description:</b> Water of the North Fork just upstream of Cement Creek.	





<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.</b> <b>11</b>	<b>Date:</b> 08/04/2015
<b>Direction Photo Taken:</b>  East	
<b>Description:</b> Water of the North Fork just upstream of Cement Creek.	



<b>Photo No.</b> <b>12</b>	<b>Date:</b> 08/04/2015
<b>Direction Photo Taken:</b>  North	
<b>Description:</b> Collapsed supports uncovered above anticipated adit, no sign of bedrock above the adit area.	





**Project Name:**  
Gold King Mine

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
0001/1408-01

<b>Photo No.</b> <b>13</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  North	
<b>Description:</b> Adit conditions the morning of 8/5.	



<b>Photo No.</b> <b>14</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  Northeast	
<b>Description:</b> Excavating material above the collapsed adit.	





<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.:</b> <b>15</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  North	
<b>Description:</b> Bedrock found above the anticipated adit.	



<b>Photo No.:</b> <b>16</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  North	
<b>Description:</b> Cleaning out excavated material, small leak.	





**Project Name:**  
Gold King Mine

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
0001/1408-01

**Photo No.**  
**17**

**Date:**  
08/05/2015

**Direction Photo Taken:**

North

**Description:**  
Small leak close up.



**Photo No.**  
**18**

**Date:**  
08/05/2015

**Direction Photo Taken:**

North

**Description:**  
Hole starting to give way to flow.





<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.</b> <b>19</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  Northeast	
<b>Description:</b>  Adit flow increasing.	



<b>Photo No.</b> <b>20</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  Northeast	
<b>Description:</b>  Water flooding out at increased rate.	





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<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.:</b> <b>21</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  West	
<b>Description:</b> Water flowing along access road and across waste dump.	



<b>Photo No.:</b> <b>22</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  Southeast	
<b>Description:</b> Water flowing over the edge of the waste dump and collapsing the edge.	





<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.</b> <b>23</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  Southwest	
<b>Description:</b> Exit route starting to collapse	



<b>Photo No.</b> <b>24</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  Southeast/Down	
<b>Description:</b> Edge of the tailings dump collapsed, suburban trapped and half submerged in center of photo.	







<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.:</b> <b>25</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  Northeast	
<b>Description:</b> Gold King adit exposed.	



<b>Photo No.:</b> <b>26</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  Southeast	
<b>Description:</b> Water flow washing out the existing road. Note Suburban in left side of photo.	





<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.</b> <b>27</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  North	
<b>Description:</b> Exposed adit, roughly 10 feet wide by 15 feet high.	



<b>Photo No.</b> <b>28</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  North	
<b>Description:</b> pH of discharge water is approximately 4 to 4.5.	





<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.</b> <b>29</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  Northeast	
<b>Description:</b> Excavator redirecting water into existing half-pipe channel.	



<b>Photo No.</b> <b>30</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  Southeast/Down	
<b>Description:</b> Collapsed portion of waste dump and road wash out.	





<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.:</b> <b>31</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  Northeast	
<b>Description:</b> Adit area after regrading.	



<b>Photo No.:</b> <b>32</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  North	
<b>Description:</b> Exposed adit and redirected flow, flow is beginning to subside.	





<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.:</b> <b>33</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  East	
<b>Description:</b> Redirected flow into existing half culvert channel.	



<b>Photo No.:</b> <b>34</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  North	
<b>Description:</b> Closeup of adit.	





<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.:</b> <b>35</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  West	
<b>Description:</b> Excavator beginning work to secure safe exit route for equipment, vehicles, and personnel.	



<b>Photo No.:</b> <b>36</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  East	
<b>Description:</b> Existing flow channel at maximum capacity.	





<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.:</b> <b>37</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  Southwest/Down	
<b>Description:</b> Excavator progress on fixing access road to create a safe exit route.	



<b>Photo No.:</b> <b>38</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  East	
<b>Description:</b> Existing culvert flows subsiding minimally.	





<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.</b> <b>39</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  North	
<b>Description:</b> No changes visible in adit structure or supports. Sloughing of materials inside the mine can be heard.	



<b>Photo No.</b> <b>40</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  South/Down	
<b>Description:</b> Excavator progresses to washed out North Fork crossing.	







<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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**Photo No.:**  
**41**

**Date:**  
08/05/2015

**Direction Photo Taken:**  
Southwest/Down

**Description:**  
Noted visitor to the site, unknown person, walked up to excavator at North Fork crossing and then back to vehicle.



**Photo No.:**  
**42**

**Date:**  
08/05/2015

**Direction Photo Taken:**  
Southwest/Down

**Description:**  
Visitor leaving.





<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.:</b> <b>43</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  South/Down	
<b>Description:</b> Excavator continues to fix access road. Continued high flow is slowing progress.	



<b>Photo No.:</b> <b>44</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  East	
<b>Description:</b> Half culvert flow continues to subside.	

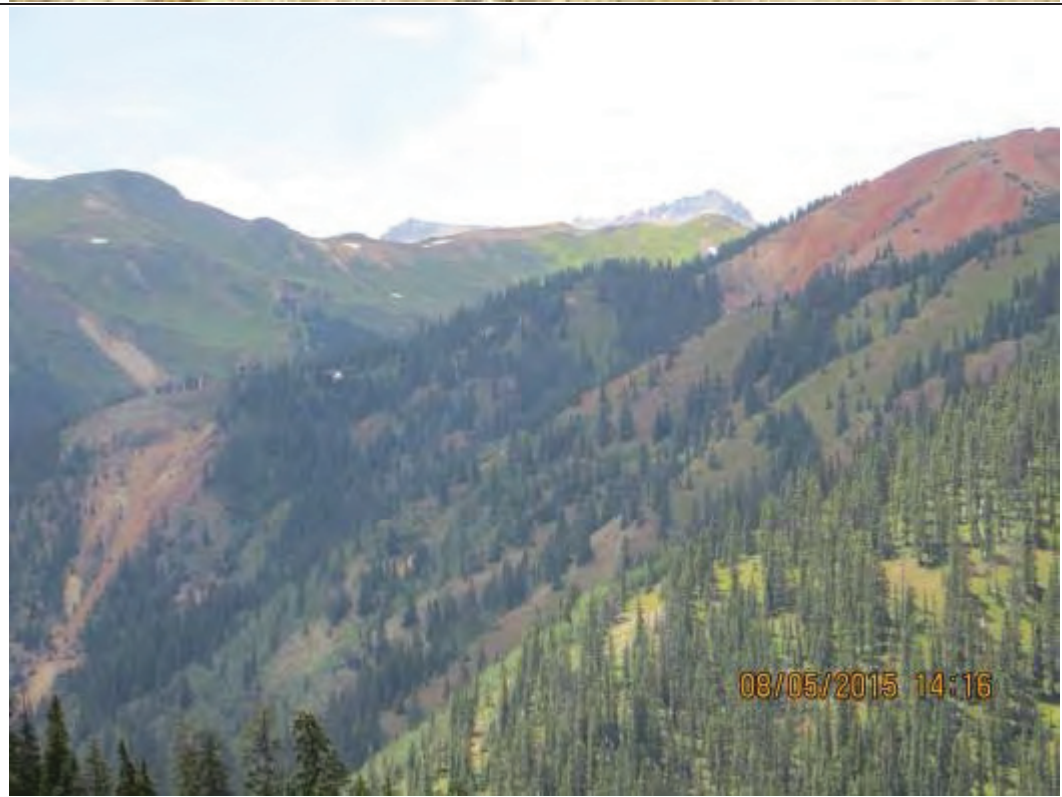


<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.</b> 0001/1408-01
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<b>Photo No.</b> <b>45</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  North	
<b>Description:</b>  Water levels lowering at adit entrance, no visible changes to structure.	



<b>Photo No.</b> <b>46</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  West	
<b>Description:</b>  Flight for life Helicopter coming up the valley to pick up a person who crashed a vehicle on Corkscrew Pass, not related to this event.	





<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
--	---	-------------------------------------

<b>Photo No.</b> <b>47</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  Southwest	
<b>Description:</b> Close up of Flight for Life.	



<b>Photo No.</b> <b>48</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  Northeast	
<b>Description:</b> Flow path from adit, water flow appears to have stabilized around 1400.	





# PHOTOGRAPH LOG

<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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<b>Photo No.</b> <b>49</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  North	
<b>Description:</b> pH measured at approximately 4.5.	



<b>Photo No.</b> <b>50</b>	<b>Date:</b> 08/05/2015
<b>Direction Photo Taken:</b>  Southwest/Down	
<b>Description:</b> DRMS arrives back on site, had visited the site around 0930 to check on progress of investigation, left approximately 1030, prior to blowout.	





**Project Name:**  
Gold King Mine

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
0001/1408-01

**Photo No.**  
**51**

**Date:**  
08/05/2015

**Direction Photo Taken:**

North

**Description:**

Looking up from the toe of the Gold King waste dump directly south of the adit.



**Photo No.**  
**52**

**Date:**  
08/05/2015

**Direction Photo Taken:**

Northeast

**Description:**

Gold King Mine tailings dump after water discharge.





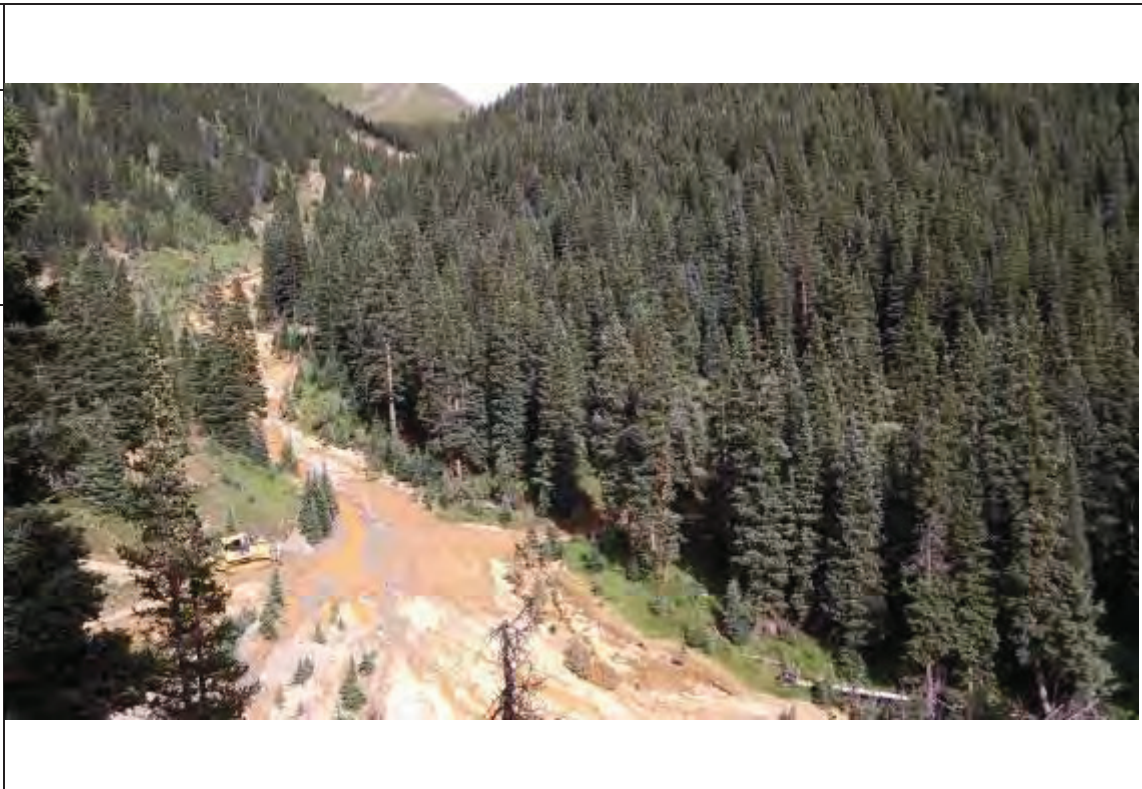
<b>Project Name:</b> Gold King Mine	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 0001/1408-01
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**Photo No.**  
**53**

**Date:**  
08/05/2015

**Direction Photo Taken:**  
  
East

**Description:**  
  
Looking east across Cement Creek from County Road 10 to excavator fixing County Road 52 at North Fork crossing just south of Red and Bonita Mine.



**Photo No.**  
**54**



**Date:**  
08/05/2015

**Direction Photo Taken:**  
  
East

**Description:**  
  
Cement Creek crossing at Gladstone.




<b>Project Name:</b> Gold King Mine ER	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.</b> 20408.012.001.0267.00
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<b>Photo No.</b> <b>1</b>	<b>Date:</b> 08/06/2015	
<b>Direction Photo Taken:</b>  Southwest		
<b>Description:</b>  Animas River from U.S. Highway 550 southwest of Silverton		
<b>Photo No.</b> <b>2</b>	<b>Date:</b> 08/06/2015	
<b>Direction Photo Taken:</b>  West		
<b>Description:</b>  Animas River from U.S. Highway 550 southwest of Silverton		



<b>Project Name:</b> Gold King Mine ER	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.</b> 20408.012.001.0267.00
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<b>Photo No.</b> <b>3</b>	<b>Date:</b> 08/06/2015	
<b>Direction Photo Taken:</b>  Northwest		
<b>Description:</b>  Animas River from U.S. Highway 550 southwest of Silverton.		

<b>Photo No.</b> <b>4</b>	<b>Date:</b> 08/06/2015	
<b>Direction Photo Taken:</b>  South		
<b>Description:</b>  Repairing road damage along County Road 110 between Silverton and Gladstone.		

<b>Project Name:</b> Gold King Mine ER	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.</b> 20408.012.001.0267.00
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<b>Photo No.</b> <b>5</b>	<b>Date:</b> 08/06/2015	
<b>Direction Photo Taken:</b> South		
<b>Description:</b> Repairing road damage along County Road 110 between Silverton and Gladstone.		

<b>Photo No.</b> <b>6</b>	<b>Date:</b> 08/06/2015	
<b>Direction Photo Taken:</b> North		
<b>Description:</b> Road crossing over Cement Creek at Gladstone damaged, view from downstream.		

**Project Name:**  
Gold King Mine ER

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
20408.012.001.0267.00

**Photo No.**  
**7**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
North

**Description:**  
Upstream of Cement Creek culvert at Gladstone.



**Photo No.**  
**8**



**Date:**  
08/06/2015

**Direction Photo Taken:**  
South

**Description:**  
Road at Gladstone coned off.



<b>Project Name:</b> Gold King Mine ER	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> 20408.012.001.0267.00
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<b>Photo No.</b> <b>9</b>	<b>Date:</b> 08/06/2015	
<b>Direction Photo Taken:</b>  South		
<b>Description:</b>  Cement Creek and North Fork convergence after Gold King discharge.		
<b>Photo No.</b> <b>10</b>	<b>Date:</b> 08/06/2015	
<b>Direction Photo Taken:</b>  South		
<b>Description:</b>  Cement Creek and North Fork convergence after Gold King discharge.		

<b>Project Name:</b> Gold King Mine ER	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.</b> 20408.012.001.0267.00
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<b>Photo No.</b> <b>11</b>	<b>Date:</b> 08/06/2015
<b>Direction Photo Taken:</b>  East	
<b>Description:</b>  Damaged GSA Suburban at base of Gold King mine dump	



<b>Photo No.</b> <b>12</b>	<b>Date:</b> 08/06/2015
<b>Direction Photo Taken:</b>  South	
<b>Description:</b>  Temporary culvert for North Fork Cement Creek at road at base of Gold King mine dump.	



**Project Name:**  
Gold King Mine ER

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
20408.012.001.0267.00

**Photo No.**  
**13**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
West

**Description:**  
  
Temporary road crossing at base of Gold King mine dump.



**Photo No.**  
**14**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
North

**Description:**  
  
Gold King mine dump damage.



**Project Name:**  
Gold King Mine ER

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
20408.012.001.0267.00

**Photo No.**  
**15**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
West

**Description:**  
  
Gold King mine dump damage.



**Photo No.**  
**16**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
North

**Description:**  
  
Gold King mine dump damage.



**Project Name:**  
Gold King Mine ER

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
20408.012.001.0267.00

**Photo No.**  
**17**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
Northwest

**Description:**  
  
Gold King mine dump damage.



**Photo No.**  
**18**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
Northwest

**Description:**  
  
Gold King mine dump damage.





<b>Project Name:</b> Gold King Mine ER	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.</b> 20408.012.001.0267.00
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<b>Photo No.</b> <b>19</b>	<b>Date:</b> 08/06/2015
<b>Direction Photo Taken:</b>  North	
<b>Description:</b>  Gold King mine dump damage.	



<b>Photo No.</b> <b>20</b>	<b>Date:</b> 08/06/2015
<b>Direction Photo Taken:</b>  Southwest	
<b>Description:</b>  North Fork Cement Creek downstream of Gold King road crossing. North Fork Cement Creek is orange.	



<b>Project Name:</b> Gold King Mine ER	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.</b> 20408.012.001.0267.00
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<b>Photo No.</b> <b>21</b>	<b>Date:</b> 08/06/2015
<b>Direction Photo Taken:</b>  West	
<b>Description:</b>  Switchback at the Gold King access road.	



<b>Photo No.</b> <b>22</b>	<b>Date:</b> 08/06/2015
<b>Direction Photo Taken:</b>  West	
<b>Description:</b>  Gold King mine dump road damage.	



**Project Name:**  
Gold King Mine ER

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
20408.012.001.0267.00

**Photo No.**  
**23**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
East

**Description:**  
  
Gold King mine dump damage.



**Photo No.**  
**24**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
East

**Description:**  
  
Top of Gold King Mine Dump.



**Project Name:**  
Gold King Mine ER

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
20408.012.001.0267.00

**Photo No.**  
**25**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
Northeast

**Description:**  
  
Gold King adit post discharge.



**Photo No.**  
**26**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
North

**Description:**  
  
Gold King adit post discharge.



<b>Project Name:</b> Gold King Mine ER	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.</b> 20408.012.001.0267.00
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<b>Photo No.</b> <b>27</b>	<b>Date:</b> 08/06/2015
<b>Direction Photo Taken:</b>  North	
<b>Description:</b>  Gold King adit	



<b>Photo No.</b> <b>28</b>	<b>Date:</b> 08/06/2015
<b>Direction Photo Taken:</b>  East	
<b>Description:</b>  Channalized flow to edge of mine dump.	



**Project Name:**  
Gold King Mine ER

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
20408.012.001.0267.00

**Photo No.**  
**29**

**Date:**  
08/06/2015

**Direction Photo Taken:**

West

**Description:**

Horiba Readings stabilizing in adit discharge. pH 3.41



**Photo No.**  
**30**

**Date:**  
08/06/2015

**Direction Photo Taken:**

West

**Description:**

Stabilized Horiba readings (DO is not accurate). pH = 2.93  
Turbidity too high for sensor reading so display shows 0 NTU.



**Project Name:**  
Gold King Mine ER

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
20408.012.001.0267.00

**Photo No.**  
**31**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
Northwest

**Description:**  
  
Secondary sealed adit at Gold King, flow has decreased from 10's of gallons per minute to almost 0.



**Photo No.**  
**32**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
West/Down

**Description:**  
  
Overview of the Gold King waste dump pad after mine discharge. Note orange water in half culvert channel and damage to center of pad.



**Project Name:**  
Gold King Mine ER

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
20408.012.001.0267.00

**Photo No.**  
**33**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
West

**Description:**  
  
Overview of the Gold King Post mine discharge.



**Photo No.**  
**34**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
West and downhill

**Description:**  
  
Overview of the Gold King mine dump after mine discharge.





**Project Name:**  
Gold King Mine ER

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
20408.012.001.0267.00

**Photo No.**  
**35**

**Date:**  
08/06/2015

**Direction Photo Taken:**

West/Down

**Description:**

Overview of the Gold King mine dump after mine discharge.



**Photo No.**  
**36**

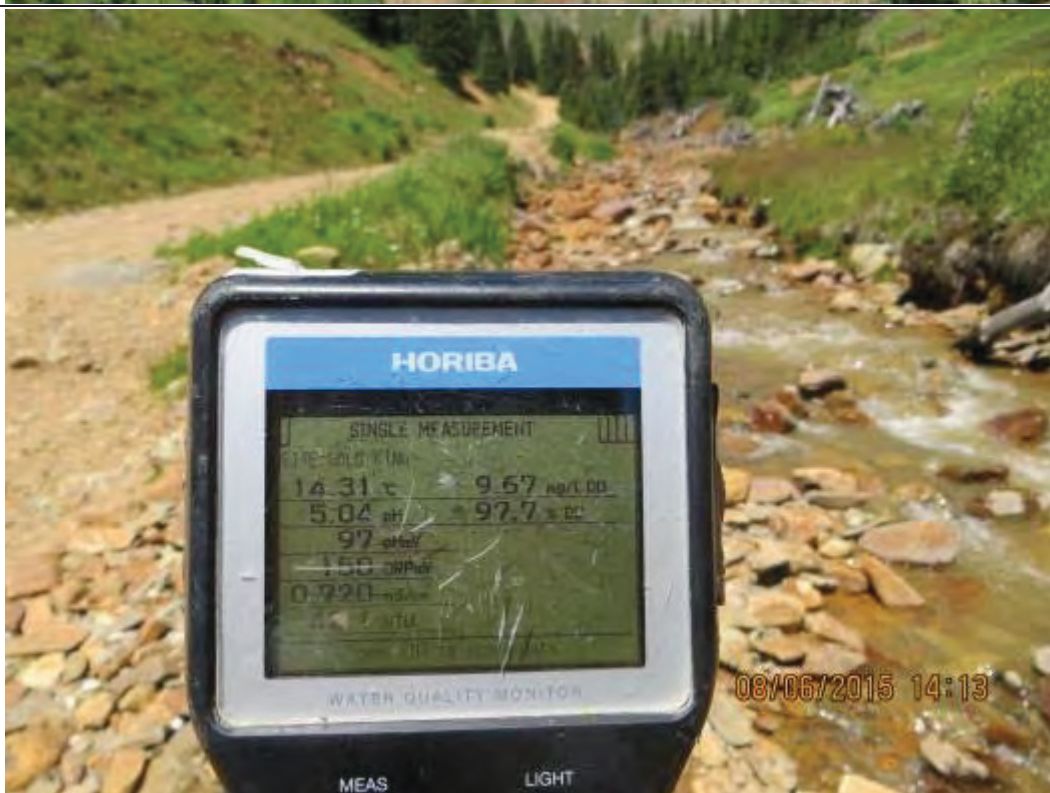
**Date:**  
08/06/2015

**Direction Photo Taken:**

North

**Description:**

Horiba reading of Cement Creek upstream of North Fork confluence. Bad DO reading. pH = 5.04



**Project Name:**  
Gold King Mine ER

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
20408.012.001.0267.00

**Photo No.**  
**37**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
North

**Description:**  
  
Stabilized Horiba reading of Cement Creek north of Gladstone culvert. Bad DO reading, pH = 2.98



**Photo No.**  
**38**

**Date:**  
08/06/2015

**Direction Photo Taken:**  
  
South

**Description:**  
  
Updated view of road repair between Gladstone and Silverton.



<b>Project Name:</b> Gold King Mine Blowout	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.</b> ER
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<b>Photo No.</b> <b>1</b>	<b>Date:</b> 08/07/2015	
<b>Direction Photo Taken:</b>  Southeast		
<b>Description:</b>  Animas River morning of 8/7/15		

<b>Photo No.</b> <b>2</b>	<b>Date:</b> 08/07/2015	
<b>Direction Photo Taken:</b>  East		
<b>Description:</b>  Animas River morning of 8/7/15		

<b>Project Name:</b> Gold King Mine Blowout	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.</b> ER
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<b>Photo No.</b> <b>3</b>	<b>Date:</b> 08/07/2015
<b>Direction Photo Taken:</b>  Northeast	
<b>Description:</b>  Animas River morning of 8/7/15	



<b>Photo No.</b> <b>4</b>	<b>Date:</b> 08/07/2015
<b>Direction Photo Taken:</b>  South	
<b>Description:</b>  Road repairs between Silverton and Gladstone.	



<b>Project Name:</b> Gold King Mine Blowout	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> ER
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**Photo No.:**  
**5**

**Date:**  
08/07/2015

**Direction Photo Taken:**  
East

**Description:**  
Gold King Mine Dump and GSA Suburban.



**Photo No.:**  
**6**

**Date:**  
08/07/2015

**Direction Photo Taken:**  
Southeast

**Description:**  
GSA Suburban and water drain down to Cement Creek



<b>Project Name:</b> Gold King Mine Blowout	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.</b> ER
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**Photo No.**  
**7**

**Date:**  
08/07/2015

**Direction Photo Taken:**  
  
North

**Description:**  
  
Gold king Mine Portal the morning of 8/7



**Photo No.**  
**8**

**Date:**  
08/07/2015

**Direction Photo Taken:**  
  
South/Down

**Description:**  
  
Cleaning up suburban area and building settling pond.



<b>Project Name:</b> Gold King Mine Blowout	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.</b> ER
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<b>Photo No.</b> <b>9</b>	<b>Date:</b> 08/07/2015	
<b>Direction Photo Taken:</b> Northwest		
<b>Description:</b> Flow measure location for adit flow at the Gold King Adit.		

<b>Photo No.</b> <b>10</b>	<b>Date:</b> 08/07/2015	
<b>Direction Photo Taken:</b> Down		
<b>Description:</b> Flow width = 3 ft.		

**Project Name:**  
Gold King Mine Blowout

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
ER

**Photo No.**  
**11**

**Date:**  
08/07/2015

**Direction Photo Taken:**

Down

**Description:**

Measuring flow with the Marsh-McBirney



08/07/2015 09:16

**Photo No.**  
**12**

**Date:**  
08/07/2015

**Direction Photo Taken:**

North

**Description:**

Close-up of the Gold King Mine Portal.



08/07/2015 09:23



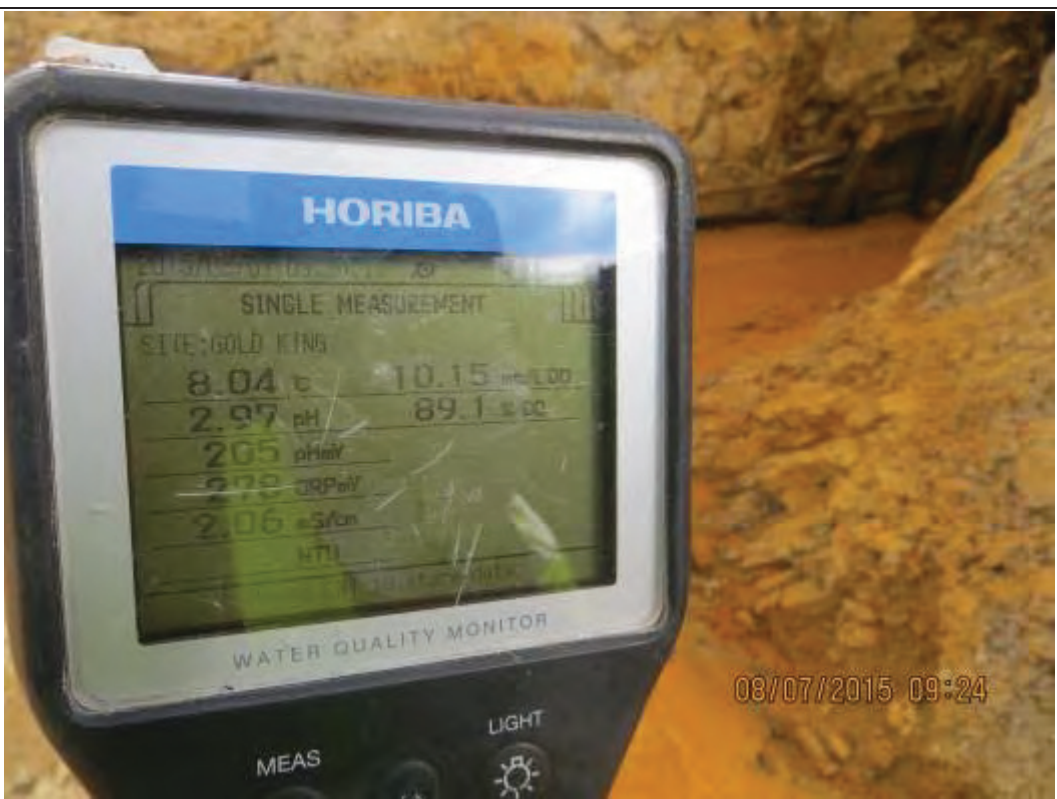
<b>Project Name:</b> Gold King Mine Blowout	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> ER
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**Photo No.:**  
**13**

**Date:**  
08/07/2015

**Direction Photo Taken:**  
  
Northwest

**Description:**  
  
Gold King Adit pH = 2.97.



**Photo No.:**  
**14**

**Date:**  
08/07/2015

**Direction Photo Taken:**  
  
Northwest/Down

**Description:**  
  
The historic adit for the Gold King has stopped flowing.



**Project Name:**  
Gold King Mine Blowout

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
ER

**Photo No.**  
**15**

**Date:**  
08/07/2015

**Direction Photo Taken:**

South

**Description:**

GSA Suburban moved and runs, is undrivable due to service needs.



**Photo No.**  
**16**

**Date:**  
08/07/2015

**Direction Photo Taken:**

West

**Description:**

pH adjustment with 2 liters/minute of 25% NaOH, pH = 5.38



<b>Project Name:</b> Gold King Mine Blowout	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> ER
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**Photo No.**  
**17**

**Date:**  
08/07/2015

**Direction Photo Taken:**  
Southwest/Down

**Description:**  
Water settling pond at base of the mine dump at Gold King.



**Photo No.**  
**18**

**Date:**  
08/07/2015

**Direction Photo Taken:**  
Up

**Description:**  
New helicopter fly over at Gold King.



**Project Name:**  
Gold King Mine Blowout

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
ER

**Photo No.**  
**19**

**Date:**  
08/07/2015

**Direction Photo Taken:**  
South/Down

**Description:**  
Gold King treatment pond with building floc.



**Photo No.**  
**20**

**Date:**  
08/07/2015

**Direction Photo Taken:**  
South/Down

**Description:**  
Gold King treatment pond with building floc.



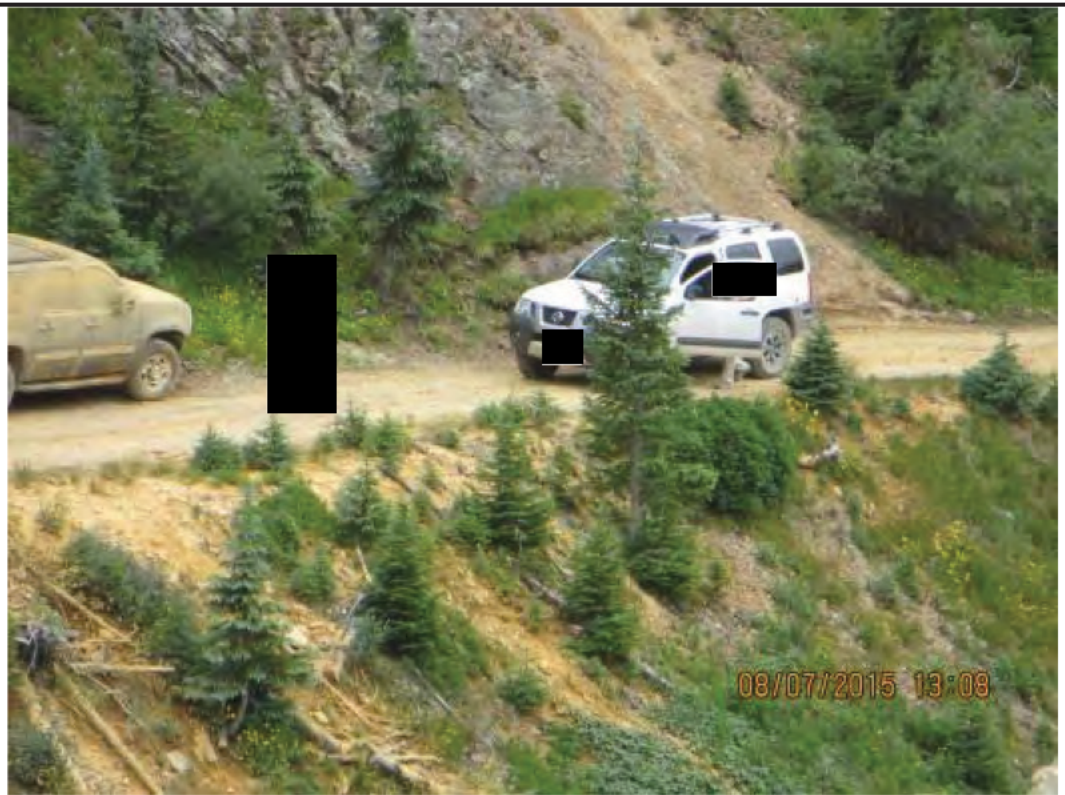


**Project Name:**  
Gold King Mine Blowout

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
ER

<b>Photo No.</b> <b>21</b>	<b>Date:</b> 08/07/2015
<b>Direction Photo Taken:</b>  Southwest	
<b>Description:</b>  Unknown visitor on-site.	



<b>Photo No.</b> <b>22</b>	<b>Date:</b> 08/07/2015
<b>Direction Photo Taken:</b>  West	
<b>Description:</b>  Adit pH = 3.37	



<b>Project Name:</b> Gold King Mine Blowout	<b>Site Location:</b> Silverton, San Juan County, Colorado	<b>Project No.:</b> ER
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<b>Photo No.:</b> <b>23</b>	<b>Date:</b> 08/07/2015
<b>Direction Photo Taken:</b>  Down	
<b>Description:</b>  Settling pond status.	



<b>Photo No.:</b> <b>24</b>	<b>Date:</b> 08/07/2015
<b>Direction Photo Taken:</b>  Northwest	
<b>Description:</b>  Building ponds at Cement Creek and the North Fork.	



**Project Name:**  
Gold King Mine Blowout

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
ER

**Photo No.**  
**25**

**Date:**  
08/07/2015

**Direction Photo Taken:**  
  
North

**Description:**  
  
County Road 53 where North Fork crosses.



**Photo No.**  
**26**

**Date:**  
08/07/2015

**Direction Photo Taken:**  
  
East

**Description:**  
  
North Fork flow from Gold King.



**Project Name:**  
Gold King Mine Blowout

**Site Location:**  
Silverton, San Juan County, Colorado

**Project No.**  
ER

<b>Photo No.</b> <b>27</b>	<b>Date:</b> 08/07/2015
<b>Direction Photo Taken:</b>  South	
<b>Description:</b>  Pond progress at the convergence of Cement Creek and the north Fork.	

