



**Huddleston-Berry**  
Engineering & Testing, LLC

2789 Riverside Parkway  
Grand Junction, Colorado 81501  
Phone: 970-255-8005  
[Info@huddlestonberry.com](mailto:Info@huddlestonberry.com)

October 31, 2023  
Project#01349-0001

Bowie Resources, LLC  
43659 Bowie Road  
Paonia, Colorado 81428

Attention: Mr. Basil Bear

Subject: Summary of Instrumentation Monitoring  
3<sup>rd</sup> Quarter 2023  
Bowie Coal Waste Disposal Area No. 3  
Paonia, Colorado

Reference: *Summary of Instrumentation Monitoring, 2<sup>nd</sup> Quarter 2023, Bowie Coal Waste Disposal Area No. 3, Paonia, Colorado* by Huddleston-Berry Engineering & Testing, LLC for Bowie Resources, LLC, July 11, 2023.

*Stability Evaluation, Gob Pile #3, Bowie No. 2 Mine* by Huddleston-Berry Engineering & Testing, LLC for Bowie Resources, LLC, July 15, 2014.

Dear Mr. Bear,

At the request of the Colorado Division of Reclamation, Mining and Safety (DRMS), Huddleston-Berry Engineering & Testing, LLC (HBET) prepared this letter regarding quarterly monitoring of vibrating wire piezometers at Coal Waste Disposal Area No. 3 (CWDA No. 3) at the Bowie mine near Paonia, Colorado. The intent of the monitoring was to detect significant changes in the pore water pressures within the coal waste which may impact the stability of the waste pile.

### **Vibrating Wire Piezometers**

Five vibrating wire piezometers were installed in CWDA No. 3 in October 2014. The piezometers were installed at three locations within the footprint of the gob pile as shown on the attached figure. Monitoring of the functioning piezometers was completed by Buckhorn Engineering (Buckhorn) on September 26<sup>th</sup>, 2023. The attached monitoring report prepared by Buckhorn includes the piezometer monitoring data and the data is summarized in the following table.

VWP ID	Initial Pore Pressure 10/31/14 (psi)	06/20/23 Pore Pressure (psi)	09/26/23 Pore Pressure (psi)	Difference Since Installation (psi)	Difference Since Last Reading (psi)
VWP-A Deep	10.4	6.1	3.9	-6.5	-2.2
VWP-A Shallow	4.7	2.3	2.2	-2.5	-0.1
VWP-B Deep	0.2	0.1	1.2	+1.0	+1.1
VWP-B Shallow	13.9	6.5	6.3	-7.6	-0.2
VWP-D	7.1	5.4	5.4	-1.7	0.0

## **Discussion of Vibrating Wire Piezometers**

### **VWP-A Deep**

VWP-A Deep was installed on October 6, 2014 near the northern edge of CWDA No. 3. VWP-A Deep was installed in the foundation soil approximately eight feet below the bottom of the gob. The pore pressures recorded at VWP-A Deep generally decreased since installation until September 2015. After that, the pore pressures have generally fluctuated in a narrow range; however, a significant increase in pore pressures has been observed in September of 2019, and June of 2022 and 2023. These 'spikes' may reflect climatic conditions during the summer months. However, HBET does not believe that the pore pressure changes in VWP-A Deep are an indication of instability in CWDA No. 3 and we anticipate that the next quarterly reading will show a decrease in pore pressures.

### **VWP-A Shallow**

VWP-A Shallow was installed on October 6, 2014 near the northern edge of CWDA No. 3. VWP-A Shallow was installed approximately ten feet above the base of the gob. After installation, the pore pressures dropped until November 2014. Between November 2014 and September 2015, increases in the pore pressures were recorded at VWP-A Shallow. However, between September 2015 and December 2016, the pore pressures decreased. Since then, the data have fluctuated within a narrow range; with a general downward trend. In general, HBET does not believe that the pore pressure changes in VWP-A Shallow are an indication of instability in CWDA No. 3.

### **VWP-B Deep**

VWP-B Deep was installed on October 6, 2014 in the west-central portion of CWDA No. 3. VWP-B Deep was installed in the foundation soil approximately ten feet below the bottom of the gob. Since installation, the pore pressures recorded at VWP-B Deep have fluctuated within a narrow range. In general, HBET does not believe that the pore pressure changes in VWP-B Deep are an indication of instability in CWDA No. 3.

### **VWP-B Shallow**

VWP-B Shallow was installed on October 6, 2014 in the west-central portion of CWDA No. 3. VWP-B Shallow was installed approximately ten feet above the base of the gob. Since installation, the pore pressures recorded at VWP-B Shallow have fluctuated with periods of slight increase and slight decrease; likely associated with activity on the gob pile. However, the pore pressures have shown a decreasing trend over the last several years. In general, HBET does not believe that the pore pressure changes in VWP-B Shallow are an indication of instability in CWDA No. 3.

### **VWP-D**

VWP-D was installed on October 7, 2014 in the east-central portion of CWDA No. 3. VWP-D was installed approximately ten feet above the base of the gob. Since installation, the pore pressures recorded at VWP-D have fluctuated. However, the pore pressures increased significantly in June 2022 before leveling out. Since then, the fluctuations have been within a narrow range and HBET does not believe that the pore pressure changes in VWP-D are an indication of instability in CWDA No. 3.

**General**

Based upon the results of the most recent VWP monitoring data, HBET does not believe that there is any reduction in the stability of CWDA No. 3.

We are pleased to be of service to your project. Please contact us if you have any questions or comments regarding the contents of this report.

Respectfully Submitted:

**Huddleston-Berry Engineering and Testing, LLC**



Michael A. Berry, P.E.  
Vice President of Engineering

**ATTACHMENTS**



September 29, 2023

Mr. Mike Berry, PE  
Huddleston-Berry Engineering and Testing, LLC  
2789 Riverside Parkway  
Grand Junction, CO 81501

**SUBJECT: Summary Report, 3<sup>rd</sup> Quarter 2023, Vibrating Wire Piezometers  
July – September 2023, Bowie Mine #2  
Coal Waste Disposal Area (CWDA) #3**

Greetings Mr. Berry,

Buckhorn Engineering, Inc. (BEI) conducted quarterly monitoring of installed vibrating wire piezometers (VWP) at Coal Waste Disposal Area #3 (CWDA #3), Bowie Resources, LLC Bowie Mine #2. This report is for the period of July through September 2023 (3<sup>rd</sup> Quarter). VWP data was recorded on September 26, 2023. Per the Colorado Division of Reclamation, Mining & Safety (CDRMS) and at your direction, vibrating wire piezometer readings for all active piezometers are currently taken quarterly.

We present a graph of measured pore pressures on the attached Figure 1 and numerically in Table 1 below. Table 1 is a summary of the initial, last year, last quarter and current readings. In addition, we present the difference between the current pore pressures and those at the time of installation, the previous quarter, and previous year.

**Table 1. Summary of Pore Pressure Readings**

VWP ID #	Pore Pressure (psi)				Pressure Difference (psi)		
	Installation 10/31/2014	Last Year (Qtr 3) 9/29/2022	Last Quarter (Qtr 2) 6/20/2023	Current (Qtr 3) 9/26/2023	Since Installation	Since Last Year (Qtr 3)	Since Last Quarter (Qtr 2)
VWP-A Deep	10.4	3.8	6.1	3.9	-6.5	0.1	-2.2
VWP-A Shallow	4.7	2.3	2.3	2.2	-2.5	-0.1	-0.1
VWP-B Deep	0.2	0.5	0.1	1.2	1.0	0.7	1.1
VWP-B Shallow	13.9	7.2	6.5	6.3	-7.6	-0.9	-0.2
VWP-D	7.1	5.3	5.4	5.4	-1.7	0.1	0.0

As seen on Figure 1 and Table 1, one of the five VWP's increased dramatically in pore pressure (VWP-B Deep), one decreased sharply in pore pressure (VWP-A Deep), and the other three had minor changes or no change in pore pressure when compared with the previous quarter. All VWP's have decreased in pore pressure since installation in 2014 except for VWP-B Deep, which fluctuates above and below the original pore pressure throughout its history. Although there is a general trend of decreasing pore pressure over time, three of the piezometers (VWP-A Deep, VWP-B-Deep and VWP-D) have more recent erratic behavior since early 2022.

If you have any questions regarding this letter or the instrumentation monitoring at CWDA #3, please contact me at (970) 497-8821 or [lbrandt@buckhornengineering.com](mailto:lbrandt@buckhornengineering.com).

Respectfully Submitted,  
**BUCKHORN ENGINEERING, INC.**



Laurie J. Brandt, CPG  
Certified Professional Geologist

Daniel C. Quigley, PE  
Principal/Senior Civil Engineer



Attachment: Figure 1 – Vibrating Wire Piezometer Data Graph



Figure 1 - Bowie Mine #2 - CWDA #3  
Vibrating Wire Piezometer Data

