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## WEEKLY REPORT – RED & BONITA BULKHEAD TEST

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**DATE:** October 1- 7, 2020

**REPORT NO:** 13

**TEST PHASE:** Phase 4, Drain Down

**TO:** Kerry Guy, James Hou

**PREPARED BY:** Christoph Goss, PhD, PE,  
Morley Beckman, PE, and Erinn Johnson

**FROM:** Deere & Ault, Mountain Studies Institute, U.S.  
Environmental Protection Agency, Environmental  
Restoration, and Weston Solutions

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### Actions Taken This Week:

- Phase 4 is in full effect. R&B is draining down and is continuing to be monitored. Head behind the bulkhead dropped from approximately 80 ft on 9/30/20 to 31 ft on 10/7/20.
- R&B adit inspections and pressure readings were performed once per day and three times a week adit flume measurements were performed by ER.
- Flow rates and pressures from various on-site instruments were monitored and recorded.
- Monitoring data was collected this week by MSI. All regularly updated data has been reported.
- ER jetted lines to plant on 10/1/20 and 10/2/20.
- Ensero cleaned the Gold King ponds 9/28-29, during this time all of the R&B and Gold King waters were diverted to the plant through the bypass line.
- Flows from R&B were increased by 100 gpm on 10/2/20 and again on 10/5/20 by opening the globe valve further. As the mine pool dropped, the flows decreased. (See Figure 1).
- On 10/7/20 a new bag was deployed at the IWTP which has relieved the excess stress on the system caused by treating both Gold King and R&B waters.

### Key Observations:

- The discharge out of Red & Bonita varied from 426-523 gpm this week (Figures 1 and 2). The discharge, as recorded manually by ER and automatically every 30 minutes by the data logger attached to the ultrasonic flow meter, has been added to the figures. The readings generally correlate well.
- The head behind the bulkhead dropped this week from 80 feet to 31 feet. Aside from small bumps each time the globe valve was opened further, the drop has been relatively steady at approximately 5 feet per day. Based on this, we estimate reaching the elevation of the stopes in the mine (22') on October 9 or 10. On or about October 12 is when the mine pool should reach approximately 10'. At that point flows should be decreased to limit the water velocity and the amount of sludge/debris that it carries. If the particulate content and water quality are compatible with the plant, the flows can remain higher.
- Flow rates at Gold King continue with daily fluctuation cycles between approximately 305 to 350 gpm (Figures 1 and 2). Average daily flow rates continue to be less volatile than prior to 9/9/20 and are generally fluctuating less than 50 gpm daily. The flow rates generally correspond with flow rates measured at the treatment plant.

- The data from American Tunnel will not be updated this week due to a problem with the data connection pin. Figure 3 shows the existing data for reference.
- Water levels in NFPZ-1 following typical seasonal cycle (Figure 4). Level in NFPZ-1 peaked in mid-August and is dropping as part of the typical cycle. The somewhat flatter curve coming down suggests a possible influence from either the Red & Bonita bulkhead test or possibly from senescence. Senescence is when there is cell death in plants, usually associated with the change in color of the leaves, which causes plants to no longer take up water thereby leaving more water in the ground.
- ATPZ-2 (water level behind American Tunnel Bulkhead 3) remained fairly steady (Figure 4).
- In Red & Bonita, flows through Flume 1, Flume 2 and Flume 3 have significantly decreased since reopening the globe valve and lowering the mine pool elevation behind the bulkhead. Flume 1 has continued to decrease to about 0.05 gpm. Flume 2 decreased to about 0.7 gpm. Flume 3 has decreased to about 0.11 gpm (Figure 5). The relationship between the flume flows (groundwater inflow into the adit) is direct and with little lag.
- Seepage within R&B has continued to decrease around the bulkhead after the globe valve was opened.
- Pressure readings from VWP in good agreement with pressure gauges.
- Ensero has continued to treat all Red & Bonita water. The IWTP continues to successfully treat the 500 to 600 gpm of Red & Bonita water along with the base load of approximately 320 gpm from Gold King. The dewatering bags that contain the underflow from the plant have filled and have been stressed with the heavy hydraulic load. A new bag was deployed on October 7 which has relieved the sludge dewatering process.
- IWTP flows have been plotted against the Gold King and R&B flows in Figure 6. This figure shows the relationship between the flows measured at the plant and the flows measured at Red & Bonita and Gold King. The flows should be identical. Prior to treating R&B water, the measured flow rates at Gold King and the plant were very close. Once the R&B water was added, the difference in readings increased to 80-120 gpm.
- One new seepage location was discovered this week, SS425, approximately 230 feet down slope of SS422 along CR 52.

**Actions for Next Week:**

- Continue to monitor the pressure behind the bulkhead while drain down and treatment of outflow water continues.
- Drain at 300-600 gpm depending on plant performance. Rate will be adjusted slowly in close coordination with plant operators.
- As R&B drains down there is potential for an increase in metals or solid materials, which could cause issues at the plant. The drain down will continue at a rate that is sustainable at the IWTP.
- Measure pressure gauges and pipe sensor in R&B once per day (ER).
- Three time per week take flume measurements in R&B (ER).
- Bi-weekly inspections of some sampling sites and emergent flow sites in the area (MSI). No inspections next week.

**Observations by Location at Originally Planned Sites (See Bulkhead Test Execution Plan):**

Location	Observations
Adams Mine	No noticeable changes.
Adams Mine – North Adit	No noticeable changes.
Adit 268-20	No noticeable changes.
Adit 268-21	No noticeable changes.
American Tunnel	No noticeable changes.
ATPZ-2	No noticeable changes.
Blackhawk Mine	No noticeable changes.
Gladstone Seeps & Springs	No noticeable changes.
Gold King Level 7	No noticeable changes.
Lead Carbonate Mine	No noticeable changes.
Mogul Mine	No noticeable changes.
Mogul Mine – South Adits	No noticeable changes.
Natalie / Occidental	No noticeable changes.
NFPZ-1	No noticeable changes.
North Fork Seeps & Springs	No noticeable changes.
Pride of Bonita	No noticeable changes.
Red & Bonita	See key observations above.
Red & Bonita / Adams Mine Gulch Seeps & Springs	Not observed this week.
Terry Tunnel	No noticeable changes.
2020 Seeps & Springs	No significant changes. One new seepage location, SS425, was discovered along CR 52, not enough water to sample. Most of the seeps are drying out, approximately 5 of the seeps are now dry from two weeks ago.

**Figure 1:** Head Behind Red & Bonita Bulkhead and Gold King Flows vs. Time (Current Testing Period)

**Figure 2:** Gold King Flow and Red & Bonita Head vs. Time (Full Testing Period)

**Figure 3:** Adit Flows and Piezometers vs. Time

**Figure 4:** NFPZ-1 and ATPZ-2 vs. Time

**Figure 5:** Red & Bonita Adit Flume Flows

**Figure 6:** IWTP Flows vs R&B and Gold King Flows

**Attachment A:** Week 13 Photo Log

**Attachment B:** Summary Report of MSI Observations (Table & Maps)

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## FIGURES

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FIGURE 1: Head on Red & Bonita Bulkhead and Gold King Flow Rate

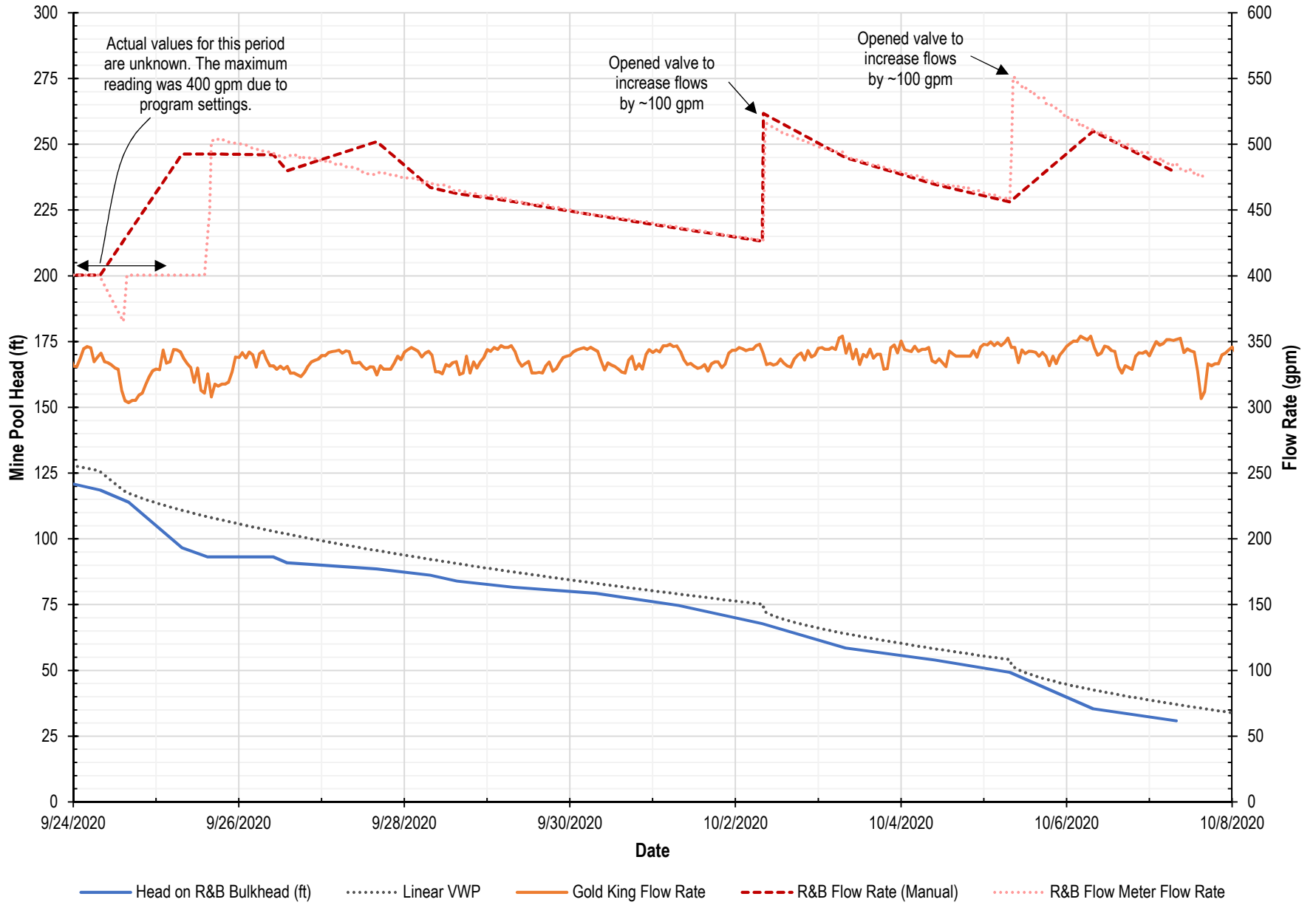


FIGURE 2: Head on Red & Bonita Bulkhead and Gold King Flow Rate - Full Time Period

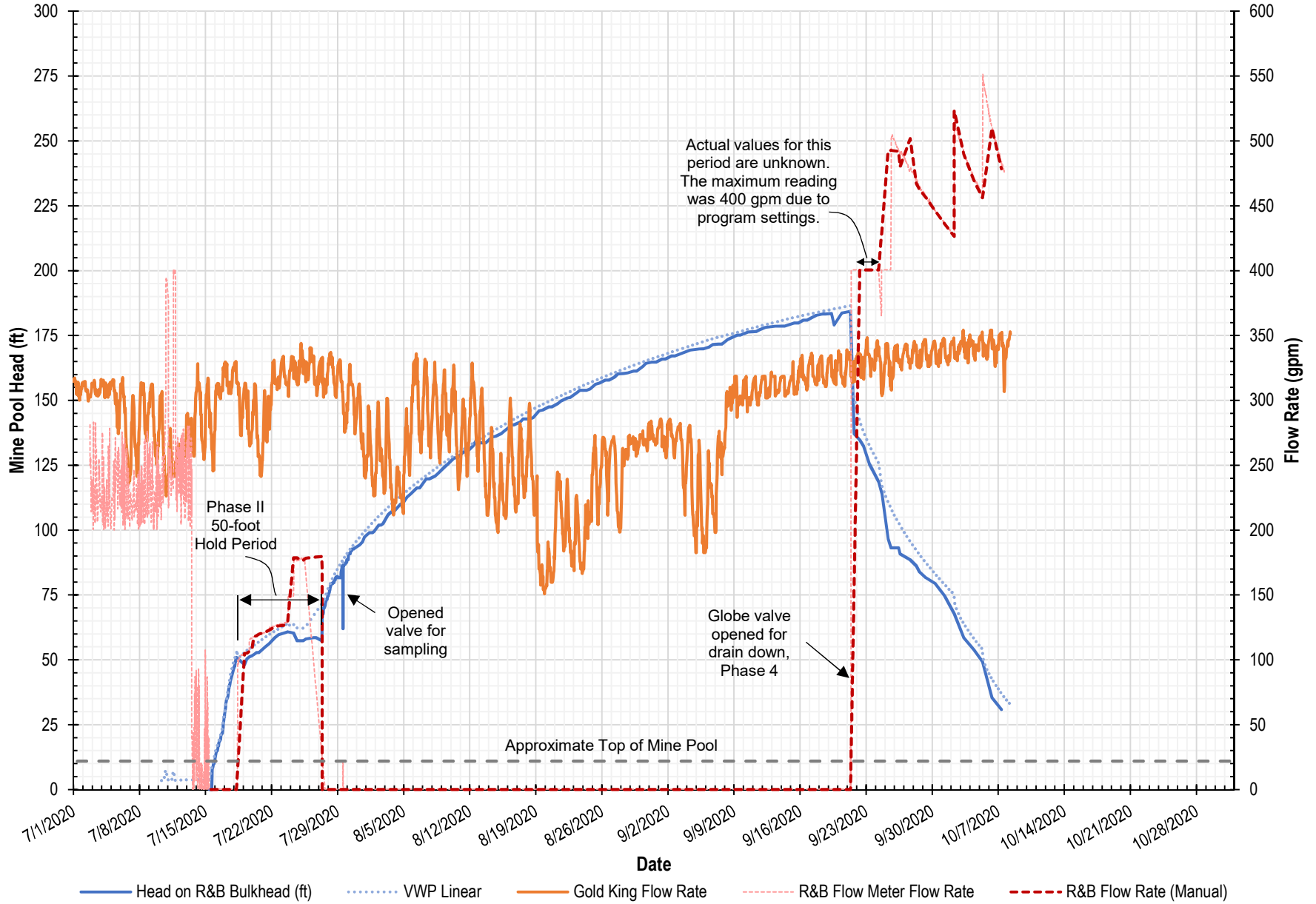


FIGURE 3: Adit Flows and Water Levels

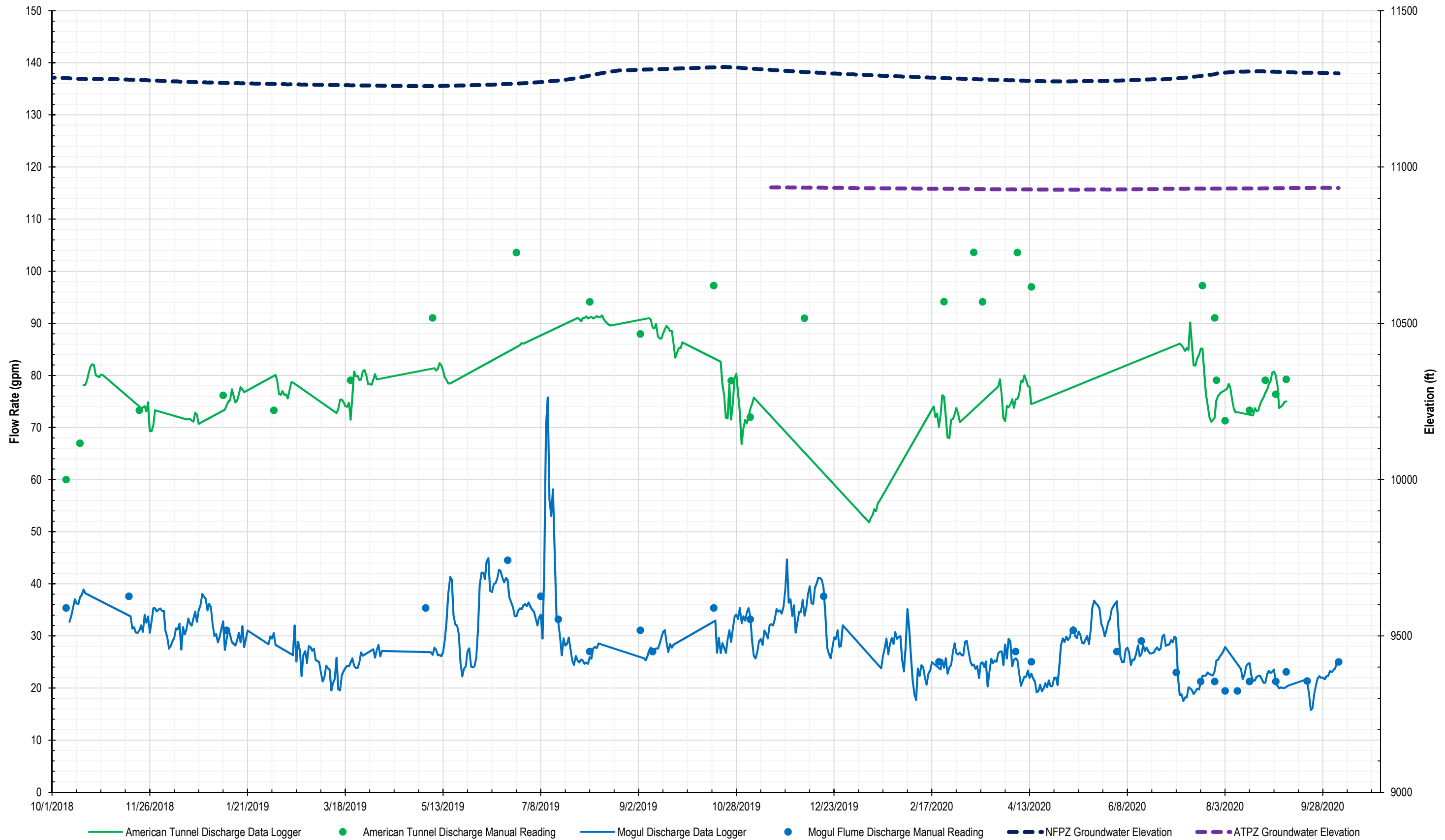


FIGURE 4: Groundwater Elevations

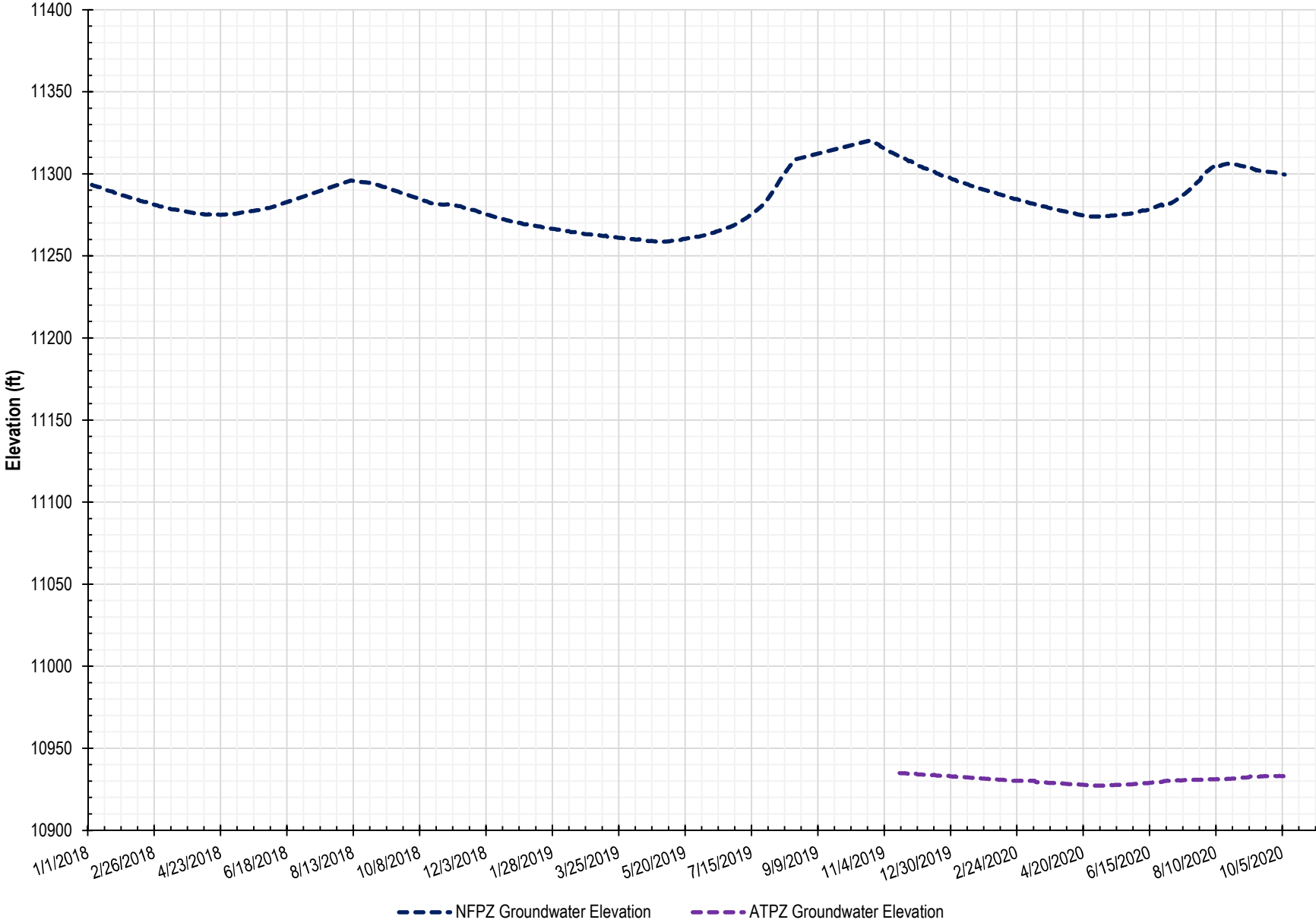




FIGURE 5: Red & Bonita Adit Flume Flow Rates

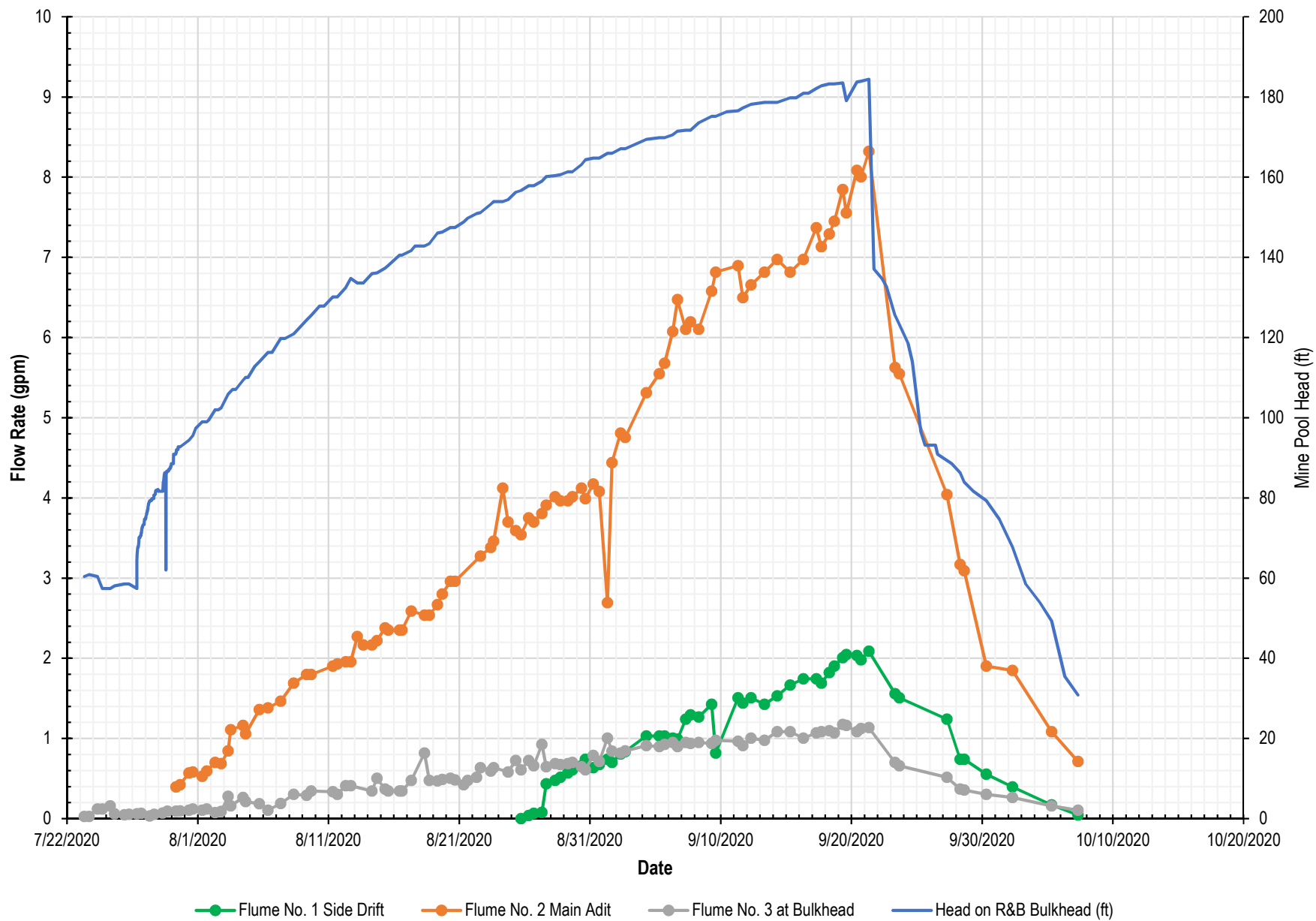
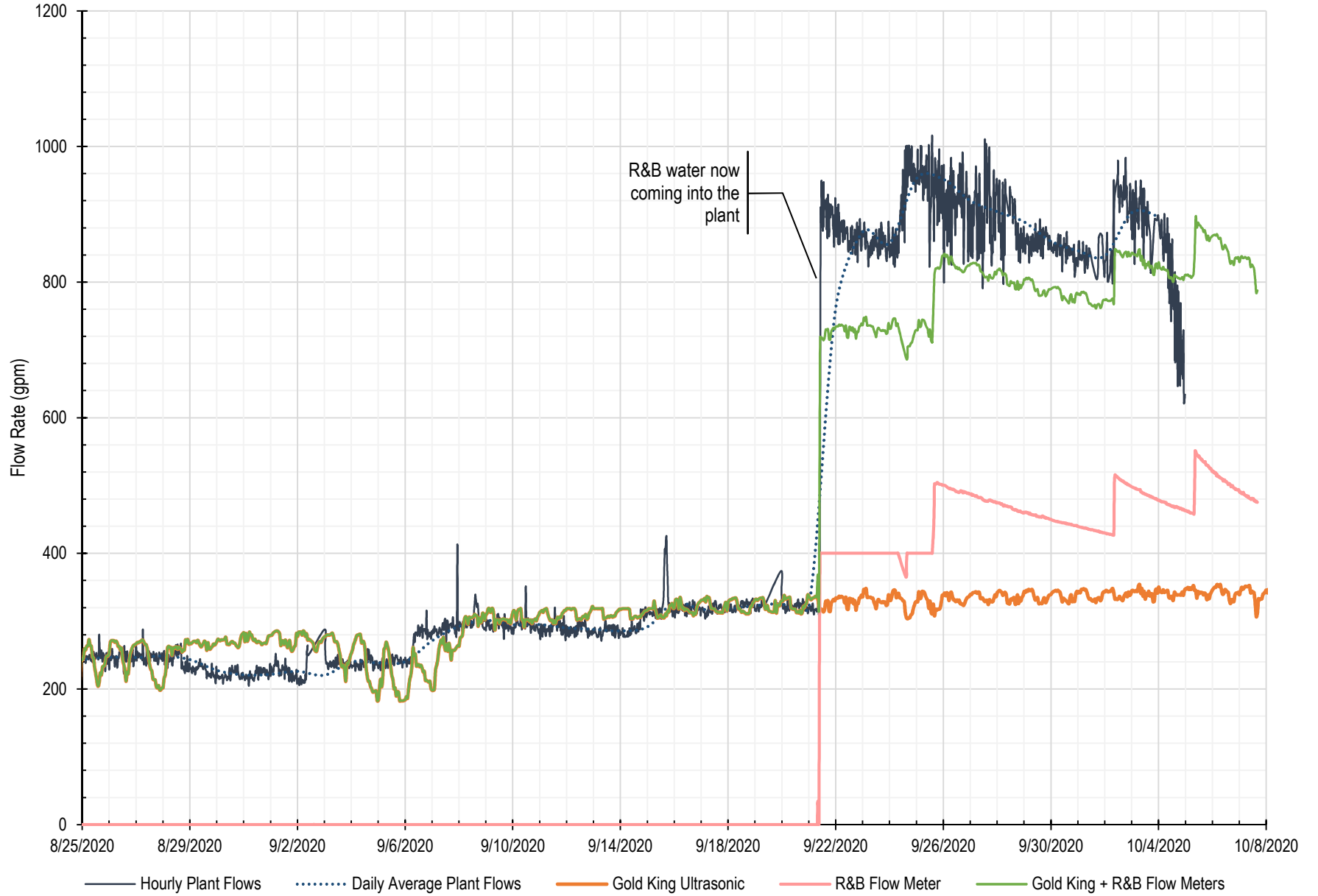


FIGURE 6: IWTP Flows vs. R&B and Gold King



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## ATTACHMENT A: PHOTOGRAPHS

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PHOTO 1

DATE TAKEN: 10/06/2020

LOCATION:

Red & Bonita Flow Meter

COMMENTS:

Flow meter in casing. Reading was about 510 gpm.



PHOTO 2

DATE TAKEN: 10/06/2020

LOCATION:

Red & Bonita Portal

COMMENTS:

Portal sump pond below overflow pipe





PHOTO 3

DATE TAKEN: 10/06/2020

LOCATION:

Red & Bonita Bulkhead

COMMENTS:

Less seepage around the bulkhead. Note light precipitate on right vs darker precipitate on left and center.



PHOTO 4

DATE TAKEN: 10/06/2020

LOCATION:

Red & Bonita near station 2+20

COMMENTS:

Less wet and dripping since opening the valve.





PHOTO 5

DATE TAKEN: 10/06/2020

LOCATION:

Flume # 3 at R&B bulkhead

COMMENTS:

Flume # 3 still draining, but at a lower rate (~0.1 gpm).



PHOTO 6

DATE TAKEN: 10/06/2020

LOCATION:

Flume # 1, Side Drift

COMMENTS:

Still flowing but at a lower rate, (~0.1 gpm)





PHOTO 7

DATE TAKEN: 10/06/2020

LOCATION:

Flume # 2, Main adit

COMMENTS:

Flume # 2 still draining, but at a lower rate (~1 gpm).



PHOTO 8

DATE TAKEN: 10/06/2020

LOCATION:

Red & Bonita main adit near 2+05

COMMENTS:

Back and ribs much drier

**DEERE & AULT**  
A SCHNABEL ENGINEERING COMPANY

RED & BONITA BULKHEAD TEST  
US EPA  
BONITA PEAK MINING DISTRICT, COLORADO  
PROJECT NO. 20C26021.00

Weekly Report No. 13  
October 1-7, 2020

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## ATTACHMENT B: MSI OBSERVATION SUMMARY

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Event Date	Event Time	Location ID	Location Description	Temp (Celsius)	Specific Conductivity (μS/cm)	pH	Flow (CFS)	Flow (GPM)	Observations
10/7/2020	13:01	ATPZ02	ATPZ-2	NA	NA	NA	NA	NA	No noticeable change since last visit.
10/7/2020	11:37	CC01B	Mogul Mine	6.4	1600	3.5	0.0561	25.2	No noticeable change since last visit.
10/5/2020	11:56	CC03C	Red and Bonita Mine	7.5	1745	5.63	NA	NA	No noticeable change since last visit.
10/7/2020	12:42	CC06	Gold King Level 7	10.7	1852	3.49	NA	NA	No noticeable change since last visit.
10/5/2020	9:06	CC14	Natalie Occidental Mine	6.23	1033	6.23	NA	NA	No noticeable change since last visit. Monthly draining mines visit.
10/5/2020	11:35	CC19	American Tunnel	8.1	2030	4.42	0.1832	82.2	No noticeable change since last visit.
10/7/2020	12:45	NFPZ1	NFPZ	NA	NA	NA	NA	NA	Dry. No noticeable change since last visit.
10/6/2020	14:39	RBPZ01	R&B fen below R&B Mine	NA	NA	NA	NA	NA	Dry. No noticeable change since last visit.
10/6/2020	14:35	RBPZ02	R&B fen below R&B Mine	NA	NA	NA	NA	NA	Dry. No noticeable change since last visit.
10/6/2020	14:29	RBPZ03	R&B fen below R&B Mine	NA	NA	NA	NA	NA	Dry. No noticeable change since last visit.
10/5/2020	10:08	SS016	Historic SS016, South Fork Cement Creek	3.9	306	5.07	0.007416	3.3	No noticeable change since last visit.

Event Date	Event Time	Location ID	Location Description	Temp (Celsius)	Specific Conductivity (µS/cm)	pH	Flow (CFS)	Flow (GPM)	Observations
10/5/2020	10:17	SS017	Historic SS017, South Fork Cement Creek	3.8	386	4.15	0.003178	1.4	No noticeable change since last visit.
10/5/2020	10:50	SS055	Mine debris pile on the corner of CR53 and CR52	3	240.5	5.83	6.10E-05	0.0	No noticeable change since last visit.
10/6/2020	14:12	SS060	Cement Creek above North Fork	6.3	72.8	5.11	0.001312	0.6	No noticeable change since last visit.
10/6/2020	14:47	SS061	Cement Creek above North Fork	NA	NA	NA	NA	NA	Dry. No noticeable change since last visit.
10/6/2020	14:51	SS062	Cement Creek above North Fork	5.5	726.4	4.17	0.000989	0.4	No noticeable change since last visit.
10/6/2020	13:42	SS067	Cement Creek above North Fork	5.5	1327	3.72	0.000589	0.3	No noticeable change since last visit.
10/6/2020	13:20	SS068	Above AT below N Fork	6.2	940	3.71	0.002225	1.0	Historic SS068, near SS086. No noticeable change since last visit.
10/6/2020	14:55	SS069	Cement Creek above North Fork	5.5	533.6	4.22	0.0010	0.4	No noticeable change since last visit.
10/7/2020	12:56	SS084	North Fork Cement Creek	NA	NA	NA	NA	NA	Dry. No noticeable change since last visit.

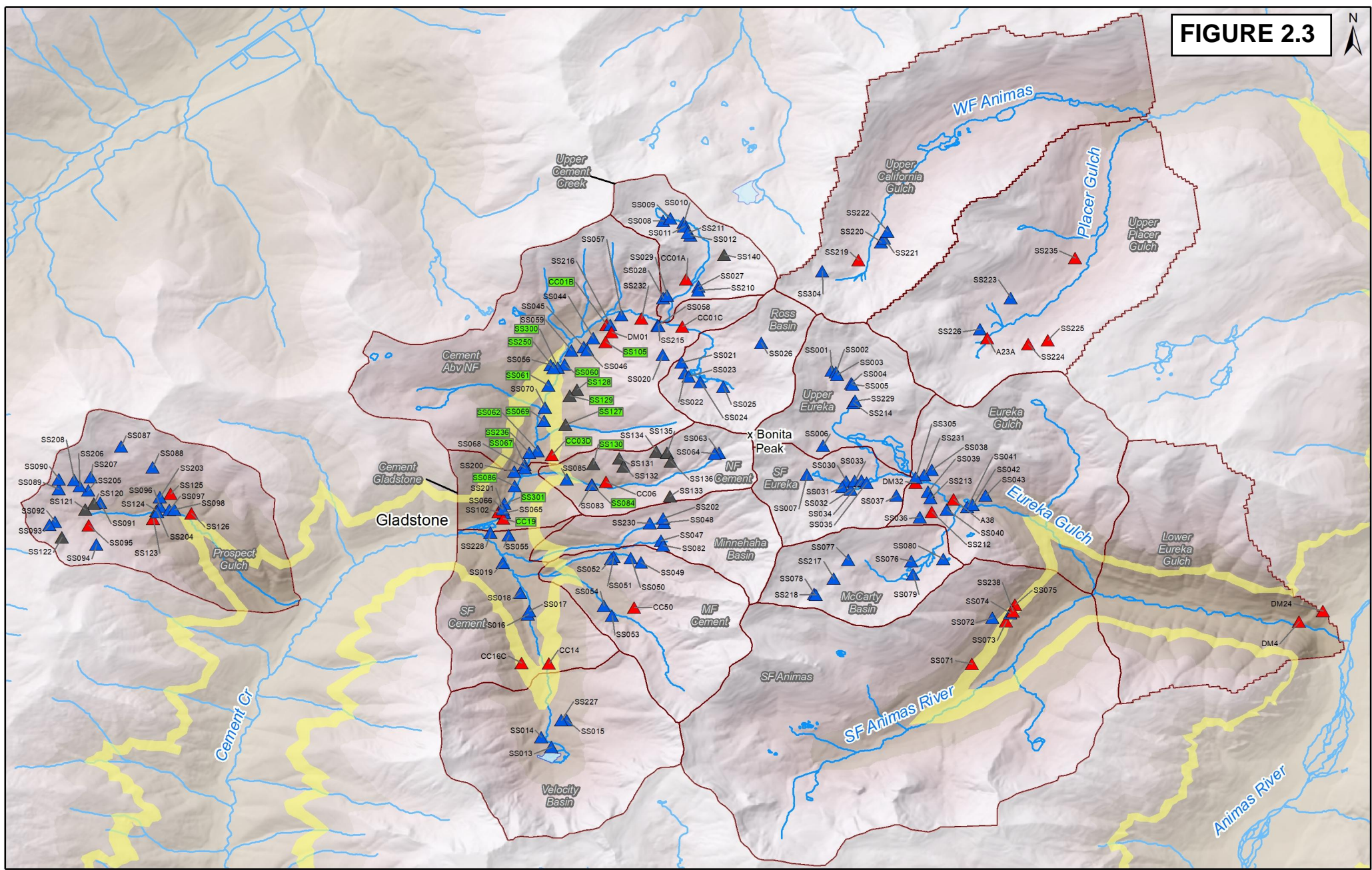
Event Date	Event Time	Location ID	Location Description	Temp (Celsius)	Specific Conductivity (μS/cm)	pH	Flow (CFS)	Flow (GPM)	Observations
10/5/2020	12:59	SS086	Above AT below N Fork	7.3	1230	3.35	0.0008	0.4	No noticeable change since last visit.
10/6/2020	13:53	SS105	Mogul South Mine	4.5	936.5	6.58	0.04312	19.4	No noticeable change since last visit.
10/6/2020	15:15	SS236	Cement Creek above North Fork	8.9	783.2	2.19	0.0070	3.1	No noticeable change since last visit.
10/6/2020	14:26	SS250	Cement Creek above North Fork	8.3	1251	6.55	0.029796	13.4	No noticeable change since last visit.
10/6/2020	14:17	SS300	Cement Creek above North Fork	6.2	29.2	4.89	8.60E-05	0.0	No noticeable change since last visit.
10/5/2020	12:06	SS301	Cement Creek above AT	6.4	2010	3.13	0.004944	2.2	No noticeable change since last visit.
10/5/2020	13:12	SS400	East side of road, above SS086	4.4	1048	3.66	0.0039	1.8	No noticeable change since last visit.
10/5/2020	13:24	SS401	East side of road, above SS086	12.4	1448	4.39	0.000371	0.2	No noticeable change since last visit.
10/5/2020	13:34	SS402	South side of NFPZ adjacent to CCSG5	3.9	1807	3.18	0.0005	0.2	No noticeable change since last visit.
10/6/2020	12:58	SS404	Culvert north of North Fork Cement Creek	8.4	806	4.31	0.011753	5.3	No noticeable change since last visit.

Event Date	Event Time	Location ID	Location Description	Temp (Celsius)	Specific Conductivity (µS/cm)	pH	Flow (CFS)	Flow (GPM)	Observations
10/5/2020	12:46	SS405	East side of road, south of North Fork Cement Creek	6	1378	4.11	0.0011	0.5	No noticeable change since last visit.
10/5/2020	11:16	SS406	100m right of CC19	11.1	1763	3.04	0.0007	0.3	No noticeable change since last visit.
10/7/2020	12:03	SS407	Below R&B Mine	10	2020	2.5	0.0005	0.2	No noticeable change since last visit. Less disperse flow.
10/7/2020	12:12	SS408	Below R&B Mine	8.2	2610	2.48	0.0003	0.1	No noticeable change since last visit.
10/6/2020	15:33	SS409	East side of CR53	NA	NA	NA	NA	NA	Dry. No noticeable change since last visit.
10/6/2020	15:20	SS410	West Side of Cement Creek	8.6	1249	3.41	0.0034	1.5	No noticeable change since last visit.
10/6/2020	15:24	SS411	Located between SS410 and SS416 along Cement Creek	6.7	699.5	4.11	0.0073	3.3	No noticeable change since last visit.
10/5/2020	12:35	SS412	Above AT along CR53	11.7	2310	2.89	0.0017	0.8	No noticeable change since last visit.
10/5/2020	11:12	SS413	Corner of CR53 and CR51	5.4	1488	3.57	0.0024	1.1	No noticeable change since last visit.
10/6/2020	15:09	SS415	R&B Outflow Channel	8.5	881.5	3.69	0.0074	3.3	No noticeable change since last visit.
10/6/2020	14:17	SS416	R&B Outflow Channel	4	1689	1.94	0.0002	0.1	No noticeable change since last visit.

Event Date	Event Time	Location ID	Location Description	Temp (Celsius)	Specific Conductivity (μS/cm)	pH	Flow (CFS)	Flow (GPM)	Observations
10/6/2020	13:59	SS417	R&B Outflow Channel	11.3	1567	4.16	0.0007	0.3	No noticeable change since last visit.
10/5/2020	13:46	SS418	North tongue of North Fork	4.13	1723	3.6	8.70E-05	0.0	No noticeable change since last visit.
10/5/2020	11:02	SS419	Culvert between SS055 and SS413	5.5	788	4.42	0.006243	2.8	No noticeable change since last visit.
10/7/2020	12:10	SS421	Headwall in drainage between 127 and Adams (127.5)	NA	NA	NA	NA	NA	Dry. No noticeable change since last visit.
10/5/2020	10:30	SS422	South Fork Cement Creek	0.82494	249.4	5.1	NA	NA	No noticeable change since discovery last visit. Located between SS016 and SS017 on upslope side of road. Not enough water for flow or field parameters.
10/5/2020	10:37	SS423	Below SS422 South of house on CR52	4.7	730	6.01	0.0038	1.7	No noticeable change since last visit.
10/5/2020	10:28	SS425	70m Below SS422 South Fork Cement Creek	NA	NA	NA	NA	NA	New seep. Located 70 meters below SS422 on upslope side of rode.



**FIGURE 2.3**



**BPMD**

**Seeps, Springs,  
& Draining Mines  
2016-18**



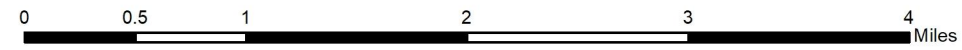
Locations sampled 2016-18

- ▲ Draining Mine
- ▲ Dry Mine
- ▲ Seep/Spring

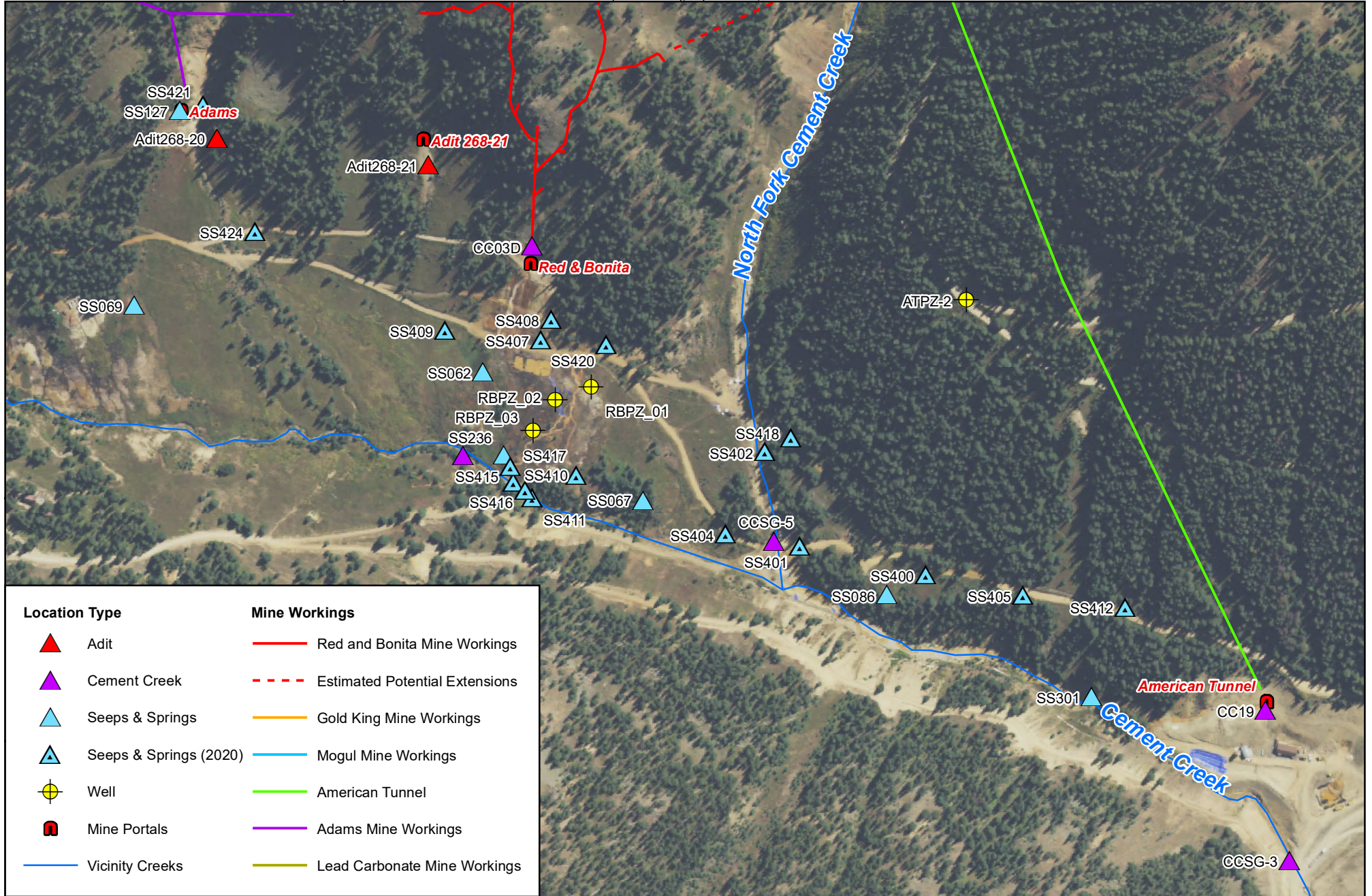
200' Elevation Band Above Red & Bonita Mine

Sub-basins focused on for this report

Locations sampled 2016-18 selected to be sampled in 2020





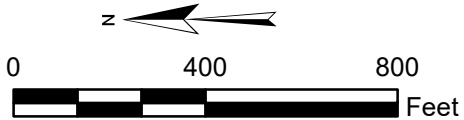


**Location Type**

- ▲ Adit
- ▲ Cement Creek
- ▲ Seeps & Springs
- ▲ Seeps & Springs (2020)
- ⊕ Well
- Mine Portals
- Vicinity Creeks

**Mine Workings**

- Red and Bonita Mine Workings
- Estimated Potential Extensions
- Gold King Mine Workings
- Mogul Mine Workings
- American Tunnel
- Adams Mine Workings
- Lead Carbonate Mine Workings



**DEERE & AULT**  
A SCHNABEL ENGINEERING COMPANY

**RED & BONITA BULKHEAD TEST  
MONITORING LOCATIONS**

JOB NO: 20C26021.00

SCALE: 1 inch = 400 feet

FIGURE NO.

**B-3**



