

**J. E. STOVER & ASSOCIATES, INC.**

2352 NORTH 7<sup>TH</sup> STREET, UNIT B  
GRAND JUNCTION, COLORADO 81501  
PHONE: (970) 245-4101, FAX: (970) 242-7908

MINE ENGINEERING  
MINE RECLAMATION

CIVIL ENGINEERING  
CONST. MANAGEMENT

Via Electronic Transmittal

October 16, 2018

Janet Binns  
Division of Reclamation, Mining & Safety  
1313 Sherman St., Room 215  
Denver, CO 80203

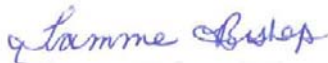
Re: Bowie Resources, LLC, Bowie No. 2 Mine  
Coal Mine Waste Banks & Instrumentation Monitoring  
Pond Quarterly Inspections  
Permit C-1996-083

Dear Ms. Binns:

Enclosed please find the referenced reports for the 3<sup>rd</sup> quarter of 2018.

Please call if you have any questions.

Sincerely,



Tamme Bishop, P.E.  
Project Engineer

cc: Wm. A. Bear, Jr.

## QUARTERLY POND INSPECTION REPORT

Operator:	Bowie Resources LLC	Quarter:	Second 2018
Mine:	Bowie No. 2 Mine - C-1996-083	Inspection Date:	20-Sep-18

<b>Pond Identification</b>	B	C	D - Gob Pile	F - New Gob	J UTL East	K UTL West
Type of Pond	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment

**Status During Inspection:**

Approximate Water Level	Dry	Puddle	Dry	Puddle	Puddle	Dry
Sediment (% remaining)	95%	95%	90%	80%	95%	80%
Outflow (cfs)	0	0	0	0	0	0

<b>Features</b>	Problem	Problem	Problem	Problem	Problem	Problem
	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No

**Erosional**

Rills & Gulleys	No	No	No	No	No	No
Inadequate Vegetation	No	No	No	No	No	No
Outlet Channel Erosion	No	No	No	No	No	No
Burrows	No	No	No	No	No	No
Other	No	No	No	No	No	No

**Structural**

Differential Settling	No	No	No	No	No	No
Cracks or Slides	No	No	No	No	No	No
Seepage	No	No	No	No	No	No
Other	No	No	No	No	No	No

**Appurtenant Structures**

Defective Spillways	No	No	No	No	No	No
Dewatering Devices Clogged	No	No	No	No	No	No
Faulty Gates, Etc.	No	No	No	No	No	No
Other	No	No	No	No	No	No

**Additional Comments**

Design depth measured from pond bottom to invert of emergency spillway:  
 Pond B=10, C=10, D=10, J=10, K=3, F=10' TD  
 Pond Bottom Elevations B=5942, C=5990, D=5970, J=5846, F=5944, K=5819  
 Pond B was dry.  
 Pond C held very little water and was below the primary spillway.  
 Pond D was dry.  
 Pond J had a very small puddle on the west end of the pond.  
 Pond K was dry.  
 Pond F held very little water.  
 There were no mud pits open at the end of the quarter.

SWMP components evaluated as part of this inspection. No corrections necessary at this time.

Name of Inspector: Tamme Bishop



## BOWIE RESOURCES, LLC

### Bowie No. 2 Mine

#### Coal Mine Waste Bank Nos. 1, 2, & 3 Inspections –3<sup>rd</sup> Quarter 2018

On September 20, 2018, a visual inspection of the Bowie No. 2 Mine coal mine waste banks was performed by the undersigned in accordance with Rule 4.10.2. This inspection includes Gob Pile Nos. 1, 2, and 3. Pile No. 1 is considered inactive. Pile no. 2 is located north of Bowie Road. Pile no. 3 is located south of Bowie Road.

I, Tamme Bishop, P.E., have a wide variety of experience in the design and construction of earth fill embankments. Nothing was observed during the inspection that would indicate the piles have a potential for failure. The slips discussed in the 4Q 2016 and 1Q 2017 report had been regraded to the design contours and show no evidence that would be cause for concern of slipping again. A fair cover of volunteer vegetation has been established.

A small area of seepage discussed in past reports, at the toe of gob pile #2 and west of the haul road was no longer noticeable. There are no windrows remaining on top of gob pile #2. All organic material and topsoil has been removed ahead of the waste bank founding. The diversion ditches were cleaned out during June, 2017 and were in good repair. The upper diversion and lower ditches at gob pile #3 were inspected, and were in good condition, however the upper diversion ditch should be cleaned out during 2018. The lower diversion ditch (J3) was cleaned out in May 2017. A new seep has been discovered at gob pile #3, north of the east drying area. At this time, the seep will not impact the long-term stability of the gob pile. However, before final placement and compaction of gob in the footprint of the east drying area, an underdrain will be installed. Approval of the underdrain design was incorporated into the permit under Technical Revision No. 105.

At gob pile #2, the first bench east of the haul road is covered with soil. The second bench east of the haul road is mostly covered with a subsoil pile. Most of the third and forth benches east of the road are covered with soil. Soil has been placed on most of the second and third benches west of the haul road.

There was no coal mine waste was generated from the preparation plant during the quarter. Coal mine waste is to be placed in the piles in approximately horizontal lifts no more than 24-inches thick. The coal mine waste is dried and then spread and compacted by self propelled sheepsfoot compactors. There were four compaction tests were taken at gob pile #3 during the quarter. There were no compaction tests taken at gob pile #2 during the quarter.

The top of gob pile #2 can serve as a drying area for end dumped gob, however, no gob is currently stockpiled on top of the pile. Gob is to be stacked to a maximum height of 20 feet, with a slope angle up to 1.5h:1v. A 25-foot buffer zone on the face of the gob pile will be maintained at all times. Gob will be spread and compacted to the currently approved slope configuration as soon as gob and weather conditions allow.

The westernmost and easternmost sections of gob pile #3 serve as drying areas for end dumped material. The purpose of the gob drying area is to provide an area for temporary

storage of gob for drying purposes. End-dumped gob in the gob drying areas is worked with dozers and track hoes to assist in the drying process. There was no work at gob pile #3 during the inspection.

During active mining conditions, it is necessary to stockpile gob material at gob pile #3 during the winter months, then place and compact the stockpiled gob when weather allows. Stockpiling of gob can commence November 15 and end April 15. Winter stockpiled material will be re-handled and compacted by September 30. Beginning on October 1, the Operator should be compacting all material concurrently, until conditions again require stockpiling. The stockpiling dates listed above should be considered flexible and may change slightly from year to year based on weather conditions. The gob material will be stockpiled in rows generally running from northwest to southeast. The rows of gob will be placed in a controlled manner and overlap will be minimized so there is space between rows to allow for drainage to the southeast. Windrows were located on top of the pile and contained gob that had been hauled out of the west drying area.

The available volume of coverfill material is sufficient to meet the requirements of Rule 4.10.4(5). No coverfill was used for blending or other uses during the quarter.

A failure of the gob pile no. 1 would probably not be a hazard to human life. The pile is located above a large flat bench. The bench is approximately 80 to 150-feet wide directly below the pile. Additionally, the gob pile sediment pond is located below the pile. If the coal mine waste bank failed, the material would very likely be contained on the bench below the pile and or within the gob pile sediment pond.

A failure of gob pile no. 2 would probably not be a hazard to human life. A residential dwelling is located over 300-feet below pile no. 2. The piles are located above Bowie Road. A failure of the piles might damage Bowie Road and the Fire Mountain Canal but would not likely impact the residential dwelling.

A failure of gob pile no. 3 would not be a hazard to human life. A failure of the pile might damage the rail track below the pile.

I certify that to the best of my knowledge and belief, that the fill and other aspects of the coal mine waste banks have been constructed as permitted in the design approved by the DRMS.

The seal is circular with a rope-like border. Inside the border, the text "COLORADO LICENSED" is at the top, "JAMIE BISHOP" is in the middle, and "43402" is at the bottom. A signature is written over the seal.

\_\_\_\_\_  
Jamie Bishop  
Colorado Professional Engineer  
Registration No. 43402

10.16.18  
Date



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

640 White Avenue  
Grand Junction, Colorado 81501  
Phone: 970-255-8005  
Fax: 970-255-6818  
HuddlestoneBerry@Bresnan.net

October 16, 2018  
Project#01349-0001

Bowie Resources, LLC  
43659 Bowie Road  
Paonia, Colorado 81428

Attention: Mr. Bill Bear

Subject: Construction Materials Testing  
3<sup>rd</sup> Quarter 2018  
Bowie Mine No. 2  
Paonia, Colorado

Dear Mr. Bear,

At your request, a representative of Huddlestone-Berry Engineering and Testing, LLC (HBET) conducted field moisture and compaction testing, and laboratory moisture testing of coal mine waste materials placed at Bowie Mine No. 2 near Paonia, Colorado. Field testing was conducted on September 26<sup>th</sup>, 2018. Soil compaction test reports, test location data, and laboratory optimum moisture and density (Proctor) data are attached.

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

# SOIL COMPACTION TEST REPORT

**Task:** Gob Pile Densities

## Field vs. Lab Densities

**Project No.:** 01349 - 0001

**Tested By:** MS **Date:** 9/26/18

**Project Name:** Bowie Mine

**Work Order No:** 54744

**Client Name:** Bowie Resources

**Authorized By:** Client **Date:** 9/26/18

**Placement Contractor:** Bowie Resources

**Reviewed By:** MAB **Date:** 10/15/18

**Contractor Representative:** Ron

No.	Point No.	Elevation	Max. Dry Density (pcf)	Optimum Moisture (%)	Wet Density (pcf)	Speedy Moisture (%)	Field Dry Density (pcf)	Relative Field Comp.(%)	Tare Weight (g)	Wet Weight (g)	Dry Weight (g)	Lab Dry Density (pcf)	Lab Moisture (%)	Relative Lab Comp.(%)	
1	1	5891	104.0	13.5	106.0				391.7	920.2	865.7	95.1	11.5%	91%	
2	2	5898	95.5	14.0	98.0				388.9	1619.3	1507.6	86.7	13.0%	91%	
3	3	5907	104.0	13.5	105.8				395.8	1356.9	1256.9	94.8	11.6%	91%	
4	4	5910	104.0	14.0	106.6				389.0	1162.7	1082.9	95.6	11.5%	92%	

**Remarks:** \_\_\_\_\_

Gauge Number: 2472

Density Counts: 2902

Moisture Counts: 392

Record No. 29 S

Bowie Resources Gob Disposal Location of Compaction Tests				
Gob Pile #3				
	North	East	Elevation	Date
Point #				
1	17515.12	35553	5910.38	9/26/2018
2	17406.34	35717.49	5897.03	9/26/2018
3	17300.14	35710.52	5891.74	9/26/2018
4	17437.48	35596.93	5907.74	9/26/2018

Total 4 Tests





Huddlestone-Berry Engineering & Testing, LLC  
640 White Avenue, Unit B  
Grand Junction, CO 81501  
970-255-8005  
970-255-6818

## MOISTURE-DENSITY RELATIONSHIP

CLIENT Bowie Resources, LLC

PROJECT NAME Bowie Mine #2

PROJECT NUMBER 00489-0003

PROJECT LOCATION Paonia, CO

Sample Date: \_\_\_\_\_

14-0195

Sample No.: \_\_\_\_\_

Source of Material: \_\_\_\_\_

Gob #3 Borrow Blend

Description of Material: \_\_\_\_\_

Test Method: \_\_\_\_\_

ASTM D698C

### TEST RESULTS

Maximum Dry Density 104.0 PCF

Optimum Water Content 13.5 %

#### GRADATION RESULTS (% PASSING)

#200

#4

3/4"

#### ATTERBERG LIMITS

LL

PL

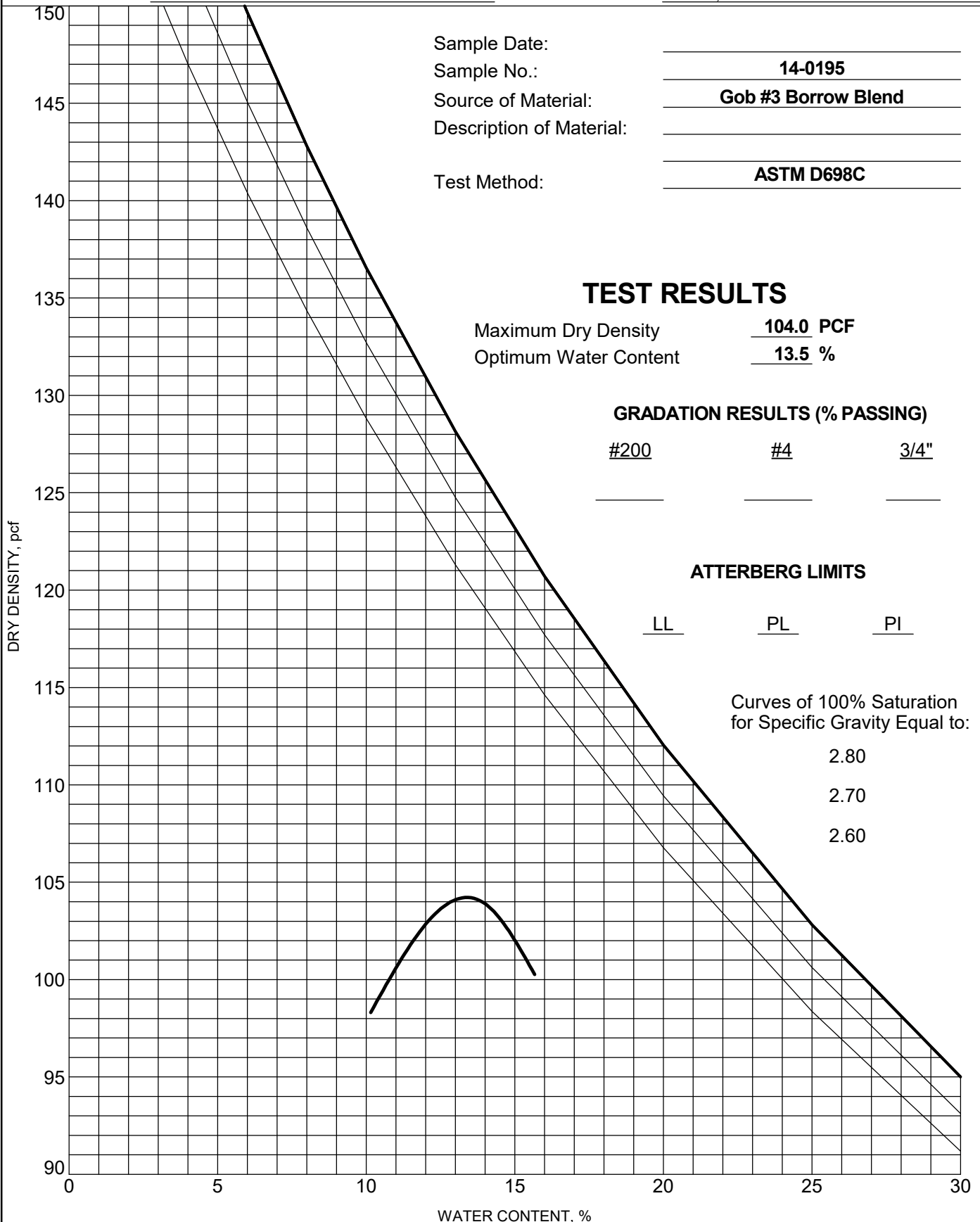
PI

Curves of 100% Saturation  
for Specific Gravity Equal to:

2.80

2.70

2.60







Huddlestone-Berry Engineering & Testing, LLC  
640 White Avenue, Unit B  
Grand Junction, CO 81501  
970-255-8005  
970-255-6818

## MOISTURE-DENSITY RELATIONSHIP

CLIENT Bowie Resources, LLC

PROJECT NAME Bowie Mine #2

PROJECT NUMBER 00489-0003

PROJECT LOCATION Paonia, CO

Sample Date: 3/28/2015  
Sample No.: 15-0116  
Source of Material: Gob 3 03/28/15  
Description of Material: SILTY SAND with GRAVEL(SM)  
Test Method: ASTM D698C

### TEST RESULTS

Maximum Dry Density 95.5 PCF  
Optimum Water Content 14.0 %

#### GRADATION RESULTS (% PASSING)

<u>#200</u>	<u>#4</u>	<u>3/4"</u>
<u>100</u>	<u>100</u>	<u>100</u>

#### ATTERBERG LIMITS

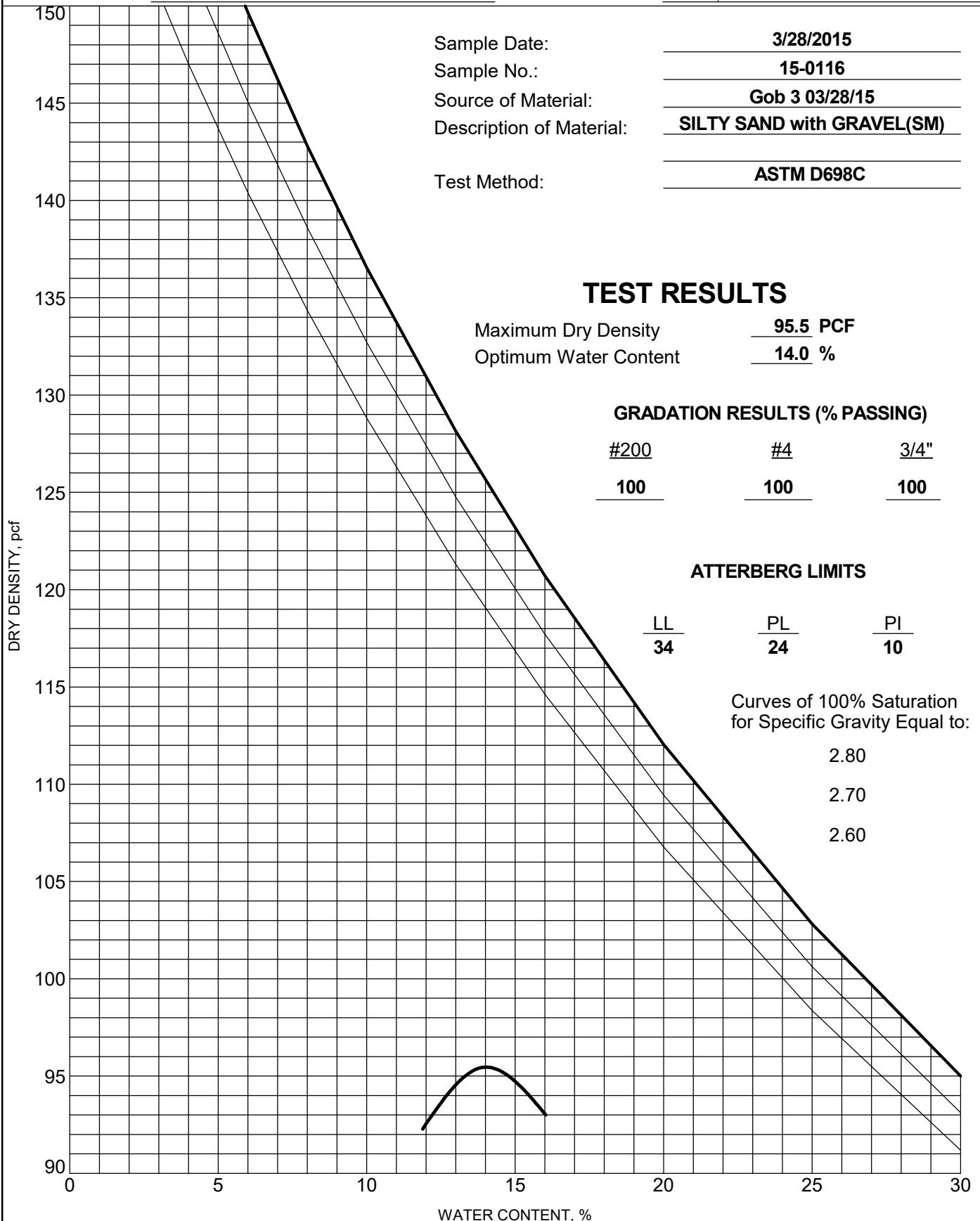
<u>LL</u>	<u>PL</u>	<u>PI</u>
<u>34</u>	<u>24</u>	<u>10</u>

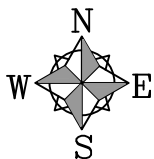
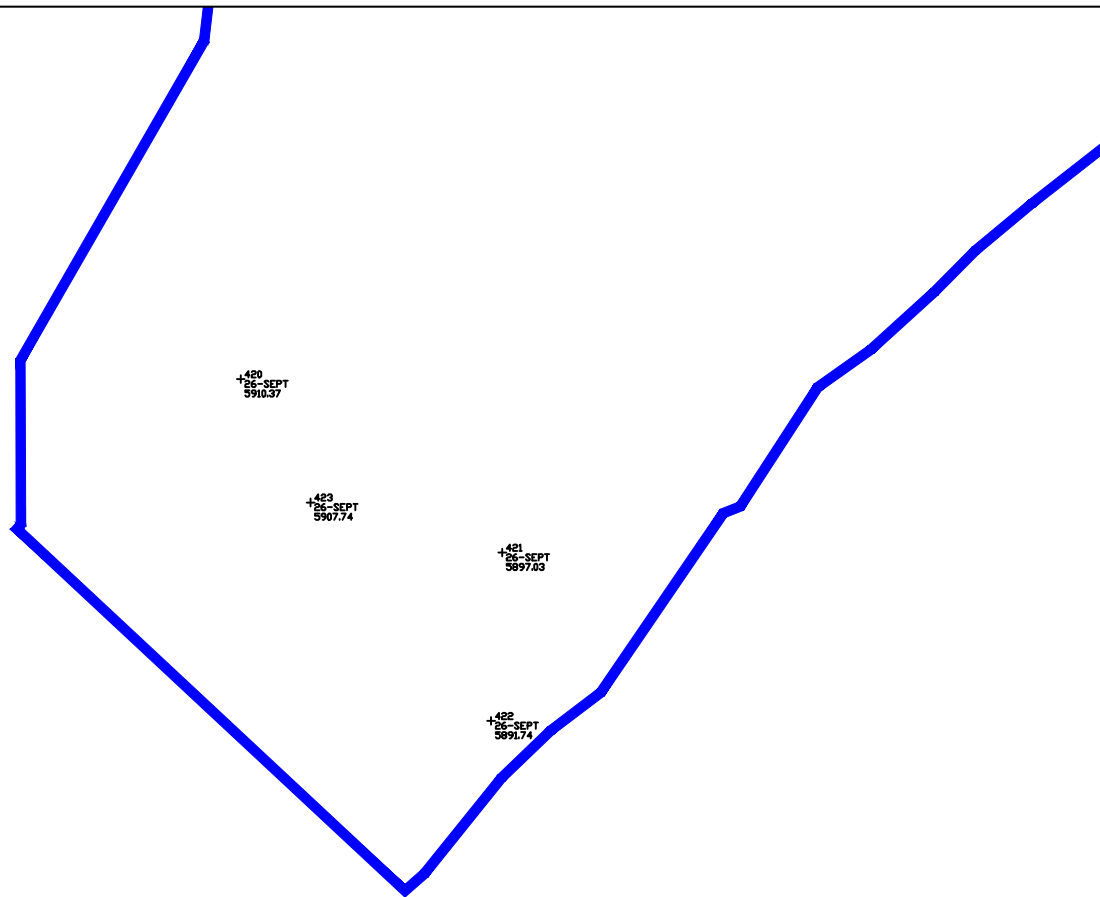
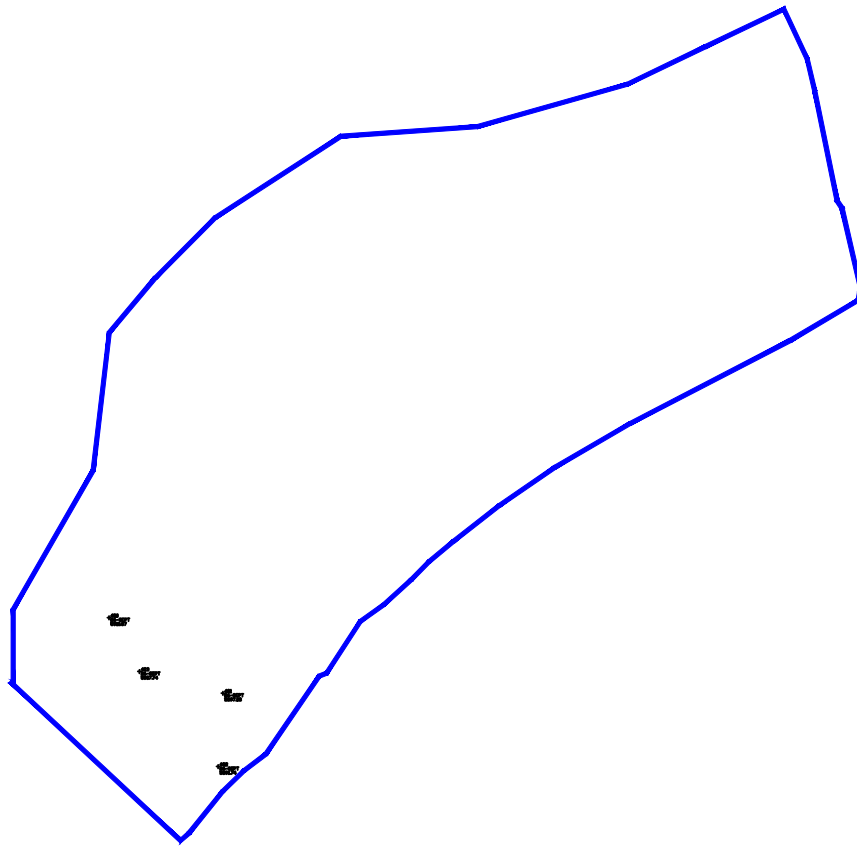
Curves of 100% Saturation  
for Specific Gravity Equal to:

2.80

2.70

2.60





# GOB PILE #3 COMPACTION TEST LOCATIONS

PREPARED FOR:



BOWTIE RESOURCES, LLC  
BOWTIE NO. 2 MINE  
P.O. BOX 483  
PAONIA, COLORADO 81428

J. E. STOVER & ASSOCIATES, INC.  
2355 N 7th St. Unit B  
Grand Jct., CO 81501

GOB PILE #3  
09/26/18

DESIGN BY:	DATE:	10/15/18
DRAWN BY:	J.E.S.	CHK'D BY:
SCALE:	NONE	
DIRECTORY:	D:\BOWTIE	DWG. NAME:



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

640 White Avenue  
Grand Junction, Colorado 81501  
Phone: 970-255-8005  
Fax: 970-255-6818  
[Info@huddlestonberry.com](mailto:Info@huddlestonberry.com)

October 16, 2018  
Project#01349-0001

Bowie Resources, LLC  
43659 Bowie Road  
Paonia, Colorado 81428

Attention: Mr. Bill Bear

Subject: Summary of Instrumentation Monitoring  
3<sup>rd</sup> Quarter 2018  
Bowie Coal Waste Disposal Area No. 3  
Paonia, Colorado

Reference: *Summary of Instrumentation Monitoring, 2<sup>nd</sup> Quarter 2018, Bowie Coal Waste Disposal Area No. 3, Paonia, Colorado* by Huddleston-Berry Engineering & Testing, LLC for Bowie Resources, LLC, July 12, 2018.

*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. Monitoring of the functioning piezometers was completed by DOWL on September 20<sup>th</sup>, 2018. 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 10/31/14 (psi)	06/20/18 Pore Pressure (psi)	09/20/18 Pore Pressure (psi)	Difference Since Installation (psi)	Difference Since Last Reading (psi)
VWP-A Deep	10.4	4.7	3.8	-6.6	-0.9
VWP-A Shallow	4.7	3.6	3.5	-1.2	-0.1
VWP-B Deep	0.2	-0.1	0.3	+0.1	+0.4
VWP-B Shallow	13.9	11.1	10.8	-3.1	-0.3
VWP-D	7.1	5.7	5.6	-1.5	-0.1

## **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 fluctuated within a narrow range. In general, HBET does not believe that the pore pressure changes in VWP-A Deep are cause for concern regarding stability of the gob pile.

### **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. However, the last several readings have shown a general downward trend. 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. The pore pressures increase slightly during the 3<sup>rd</sup> Quarter of 2017. However, this likely reflects the activity at CWDA No. 3 during the monitoring period and the pore pressures have decreased since September 2017. In general, 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. 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**

October 3, 2018

Mike Berry  
Huddleston-Berry Engineering and Testing, LLC  
640 White Avenue  
Grand Junction, CO 81501

**SUBJECT: Summary Report, 3rd Quarter 2018, Vibrating Wire Piezometers  
July – September 2018, Bowie Mine #2  
Coal Waste Disposal Area (CWDA) #3**

Dear Mr. Berry,

DOWL conducted quarterly monitoring of installed vibrating wire piezometers at Coal Waste Disposal Area #3 (CWDA #3), Bowie Resources, LLC. This report is intended to cover the period of July through September 2018 (3rd Quarter). VWP data was recorded on 09/20/18. Per CDRMS and your instructions, vibrating wire piezometer readings for all active piezometers are taken quarterly.

A graph of measured pore pressures is presented on the attached Figure 1 and numerically in Table 1 below. Table 1 summarizes the initial, prior and current readings and the difference in individual pore pressures since installation and previous quarterly readings.

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

VWP ID #	10/31/14 Installation Pore Pressure (psi)	06/20/18 Pore Pressure (psi)	09/20/18 Pore Pressure (psi)	Difference Since Installation (psi)	Difference Since Last Quarter (psi)
VWP-A Deep	10.4	4.7	3.8	-6.6	-0.9
VWP-A Shallow	4.7	3.6	3.5	-1.2	-0.1
VWP-B Deep	0.2	-0.1	0.3	+0.1	+0.4
VWP-B Shallow	13.9	11.1	10.8	-3.1	-0.3
VWP-D	7.1	5.7	5.6	-1.5	-0.1



As seen on Figure 1, the readings are either consistent with previous historic readings or show a trend of generally decreasing pore pressure. If you have any questions regarding this letter or the instrumentation monitoring at CWDA #3, please contact me at (907) 562-2000 or [jholland@dowl.com](mailto:jholland@dowl.com).

Respectfully Submitted,  
**DOWL**



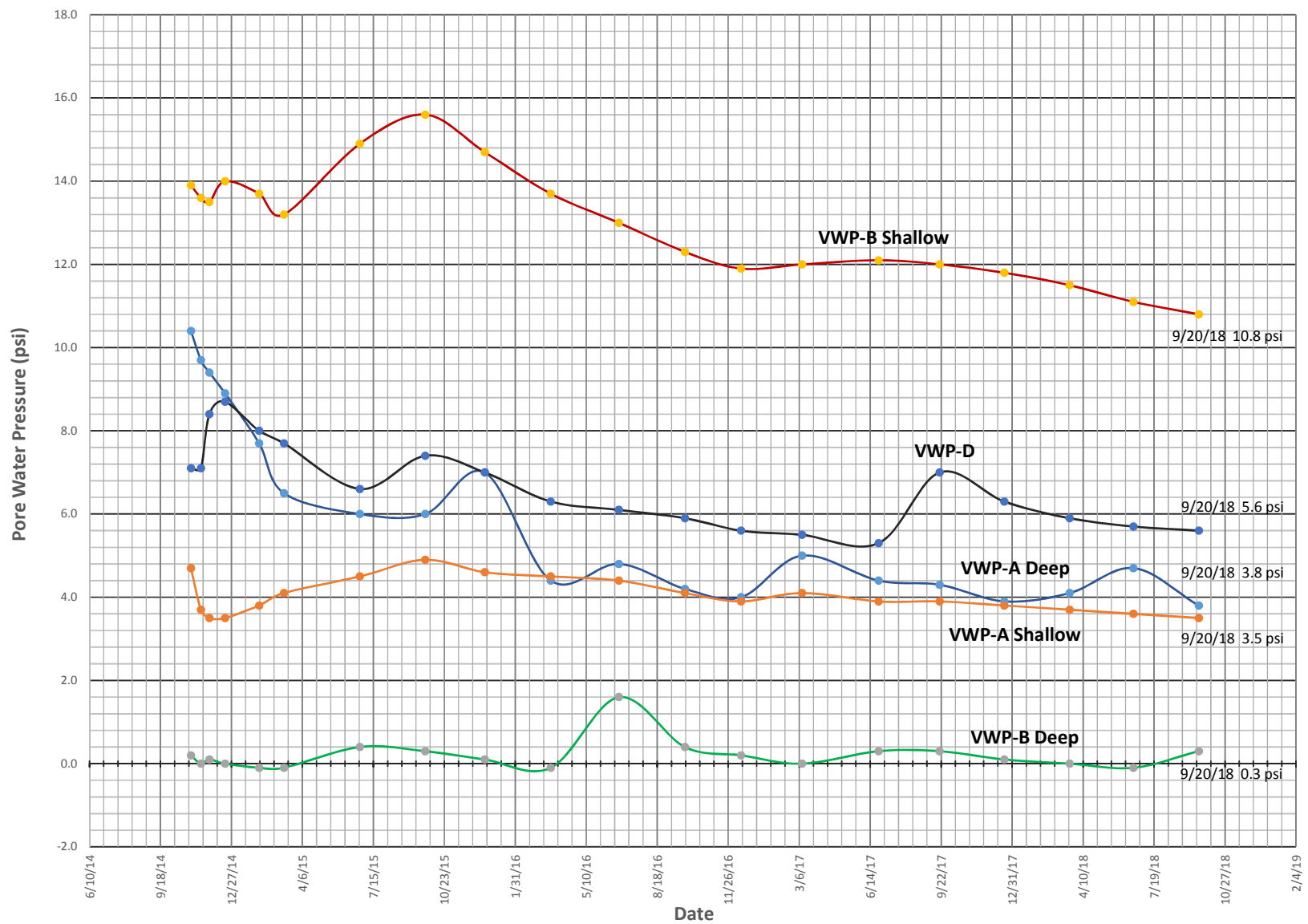
Jeremiah E. Holland, P.E.  
Geotechnical Engineer



LJB/JEH

Enclosure: Figure 1 – Vibrating Wire Piezometer Data Graph

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





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

640 White Avenue  
Grand Junction, Colorado 81501  
Phone: 970-255-8005  
Fax: 970-255-6818  
Info@huddlestonberry.com

October 16, 2018  
Project#01349-0001

Bowie Resources, LLC  
43659 Bowie Road  
Paonia, Colorado 81428

Attention: Mr. Bill Bear

Subject: Summary of Instrumentation Monitoring  
3<sup>rd</sup> Quarter 2018  
Bowie Coal Waste Disposal Area No. 2  
Paonia, Colorado

Reference: *Summary of Instrumentation Monitoring, 2<sup>nd</sup> Quarter 2018, Bowie Coal Waste Disposal Area No. 2, Paonia, Colorado* by Huddleston-Berry Engineering & Testing, LLC for Bowie Resources, LLC, July 16, 2018.

*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 3<sup>rd</sup> Quarter 2018 monitoring was completed by DOWL on September 20<sup>th</sup>, 2018. 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 3<sup>rd</sup> Quarter 2018 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 on September 20<sup>th</sup>, 2018. 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)	06/20/18 Pore Pressure (psi)	09/20/18 Pore Pressure (psi)	Difference Since Installation (psi)	Difference Since Last Reading (psi)
VWP-05	6.8	1.5	1.7	-5.1	+0.2
VWP-06	11.3	12.7	12.6	+1.3	-0.1
VWP-08	8.2	9.2	9.1	+0.9	-0.1
VWP-09	2.8	2.9	2.8	0.0	-0.1
VWP-10	-1.9	-1.7	-1.8	+0.1	-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 6097 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**

October 3, 2018

Mike Berry  
Huddleston-Berry Engineering and Testing, LLC  
640 White Avenue  
Grand Junction, CO 81501

**SUBJECT: Summary Report, 3rd Quarter 2018, Inclinator and Active Vibrating Wire Piezometer Data July – September 2018, Bowie Mine #2 Coal Waste Disposal Area (CWDA) #2**

Dear Mr. Berry:

DOWL conducted quarterly monitoring of inclinometers and vibrating wire piezometers (VWP) at Coal Waste Disposal Area #2 (CWDA #2), Bowie Resources, LLC. This report is intended to cover the period of July through September 2018. VWP and inclinometer data was recorded on 9/20/18. Per CDRMS and your instructions, vibrating wire piezometer and inclinometer readings for all active instruments are taken 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 the three inclinometers. The graph of historical 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 #	Installation Pore Pressure (psi)	06/20/18 (Q2) Pore Pressure (psi)	09/20/18 (Q3) Pore Pressure (psi)	Difference Since Installation (psi)	Difference Since Last Quarter (psi)
VWP-05	6.8	1.5	1.7	-5.1	0.2
VWP-06	11.3	12.7	12.6	1.3	-0.1
VWP-08	8.2	9.2	9.1	0.9	-0.1
VWP-09	2.8	2.9	2.8	0.0	-0.1
VWP-10	-1.9	-1.7	-1.8	0.1	-0.1



## **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 physical 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 prior 2017-2018 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, we believe historic displacements indicated on the plots for the approximate upper ten feet of the inclinometers are likely due to placement of cover soil on the face of the waste bank during normal operations for maintenance and revegetation. Recent readings are generally consistent with previous readings.

If you have any questions regarding this letter or the instrumentation monitoring at CWDA #2, please contact me at (907) 562-2000 or [jholland@dowl.com](mailto:jholland@dowl.com).

Respectfully Submitted,  
**DOWL**



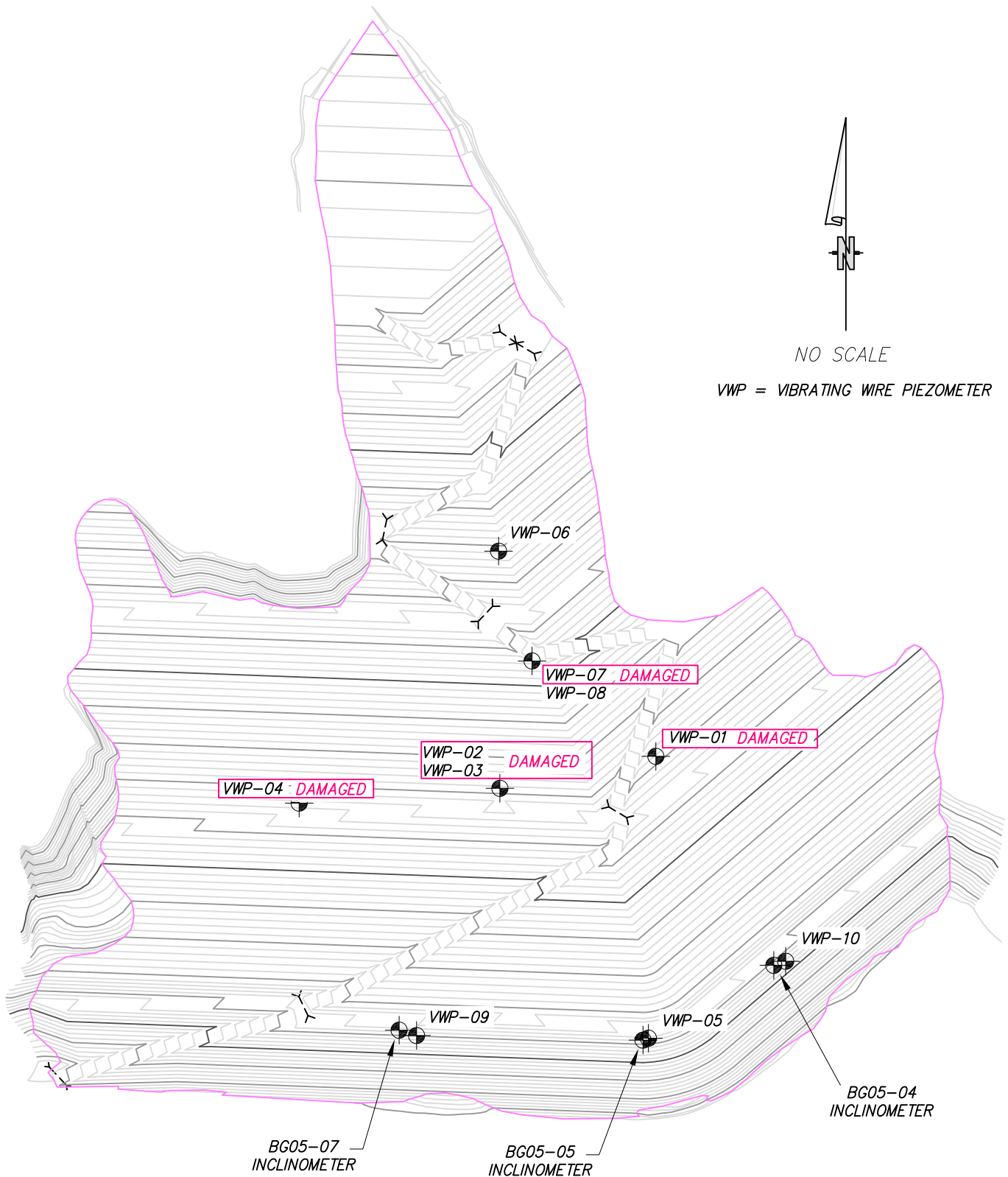
Jeremiah E. Holland, P.E.  
Geotechnical Engineer



LJB/JEH

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

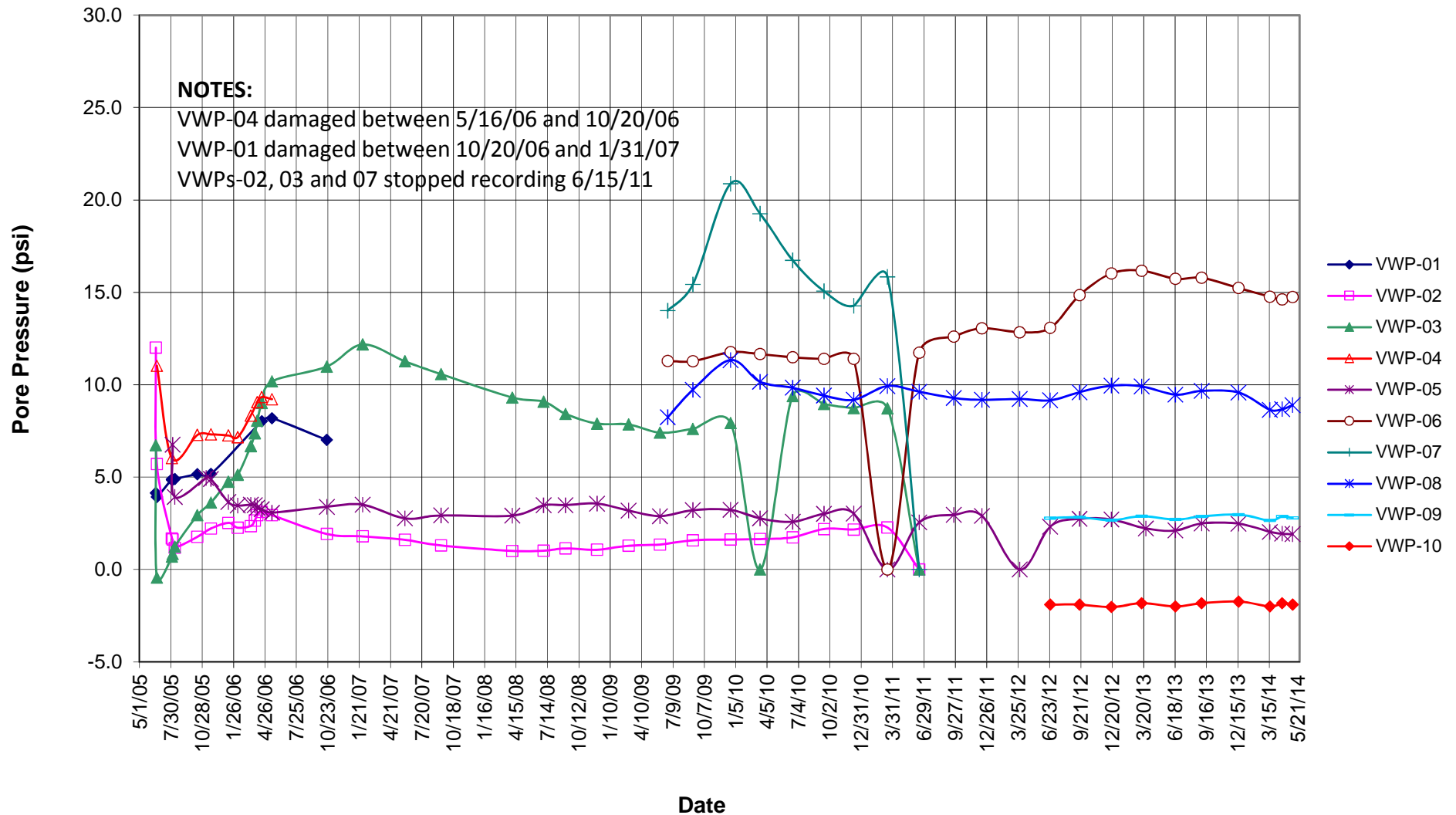
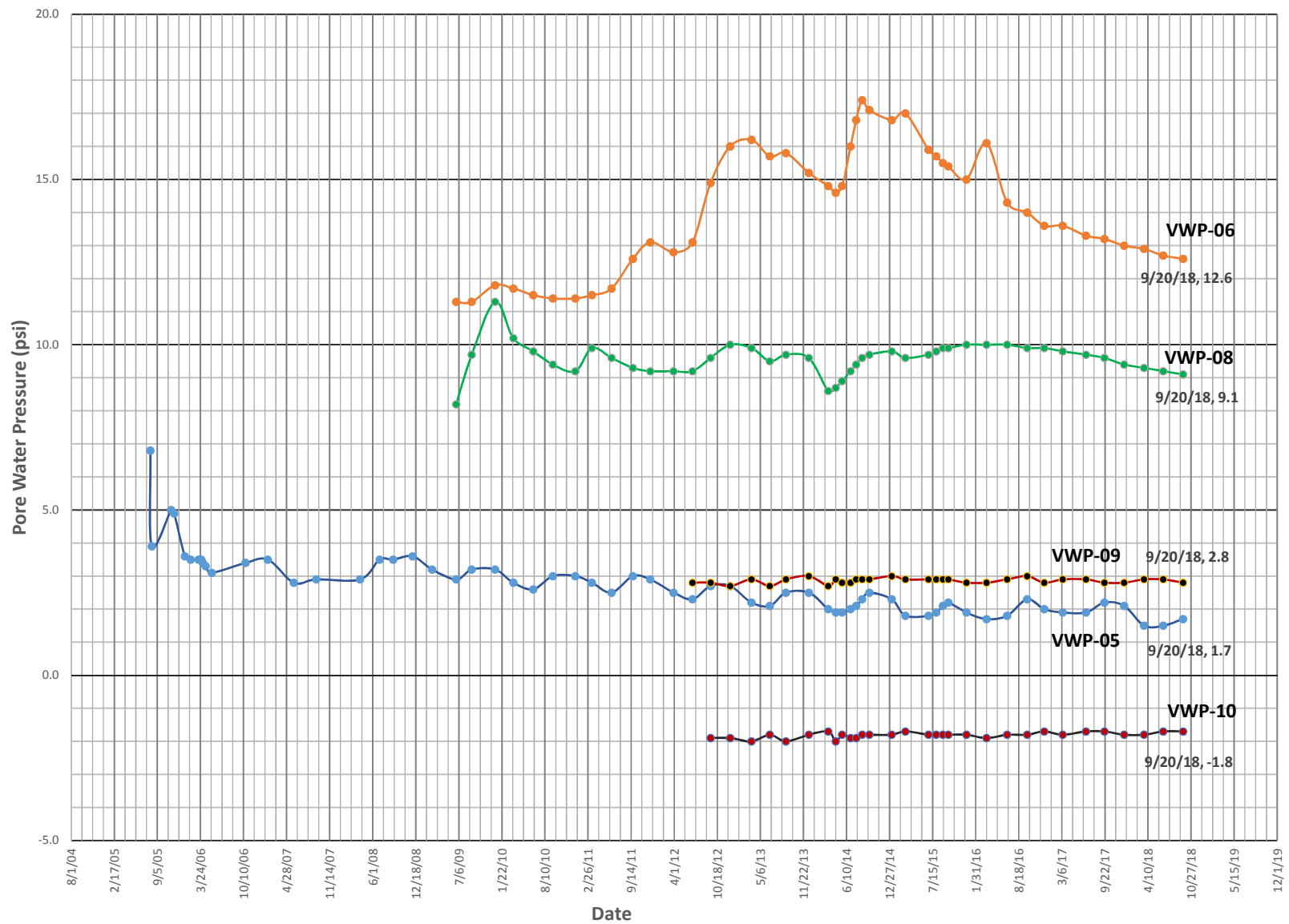
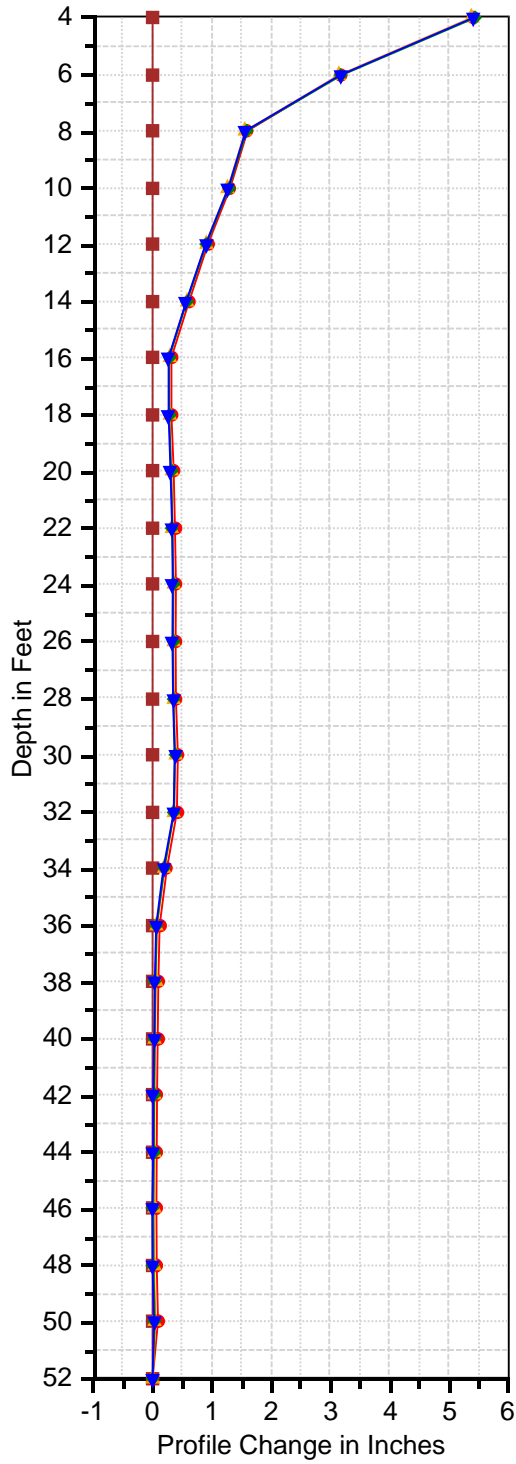


Figure 2 - Bowie Mine #2 - CWDA #2  
Active Vibrating Wire Piezometer Data



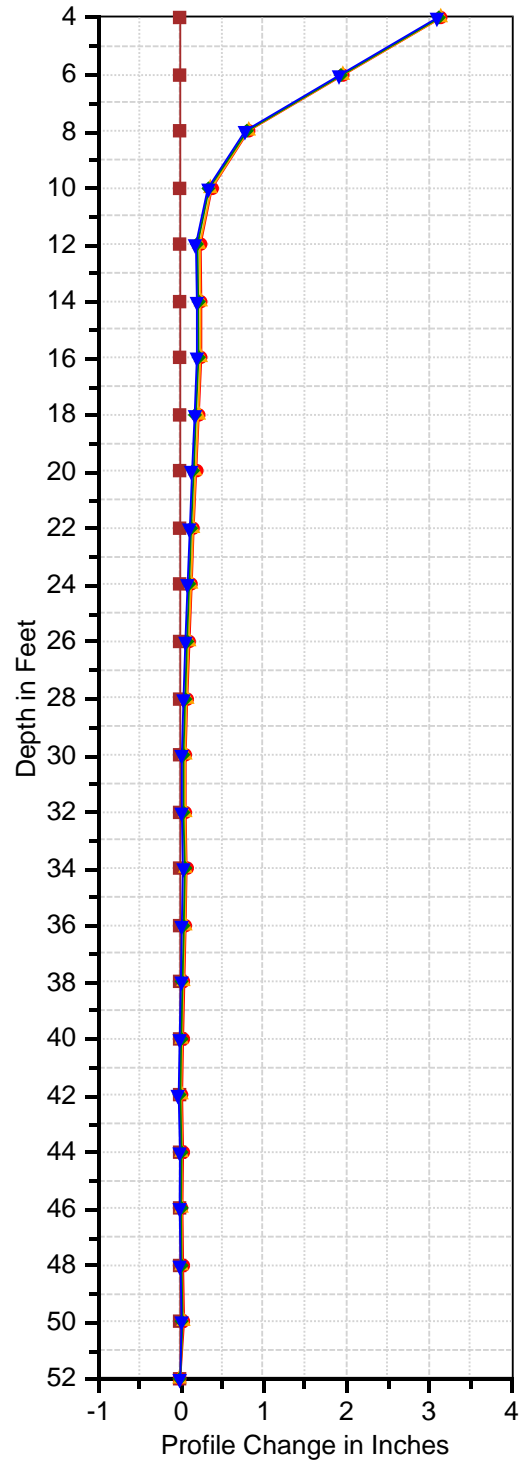
### BOWIE BG05\_4 A

■ 8/10/2005    ● 1/20/2018    ▲ 3/22/2018  
◆ 6/20/2018    ▼ 9/20/2018



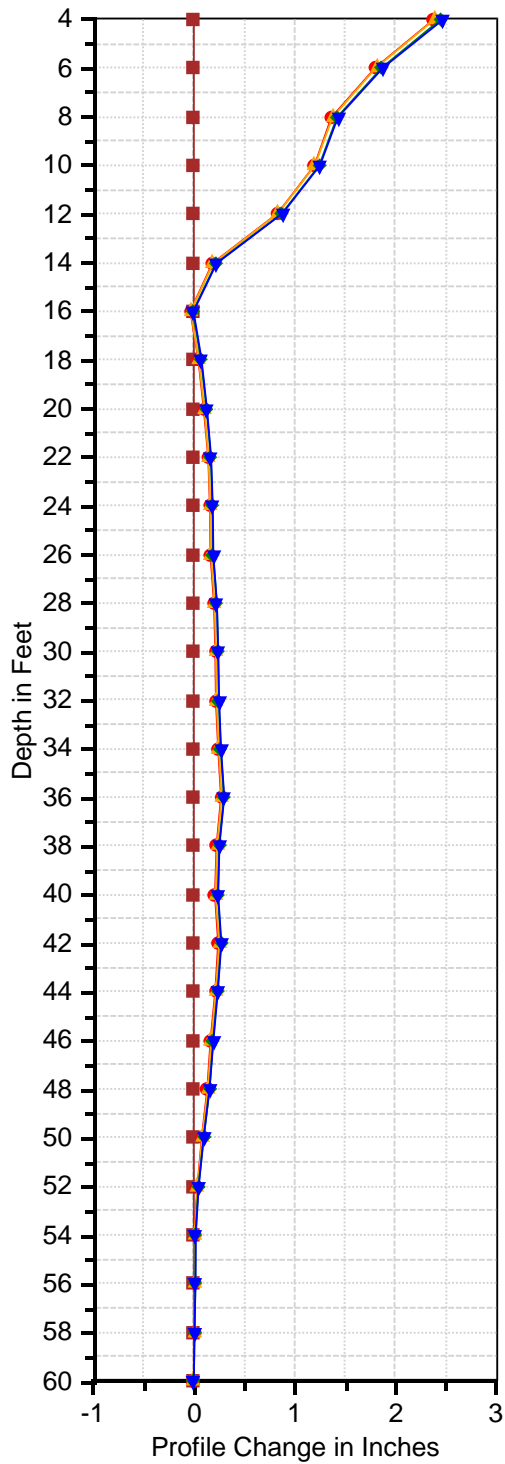
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◆ 6/20/2018    ▼ 9/20/2018



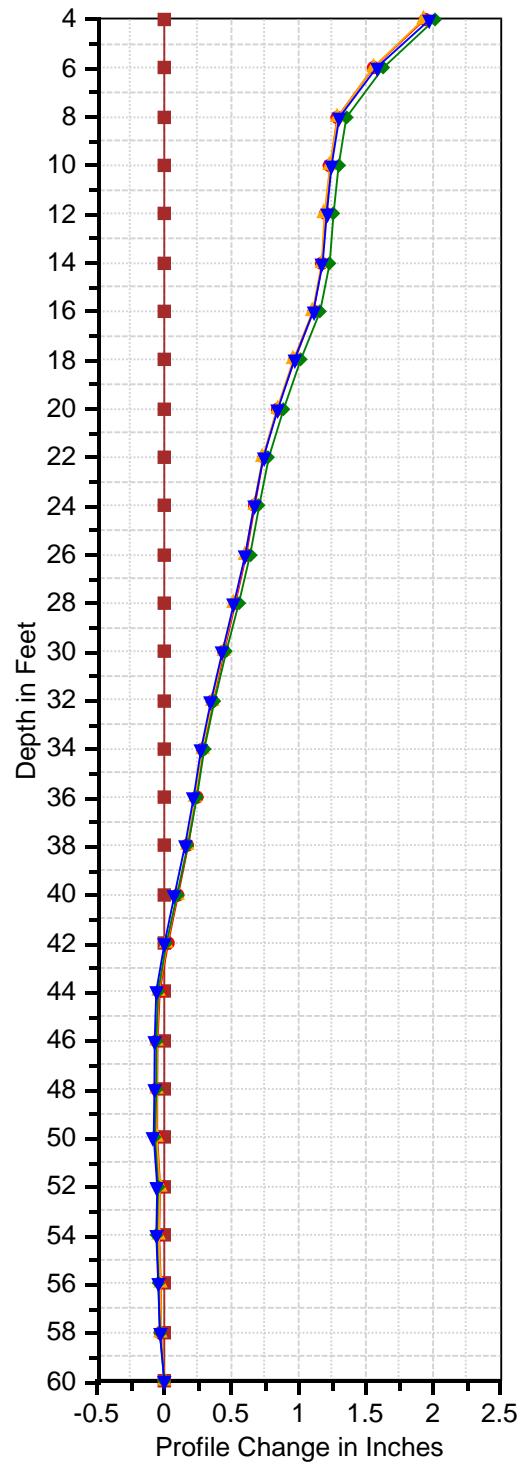
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◆ 7/12/2018    ▼ 9/20/2018



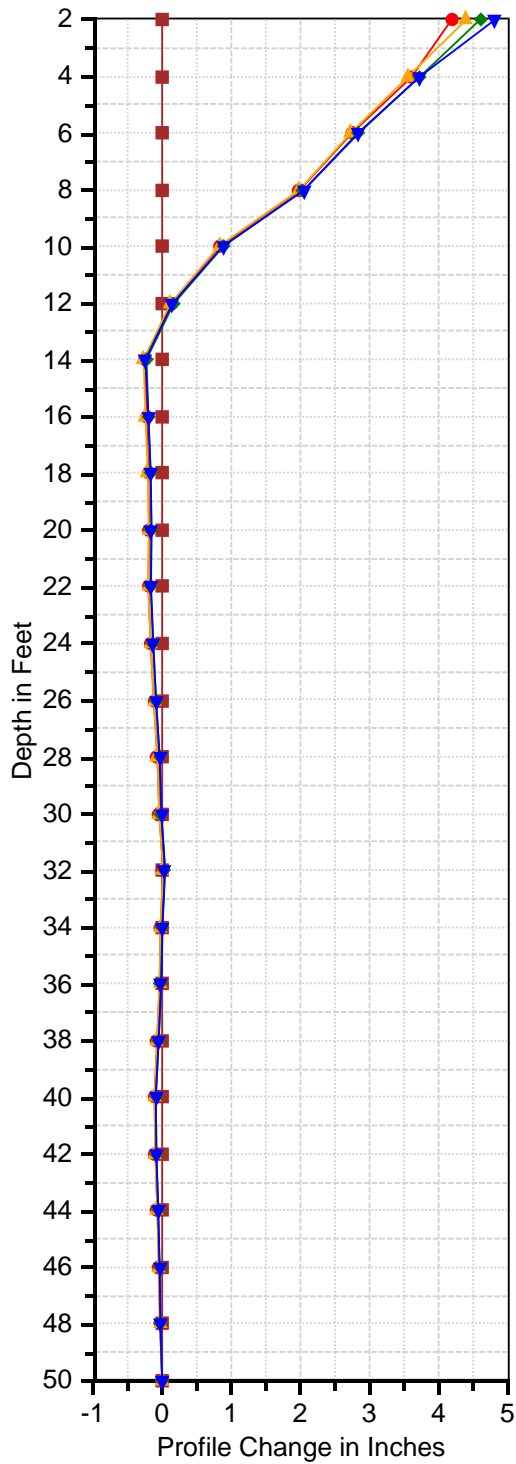
### BOWIE BG05\_5 B

■ 8/10/2005    ● 1/20/2018    ▲ 3/22/2018  
◆ 7/12/2018    ▼ 9/20/2018



BOWIE BG05\_7 A

8/10/2005 1/20/2018 3/22/2018  
6/20/2018 9/20/2018



BOWIE BG05\_7 B

8/10/2005 1/20/2018 3/22/2018  
6/20/2018 9/20/2018

