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July 9, 2020  
Project#01349-0001

Bowie Resources, LLC  
43659 Bowie Road  
Paonia, Colorado 81428

Attention: Mr. Basil Bear

Subject: Summary of Instrumentation Monitoring  
2<sup>nd</sup> Quarter 2020  
Bowie Coal Waste Disposal Area No. 2  
Paonia, Colorado

Reference: *Summary of Instrumentation Monitoring, 1<sup>st</sup> Quarter 2020, Bowie Coal Waste Disposal Area No. 2, Paonia, Colorado* by Huddleston-Berry Engineering & Testing, LLC for Bowie Resources, LLC, April 14, 2020.

*Stability Evaluation, Technical Revision #85, Gob Pile #2 Drying Area, Bowie No. 2 Mine* by Huddleston-Berry Engineering & Testing, LLC for Bowie Resources, LLC, June 3, 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 and inclinometers at Coal Waste Disposal Area No. 2 (CWDA No. 2) at the Bowie mine near Paonia, Colorado. The intent of the monitoring was to detect significant changes in the pore water pressures or significant displacements within the coal waste which may impact the stability of the waste pile.

### **Inclinometers**

In 2005, three inclinometers, designated BG05-04, BG05-05, and BG05-07, were installed at CWDA No. 2 through the coal refuse and into the native foundation soils. The inclinometers have been monitored quarterly since August 2005. The 2<sup>nd</sup> Quarter 2020 monitoring was completed by DOWL on June 25<sup>th</sup>, 2020. The monitoring report prepared by DOWL includes a site plan showing the locations of the inclinometers and cumulative displacement curves relative to the baseline readings in 2005. Axis "A" reflects deformation with depth in the direction of anticipated movement perpendicular to the face of the gob. Axis "B" reflects deformation with depth parallel to the face of the gob.

### **Discussion of Inclinometer Monitoring**

The latest inclinometer readings indicate no major movements since the last quarterly reading. In general, the 1<sup>st</sup> Quarter 2020 monitoring data does not provide any indication of instability in CWDA No. 2.

### **Vibrating Wire Piezometers**

Between 2005 and 2012, a total of ten vibrating wire piezometers were installed in CWDA No. 2. However, several of the piezometers have been damaged or have otherwise ceased to function. Currently, five of the piezometers are functional.

Monitoring of the functioning piezometers was completed by DOWL June 25<sup>th</sup>, 2020. The attached monitoring report prepared by DOWL includes the piezometer monitoring data and the data is summarized in the following table.

VWP ID	Initial Pore Pressure (psi)	03/25/20 Pore Pressure (psi)	06/25/20 Pore Pressure (psi)	Difference Since Installation (psi)	Difference Since Last Reading (psi)
VWP-05	6.8	1.5	1.5	-5.3	0.0
VWP-06	11.3	11.8	11.7	+0.4	-0.1
VWP-08	8.2	8.6	8.6	+0.4	0.0
VWP-09	2.8	2.8	2.9	+0.1	+0.1
VWP-10	-1.9	-1.8	-1.7	+0.2	+0.1

### **Discussion of Vibrating Wire Piezometers**

#### **VWP-05**

VWP-05 was installed on August 3, 2005 near the toe of CWDA No. 2 adjacent to the access road/bench. The pore pressures recorded at VWP-05 have shown some seasonal fluctuations; however, the range of pore pressure changes is fairly small. In general, HBET does not believe that the pore pressures in VWP-05 are cause for concern regarding stability of the gob pile.

#### **VWP-06**

VWP-06 was installed on June 5, 2009 near the existing top of CWDA No. 2. The pore pressures recorded at VWP-06 have fluctuated since installation. In general, the fluctuations have been seasonal and reflect the level of coal mine waste placement activity on top of CWDA No. 2. In general, HBET does not believe that the measured pore pressures are an indication of any instability in CWDA No. 2.

#### **VWP-08**

VWP-08 was installed on June 5, 2009 at a slightly lower elevation than VWP-06. The pore pressures recorded at VWP-08 have fluctuated since installation. However, the fluctuations have generally been within a narrow range of values. The measured pore pressures are generally consistent with the level of coal mine waste placement activity at CWDA No. 2.

As indicated in the referenced *Stability Evaluation* report, the stability of CWDA No. 2 is sensitive to increases in pore pressures in VWP-08. An increase in the pore pressure of 7 psi in VWP-08 would result in a reduction of the Factor of Safety to below 1.5.

The current pore pressure reflects a piezometric surface elevation of approximately 6096 feet which is much less than the critical elevation of 6113 feet. As a result, HBET does not believe that the measured pore pressures in VWP-08 are any indication of instability in CWDA No. 2.

#### VWP-09

VWP-09 was installed on May 18, 2012 near the toe of CWDA No. 2. The pore pressures recorded at VWP-09 have been fairly steady since installation. This suggests that dewatering of the gob in this area is likely nearly complete. It is anticipated that the pore pressures at VWP-09 will remain fairly steady over time.

#### VWP-10

VWP-10 was installed on May 18, 2014 near the toe of CWDA No. 2. The pore pressures recorded at VWP-10 have been fairly steady since installation. This suggests that dewatering of the gob in this area is likely nearly complete. It is anticipated that the pore pressures at VWP-10 will remain fairly steady over time.

#### General

In general, based upon the results of the recent VWP and inclinometer monitoring data, HBET does not believe that there is any reduction in the stability of CWDA No. 2. Due to the limited activity at the mine, HBET recommends that the monitoring frequency be reduced to semi-annually.

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:

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



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

**ATTACHMENTS**

June 30, 2020

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

**SUBJECT: Summary Report, 2<sup>nd</sup> Quarter 2020, Inclinator and Active Vibrating Wire Piezometer Data April – June 2020, Bowie Mine #2 Coal Waste Disposal Area (CWDA) #2**

Greetings Mr. Berry:

DOWL conducted quarterly monitoring of inclinometers and vibrating wire piezometers (VWP) at Coal Waste Disposal Area #2 (CWDA #2), Bowie Resources, LLC Bowie Mine #2. This report is intended to cover the period of April through June 2020. Inclinator and VWP data were recorded on 6/25/20. Per Colorado Division of Reclamation, Mining & Safety (CDRMS) and your instructions, vibrating wire piezometer and inclinometer readings for all active instruments are recorded and reported quarterly.

**Vibrating Wire Piezometers**

The physical locations of the piezometers are shown on the attached Instrumentation Site Plan (Map 1). As seen on this map, five of the original VWP's were damaged and some were replaced. Currently, there are five active VWP's, and three of them are adjacent to inclinometers. The graph of historical VWP data from 5/16/05 through 5/21/14 is presented for reference as Figure 1. A graph of measured pore pressures of active piezometers is presented on the attached Figure 2 and is presented numerically in Table 1 below.

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

VWP ID #	Measured Pore Pressures (psi)				Pore Pressure Difference (psi)		
	Installation	Last Year 6/14/2019	Last Quarter 3/25/2020	Current 6/25/2020	Since Installation	Last Year	Last Quarter
VWP-05	6.8	1.5	1.5	1.5	-5.3	0.0	0.0
VWP-06	11.3	12.2	11.8	11.7	0.4	-0.5	-0.1
VWP-08	8.2	8.9	8.6	8.6	0.4	-0.3	0
VWP-09	2.8	2.8	2.8	2.9	0.1	0.1	0.1
VWP-10	-1.9	-1.8	-1.8	-1.7	0.2	0.1	0.1

As seen on Figure 2, the VWP readings and trends are consistent with recent and historic readings. Pore pressure readings varied very little (by 0 to  $\pm 0.1$  psi) since the first quarter readings. When compared with a year ago (Q2 2019), pore pressures varied from 0 to 0.1 psi for three of the piezometers and by -0.5 psi for VWP-06 and by -0.3 psi for VWP-08. Since installation, four of the piezometers experienced 0.4 psi or less, while VWP-05 had a pore pressure that decreased by 5.3 psi.

## **Inclinometers**

Three inclinometers, designated BG05-4, BG05-5, and BG05-7, were installed at CWDA #2 in August 2005. The inclinometers were installed through the coal refuse and approximately 20 feet into the native foundation soils. The locations of the inclinometers are shown on the attached Instrumentation Site Plan (Map 1). Baseline readings were taken on 8/10/05 and subsequent readings have generally been taken quarterly since that time. Displacement curves for each of the three inclinometers for the current and the prior three readings are presented as attachments to this letter in Figure 3. Axis "A" reflects deformation with depth in the direction of anticipated movement (downslope), while Axis "B" is orthogonal to Axis A.

As described in previous reports, historic displacements indicated on the plots for the approximate upper ten feet of the inclinometers since installation in 2005 are due to placement of cover soil on the face of the waste pile during revegetation operations in late 2006/early 2007. This man-caused displacement is documented in a report by Buckhorn Geotech dated September 22, 2008 to Bowie Resources called *Revised Stability Evaluations for Coal Mine Waste Disposal Area No. 2, Bowie No. 2 Mine*.

Based on the current inclinometer readings, there hasn't been downslope movement (Axis A) in any of the inclinometers since 2007 and they are generally consistent with previous readings. As we mentioned in our October 2019 (Q3) report, there appeared to have been some displacement in the orthogonal direction (Axis B) for inclinometer BG05-5B in the 3<sup>rd</sup> quarter of 2019. However, in June 2020 (Q2) the displacement graph appeared to be very similar to the March 2020 (Q1), March 2019 (Q1), June 2019 (Q2), and December 2019 (Q4) readings. Based on the three consistent readings listed above, we conclude that the displacement calculated in October 2019 (Q3) reading was due to a recording error near 42 feet and should be disregarded. We will continue to track this to confirm whether there is additional movement.

It should be noted that water was standing in the BGI05-04 inclinometer pipe at a depth of about 1 foot below grade (while it was at 5 feet during our Q1 site visit). Based on our observations there has always been water in the pipe. We measured water around 10 feet in inclinometer BGI05-07 during our June Q2 2020 readings and there was no water in the BGI05-05 pipe.

If you have any questions regarding this letter or the instrumentation monitoring at CWDA #2, please contact me at (970) 497-8821 or LBrandt@dowl.com.

Respectfully Submitted,  
**DOWL**



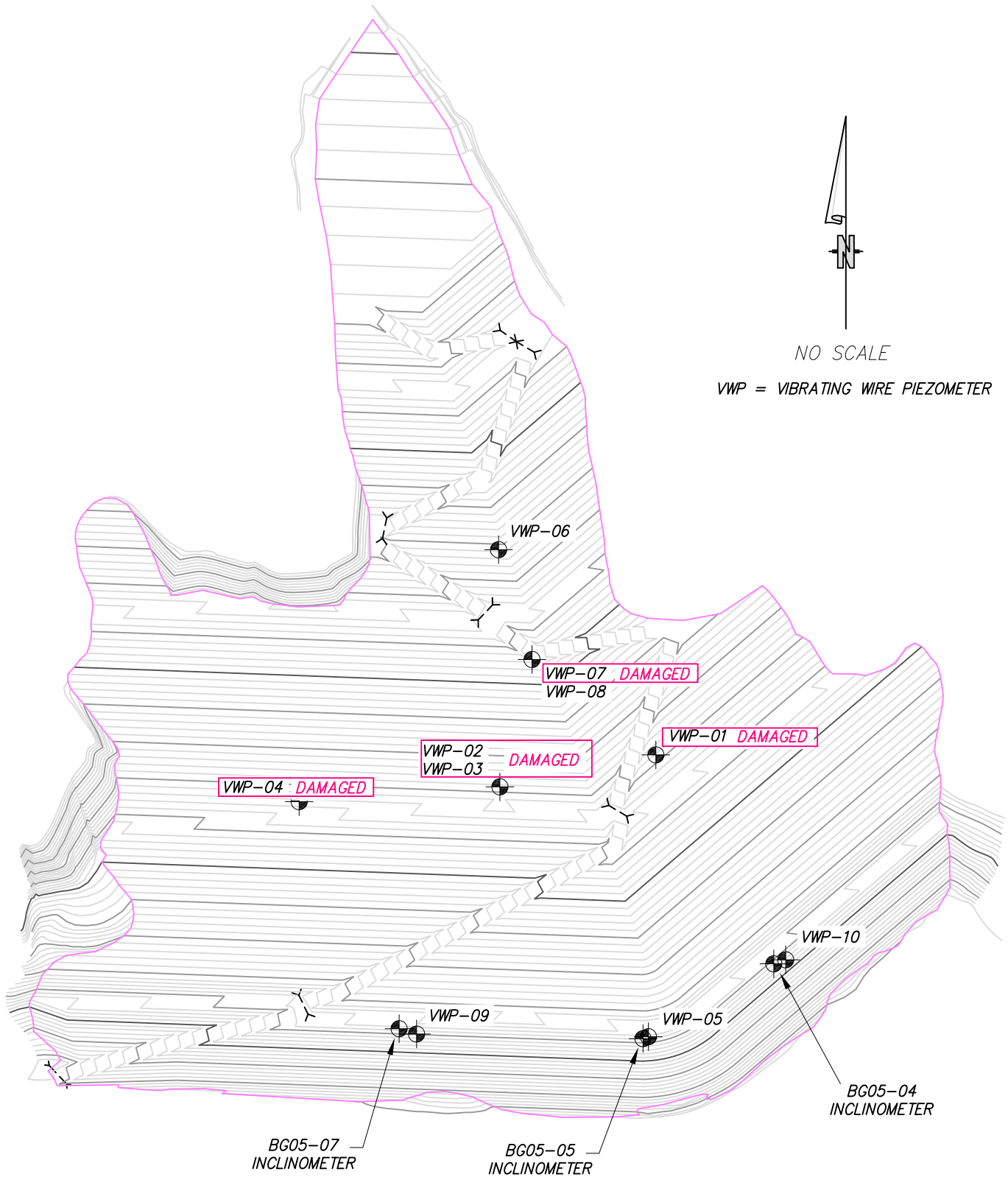
Laurie Brandt, CPG  
Professional Geologist



Dennis A. Russell, P.E.  
Geotechnical Engineer

Enclosures:    Map 1 – Instrumentation Location Plan  
                     Figure 1 – Active and Damaged Piezometer Data Graph (2005-2014)  
                     Figure 2 – Active Vibrating Wire Piezometer Data Graph (installation to present)  
                     Figure 3 – Inclinator Displacement Curves

# INSTRUMENTATION SITE PLAN



Map

1

OF 1

DATE

2017

JOB NO.

7131.74699.01

Huddleston-Berry

BOWIE #2 GOB PILE

DELTA COUNTY, COLORADO



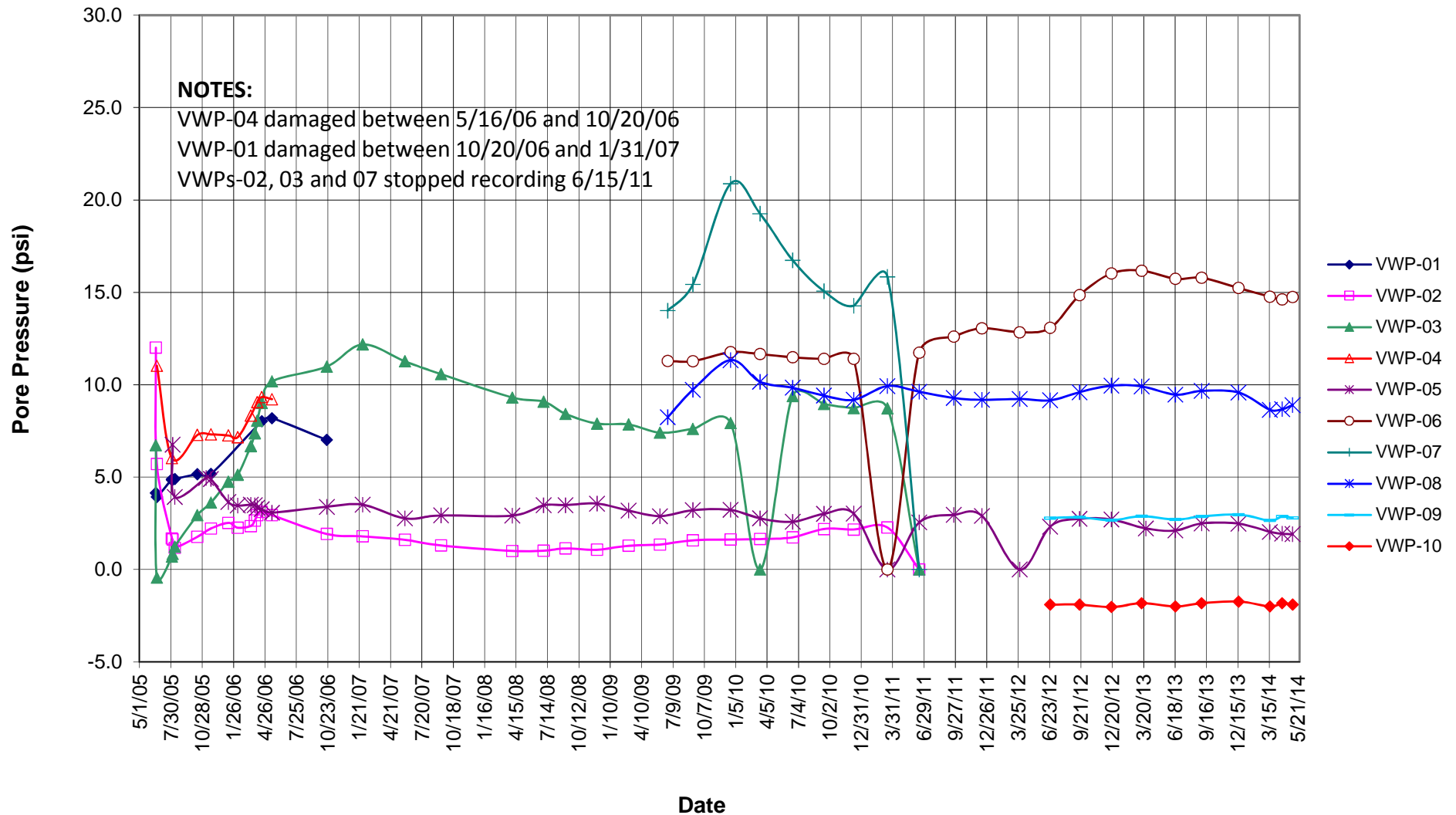
WWW.DOWL.COM

222 South Park Avenue  
Montrose, Colorado 81401  
970-249-6828

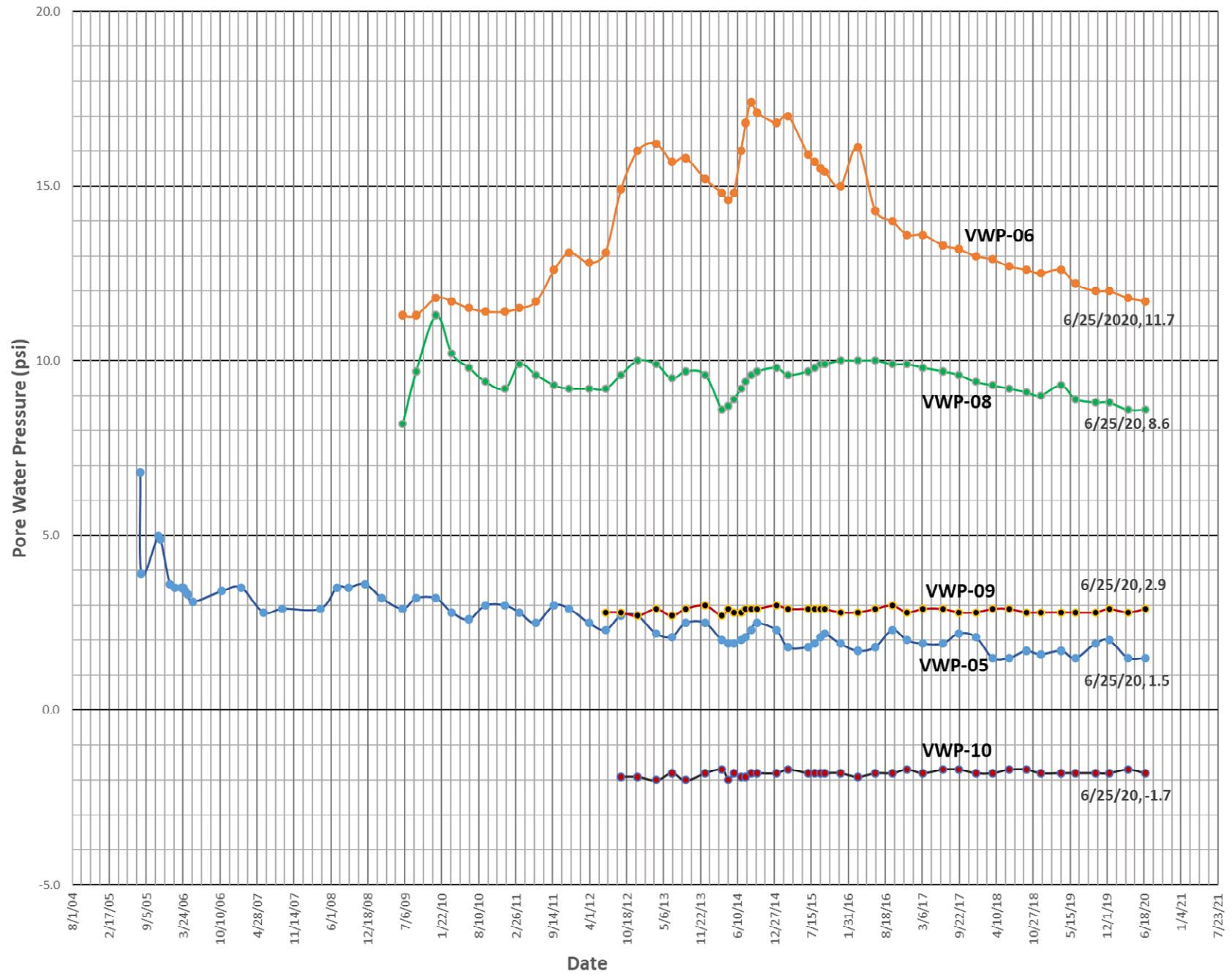


**Figure 1 - Bowie Mine #2 - CWDA #2**  
**Active and Damaged Vibrating Wire Piezometer Data**

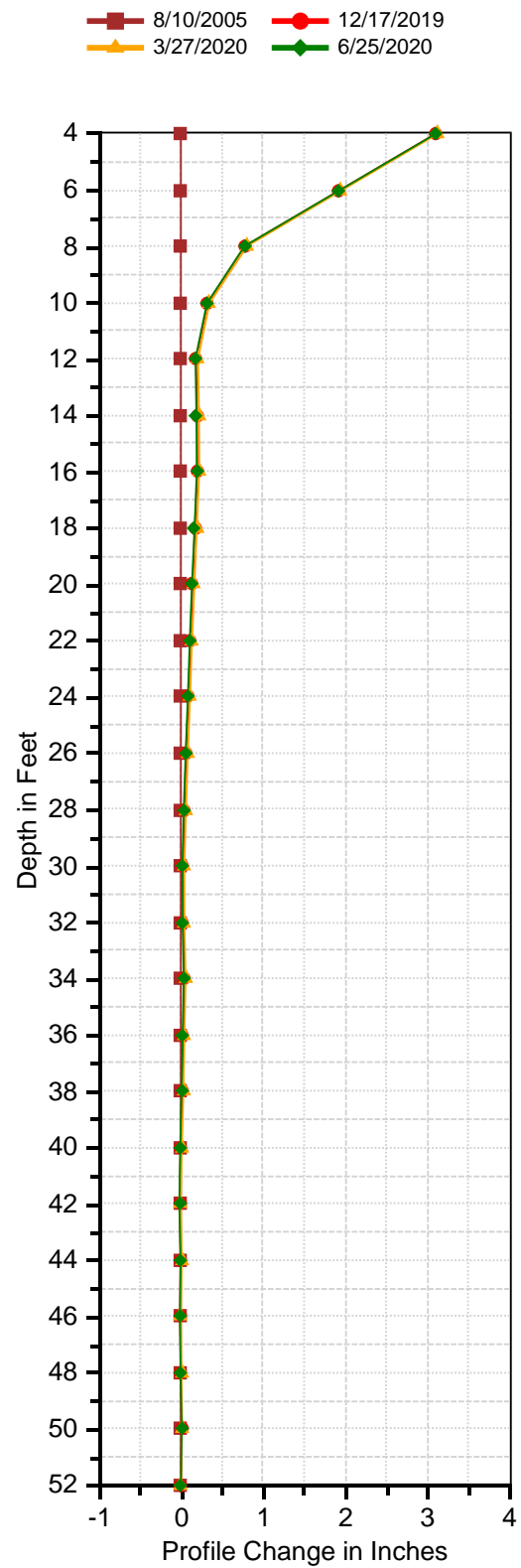
**Inception (5/16/05) through 5/21/14**



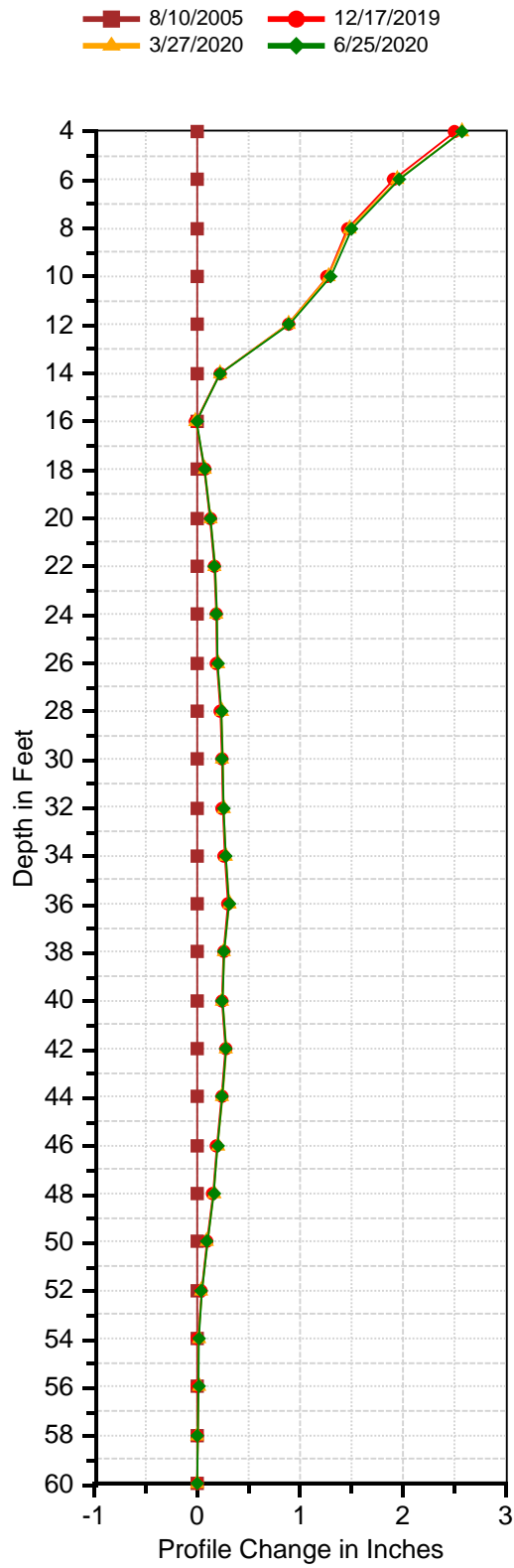
**Figure 2 - Bowie Mine #2 - CWDA #2**  
**Active Vibrating Wire Piezometer Data**



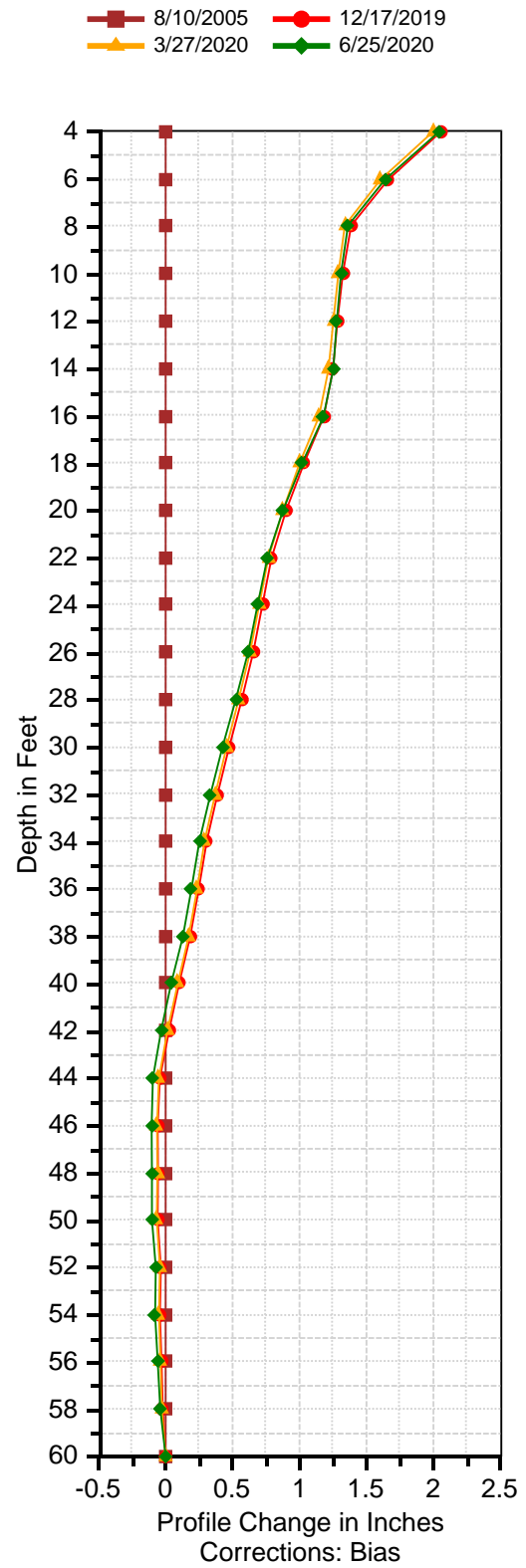
BOWIE BG05\_4 A



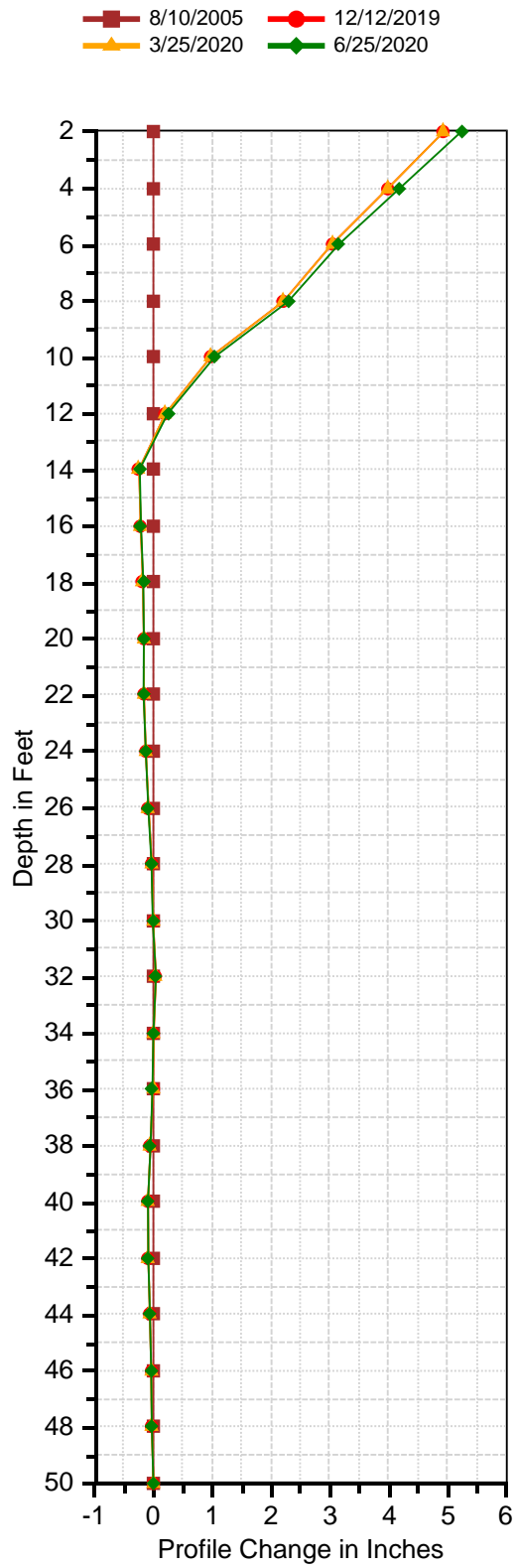
BOWIE BG05\_5 A



BOWIE BG05\_5 B



### BOWIE BG05\_7 A



### BOWIE BG05\_7 B

