# Fall 2023 Subsidence and Geologic Field Observations

## Southern Panels and Sunset Trail Mining Areas

**PREPARED FOR:**
Mountain Coal Company, LLC
West Elk Mine
P.O. Box 591
Somerset, CO 81434

**PREPARED BY:**
Jonathan M. Kelly, P.E.
Wright Water Engineers, Inc.

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April 2024

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April 30, 2024

Mr. Leigh Simmons
Colorado Division of Reclamation, Mining and Safety
1313 Sherman St., Rm. 215
Denver, CO 80203

Re: Fall 2023 Subsidence Monitoring Report Preparation – Mountain Coal Company, LLC.

Dear Mr. Simmons,

The following report entitled *Fall 2023 Subsidence and Geologic Field Observations – Southern Panels and Sunset Trail Mining Areas*, was prepared by Jonathan M. Kelly (a licensed professional engineer) and employee of Wright Water Engineers, Inc.

Sincerely,

WRIGHT WATER ENGINEERS, INC.

By _____
Jonathan M. Kelly, P.E.
Vice President/Project Manager

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# FALL 2023 SUBSIDENCE AND GEOLOGIC FIELD OBSERVATIONS SOUTHERN PANELS AND SUNSET TRAIL MINING AREAS[1]

## 1.0 BACKGROUND

This subsidence report is the second of two detailed documents on this subject to be generated based on 2023 calendar year observations. These reports of subsidence-related observations associated with the West Elk Mine have occurred annually between 1996 and 2006, and biannually since spring 2007. In accordance with Mountain Coal Company, LLC's (MCC) Colorado Division of Reclamation, Mining and Safety (CDRMS) permit, these subsidence reports are to be submitted by April 30 (for preceding fall monitoring) and by September 30 (for preceding spring monitoring) of each year.

Prior field observations and experience in the West Elk Mine area over the last twenty-eight years[2] (1996 to 2023 inclusive) indicate that subsidence-related features (cracks and bulges) are most visible on roads, well pads, and trails, where the ground is compact and free of brush. These areas have been, and will continue to be, the focus of the biannual observations. Other subsidence features such as rockfalls and landslides are generally observable from overview locations along roads or on well pads and have been, and will continue to be, noted when they occur.

Fall 2023 subsidence observations were performed on October 10, 2023, in the Southern Panels Mining Area with specific focus on the E-seam Longwall Panels 14 and 15 and in the Sunset Trail Mining Area relative to the last two E-seam Longwall Panels (SS3 and SS4). Traverse names used in the previous reports may not coincide with those used in this report. Observations associated

[1] The Southern Panels Mining Area includes the E-seam Longwall Panels E1 through E8 included in the South of Divide Mining Area, some of which were included in the Dry Fork Mining Area. Also included in the Southern Panels Mining Area are E-seam Longwall Panels E14 through E17. The Southern Panels Mining Area also includes planned B-seam Longwall Panels B26 through B29 that underlie E-seam Longwall Panels E1 through E5. The term Southern Panels Mining Area will be used throughout this report to identify what was formerly referred to as the South of Divide and Dry Fork Mining Areas. The Sunset Trail Mining Area represents four panels (SS1 through SS4) located to the south of E-seam Longwall Panel E8 of the Southern Panels Mining Area.

[2] Annual subsidence and geologic hazard reports are maintained at Mountain Coal Company, LLC, and at the Colorado Division of Reclamation, Mining and Safety, and are exhibits to the permit document (Exhibits 60, 60A, 60B, 60C, 60D, and 60E).

with E-seam longwall mining of Panels E1 through E8 can be found in earlier reports. Observations of the Apache Rocks and Box Canyon B-seam Mining Areas are covered in reports prior to 2013.

During the fall 2023 field visit, accessible areas within the Southern Panels and Sunset Trail Mining Areas were visited, examined, and photographed to document subsidence-related features observed since the last field visit and to record newly observed features for future reference (see Maps 1 and 2). Field observations were made from a four-wheel drive vehicle and by foot as needed.

Thirteen photographic observation points with number designations were established and used starting in 2007 to view and assess changes that may occur as a result of mining. In 2016, all references to number designations for these locations were dropped. These historical photographic observation points are now checked only occasionally to assess substantial changes (i.e., no rockfalls or landslides). However, repeated visits and photographic documentation over several site visits are commonly performed once a subsidence feature is observed to track either further exacerbation of the feature or, more typically, ongoing weathering and disappearance.

## 2.0 GENERAL SUBSIDENCE OBSERVATION AND REPORTING

On October 10, 2023, Wright Water Engineers, Inc. (WWE) observed surface subsidence and geologic field conditions of the Southern Panels and Sunset Trail Mining Areas (consistent with current Exhibit 60E) for MCC relative to their coal mining activities. Mining in the area is performed below the surface within the West Elk Mine using longwall mining methods. Similar surface observations have been made annually since 1996 and semi-annually since 2007 to assess potential longwall mining effects on the environment.

Based on field observations from 1996 to fall 2023, the effects of longwall mining above the West Elk Mine have been less than initially projected as reported in Exhibit 60 (Dunrud et al., 1998 rev.) and 60E (WWE, 2012). Rockfalls and/or landslides were generally observed only sporadically in the Box Canyon Mining Area since 2006 where the steep, upper reaches of Sylvester Gulch and Box Canyon abut the large geographic feature known as West Flatiron. In the flatter and more rounded topography of the Apache Rocks, Southern Panels, and Sunset Trail Mining Areas, the rockfall and landslide potential is much smaller. However, subsidence-related tension cracks have occurred in these mining areas, particularly above the active longwall mining face.

E-seam longwall mining in the Southern Panels Mining Area was initiated on Panel E1 in December 2008 beginning at the east end and progressing westward. All mining in the Southern Panels Mining Area has been planned to progress from the east to west across the panels. As of 2020, mining was complete in E-seam Longwall Panels E1 through E8. Mining of the E-seam Longwall Panel SS1 in the Sunset Trail Mining Area was initiated in January 2020. At the time of our fall 2023 site visit, mining of Longwall Panels SS1 through SS4 (as revised) was complete (Map 1).

Beginning with the Spring 2011 Subsidence Report, an effort was made to reduce the size of the semi-annual subsidence reports by eliminating much of the regularly included background and historical information (e.g., subsidence projections). For this reason, specific details associated with subsidence projections and field recognition of subsidence and non-subsidence features were eliminated. Since that time, readers have been directed to Sections 1.0 and 2.0, respectively, of the

Spring 2011 Subsidence Report and to Exhibits 60 and 60E of the West Elk Mine permit for this information.

Also, in keeping with the goal of reducing document size, the reports since 2011 have focused on the identification and discussion of those observations that reflect an obvious change in the conditions overlying the active portion of the mine and on documenting baseline conditions in areas that have yet to be mined. For this reason, observations from our fall 2023 field visit were focused on areas above mined E-seam Longwall Panels E14 and E15 in the Southern Panels Mining Area and on E-seam Longwall Panel SS3 and SS4 of the Sunset Trail Mining Area.

Readers should note that observations are discussed relative to traverses along segments of drill roads providing access to drilling pads containing mine ventilation boreholes (MVBs). Given the dynamic nature of the mining activities (i.e., adding and reclaiming of road segments and MVB pads), future naming of traverses will likely vary from report to report. Specific nomenclature for observed features will be regularly represented on Map 1 of each report.

# 3.0 SUBSIDENCE MONITORING

MCC has been collecting data from monitoring locations near Minnesota Reservoir and Monument Dam, as well as numerous locations within the mining areas for many years. Ongoing monitoring by MCC personnel includes the U.S. Forest Service (USFS) roads and stock ponds, as well as the Monument Dam and Minnesota Reservoir area. Inspection forms for these areas are provided in Appendices A and B, respectively.

## 3.1 USFS Roads and Stock Pond Monitoring

Observations by MCC personnel of the USFS roads and stock ponds in the vicinity of active mining activities have occurred for many years. Inspection forms from observations conducted during 2023 are included with this report in Appendix A.

## 3.2 Monument Dam/Minnesota Reservoir Monitoring

As described in previous subsidence reports, MCC has conducted monitoring of the Monument Dam and strategic locations around Minnesota Reservoir since 2006. Currently, MCC has monitoring and reporting responsibilities for the land survey stations. Dam Inspection Forms for Monument Dam from January 2023 through fall 2023 are provided in Appendix B.

Quarterly land surveys of the monuments (monthly when mining is within one mile of the dam) were completed. A summary of height and longitudinal displacement data is obtained by MCC. However, with advancing technology and more stringent regulations, MCC updated the Survey Monitoring System. New base point data, using the new technology that was required for MCC to obtain in order to comply with dam monitoring requirements. Fall 2023 data will become the new base point data for future displacement, as opposed to the 2006 data that was previously used. Appendix C shows the comparison of the spring 2023 survey data with the fall 2023 data for the Monument Dam.

## 4.0 FALL 2023 SUBSIDENCE OBSERVATIONS

During WWE's fall 2023 field visit, pre-existing subsidence-related tension crack locations were observed at various locations along the established traverses above mined E-seam longwall panels in both the Southern Panels and Sunset Trail Mining Areas as accessed by USFS Road 711 (Dry Fork Road) and on MVB pads, particularly where they exist above recent mining activities. However, WWE has ceased visiting historical features over Longwall Panel E7 that had been mined years ago and have been thoroughly documented in previous reports without significant changes. Similarly, previous traverses over Longwall Panels E3 through E8 were replaced with new traverses over active mining or proposed mining areas. Subsidence features previously observed along Traverse G-G' over mined E-seam Longwall Panel SS1 were no longer visible or have been lost due to reclamation.

It should also be noted that reclamation had occurred along Traverse G-G' west of MVB SS1-6, Previously Traverse G-G' beyond MVB SS1-6 was accessed by foot; however, the previously observed subsidence features on the road and on the MVB SS1-7 pad could no longer be located due to the reclamation activities. Therefore, no effort was made to proceed past MVB SS1-6.

Observations previously made over Longwall Panel SS2 from the northeast were replaced by a new traverse E-E' from the south to observe the area overlying the western portion of the panel that was mined since the fall 2021 field visit.

No subsidence-related features were observed in alluvium, even above active longwall mining activities.

The remainder of this report provides a detailed discussion of new or recent observations associated with Traverses A-A' through G-G' (see Maps 1 and 2) as observed during the fall 2023 field visit. Details associated with these observations can be found in Sections 4.1 through 4.7 of this report. Map 1 shows the outline of E-seam mine workings along with surface topography and other surface features, including the named traverses. Map 2 shows the same area and detail as Map 1 (minus traverses) along with recently active, or potentially active, landslide and rockfall areas as delineated from aerial photo research and field observations. Also on Map 1, note that a designation such as E6-1/2/3 indicates one MVB pad containing three drill holes. The surface and

termination points of each drill hole are shown by small and large filled green circles, respectively, that are connected by green lines.

### 4.1 Traverse A-A'

This traverse overlies portions of mined E-seam Longwall Panels E1 through E4. Traverse A-A' originates just south of Monument Dam (and Minnesota Reservoir) and proceeds in a southeasterly direction along Dry Fork Road, a distance of approximately three miles. The western end of this traverse is adjacent to Minnesota Reservoir and outside the proposed E-seam longwall mining influences. The eastern end of this traverse is adjacent to the upper flume on the Dry Fork of Minnesota Creek.

Traverse A-A' is included in this report to provide context for other traverses that originate along this path and continue southward across the Southern Panels and Sunset Trail Mining Areas (see Maps 1 and 2).

No subsidence-related features were observed along this traverse during our fall 2023 field visit.

### 4.2 Traverse B-B'

Traverse B-B′ begins where the Deer Creek drainage meets the Dry Fork Road (Traverse A-A′). It continues southward up the Deer Creek drainage, past a gate located near two manufactured stock watering troughs (fed by a nearby spring), to an intersection with another road located between the E-South Mains and E-seam Longwall Panel E14, a distance of approximately one-and-a-half miles (see Map 1). Two additional stock ponds (P74 and P93) with earthen embankments are located lower in the drainage. Both of these ponds are also fed by nearby springs. This traverse is mostly located between the E-South Mains and the western ends of mined E-seam Longwall Panels E3, E4, E5, E6, and E7. The termination of this traverse (B′) is at Traverse C-C′, which proceeds both northwest and southeast from the intersection.

No subsidence-related features were observed along this traverse during the fall 2023 field visit.

## 4.3 Traverse C-C'

Traverse C-C' is intersected by the end of Traverse B-B' and extends from E-Seam Longwall Panel E15 to the northwest to the E-Seam Longwall Panels SS2 through SS4 to the southeast. En route the traverse runs along the north side of E-Seam Longwall Panel E14, which was mined from mid-April through mid-September of 2022. The traverse also crosses Lick Creek and South Prong stream channels, providing an opportunity to observe whether there has been any observable longwall-mining induced subsidence impact to these drainages.

Traverse C-C' extends to the northwest over the proposed E-seam Longwall Panel E15. The road was passible for the initial stretch in our four-wheel drive vehicle, after which the rest of the observations had to occur on foot.

The traverse provided the best opportunity to observe areas that had most recently been mined beneath. The segment southeast of the intersection with Traverse B-B' was immediately adjacent to the recently mined Longwall Panel E14. Locations 1 and 2 are located over the E14 Headgate as shown in Map 1.

### 4.3.1 Location 1

Cracks were observed along the existing road over the E14 Headgate between Crosscuts 23 and 22 during our spring 2022 site visit (Figure 1). No cracks had been observed along this traverse prior to mining in Longwall Panel E14. Therefore, the cracks were deemed to be subsidence-related features. The E-seam overburden thickness at this location is approximately 650 to 700 feet.

During the fall 2023 site visit, no new cracks were observed, and previously observed cracks were no longer discernable. The road has been subject to heavy truck traffic and routine grading making the observations along the road difficult as shown in Figure 2.

Figure 1: Southeast view of subsidence crack parallel to road on Traverse C-C' located over the E14 Headgate, between crosscuts 23 and 22 during spring 2022 visit.

Figure 2: Access road along Longwall Panel E14 Headgate following roadwork in fall 2023.

### 4.3.2 Location 2

New cracks were first observed south of the access road overlying the north end of E-seam Longwall Panel E14 during the fall 2022 site visit. As shown on Map 1, the cracks were observed at Location 2 adjacent to cross cut 17 of the E14 Headgate. A series of parallel cracks were

observed roughly parallel to the E14 Headgate with an orientation of South 40° East. The largest of the observed cracks followed the topographic contour for approximately 100 feet (Figure 3).

Figure 3: The largest of the cracks observed at Location 2 in fall 2022, south of the across road on Traverse C-C'.

The location of these cracks is consistent with locations where the tilt and horizontal displacement are largest near the edge of the panel as shown in Figure 3 of Exhibit 60E (WWE 2018). The existence of the series of parallel cracks was likely a combination of these horizontal strains in combination with the natural sloped hillside. In total, there were 5 cracks observed with the

dimensions of the cracks generally decreasing in the downhill direction towards the center of the longwall panel.

During the fall 2023 site visit, these cracks were still evident but were much less prominent. The smaller cracks had largely healed/sealed, especially where cattle or large game trails occurred. The larger cracks continue to heal; however, the sealing process appears to have stopped as some of the largest cracks remain open (Figure 4).

Figure 4: One of the largest of the cracks at Location 2, south of the across road on Traverse C-C' during fall 2023 visit showing continued healing.

## 4.4 Traverse D-D'

This new traverse branches off Traverse C-C' to the southwest across E-seam Longwall Panel E14. We were able to drive the initial portion of this traverse across Panel E14 and then proceeded on foot to the end of the traverse as shown in Map 1.

The mining of Panel E14 occurred from mid-April to mid-October with the longwall passing underneath this traverse during June 2022. While no discernable subsidence features were observed along this traverse during either our fall 2022 or spring 2023 site visits, cracks were observed during the fall 2023 site visit.

### *4.4.1 Location 4*

The newly observed cracks were located on both sides of the access road but were not seen on the road itself. This fact may indicate that the cracks were present, but not observed, prior to the fall 2023 site visit. The majority of the observed cracks were located on the eastern side of the road with E-seam overburden depth of roughly 500 to 600 feet. In general, the orientation of the cracks was north-south along the downslope of the topography away from the road that follows a ridgeline over Panel E14. The maximum depth of the cracks was 1.5 to 2.0 feet with a maximum width of approximately 4 inches. Figure 5 shows the largest of the cracks observed at Location 4 in the fall 2023.

Figure 5. Crack observed along D-D' over Longwall Panel E14 during fall 2023 site visit.

## 4.5 Traverse E-E'

This new traverse begins at Traverse C-C′ and continues north toward mined E-seam Longwall Panel SS2 before turning southeast toward E-seam Longwall Panel SS3 and terminating at MVB SS3-2 (see Map 1). Overburden along this traverse varies from about 250 feet over the mains up to just under 1,000 feet at the drill pad.

Cracks were observed along the access road to MBV SS3-2 overlying E-seam Longwall Panel SS3 in between Locations 3a and 3b as shown in Map 1 during the spring 2023 field visit.

### 4.5.1 Locations 3a to 3b

New cracks were observed along the north side of the access road overlying the north end of E-seam Longwall Panel SS3 during the spring 2023 site visit. As shown on Map 1, the cracks were observed between Location 3a and 3b. A series of parallel cracks were observed roughly parallel each other with an orientation of South 37° East. The cracks had no discernable depth or width and were not perpendicular to the road (Figure 6). It is unclear whether these observed cracks were related to mining subsidence; however, their consistent orientation was noteworthy and merited documentation. Longwall mining occurred under Locations 3a to 3b during the months of December 2022 and January 2023.

Figure 6: Example of a newly observed crack along the north side of E-seam Longwall Panel SS3 during spring 2023 site visit

During the fall 2023 site visit, the access road for Traverse E-E' had undergone significant work to install water bars prior to winter. The location could not be accessed by our vehicle, so the traverse was observed on foot. The roadwork made observations challenging and, for the most part, the previous cracks were not observed with the exception of one small crack observed on the north side of the road.

### 4.6 Traverse F-F'

Traverse F-F′ departs Traverse E-E′ in a southeasterly direction over the east end of mined E-seam Longwall Panels E5, E6, and E7. All MVB pads along this traverse have been reclaimed except E6-4. The E-seam overburden depth along this traverse varies from 1,000 feet to 1,200 feet.

No subsidence features were observed along this traverse during the fall 2023 field visit.

### 4.7 Traverse G-G′

Traverse G-G′ departs Traverse F-F′ in a southerly direction from the east end of mined E-seam Longwall Panel E7 (see Map 1). This traverse continues south over Lick Creek and to the east end of E-seam Longwall Panel SS1 of the Sunset Trail Mining Area. From this location, the traverse west across mined portions of E-seam Longwall Panel SS1 to several MVB pads (i.e., SS1-1 through SS1-7).

Longwall mining of E-seam Longwall Panel SS1 began in January 2020. As of our spring 2023 field visit, mining of this panel was complete and that portion of the traverse west of MVB pad had been reclaimed. As a result of reclamation, subsidence features originally observed during our spring 2021 field visit (on the road leading to the MVB pad SS1-7) could not be located during our fall 2023 field visit. In addition, another subsidence feature first observed during the spring 2021 field visit on MVB pad SS1-6 was no longer visible during our fall 2023 field visit due to reclamation activities.

No other subsidence-related features were observed along this traverse during our fall 2023 field visit. Due to reclamation activities and the absence of new subsidence features, this traverse could be considered for removal from future observations.

## 5.0 CONCLUSIONS

1. The conceptual B- and E-seam mining model presented in the Exhibit 60 series of the mining permit has been verified by annual field observations in the various West Elk Mine mining areas. With the use of longwall mining methods in which the uniform downwarping of the overburden rocks and unconsolidated material act as laterally constrained plates, cracks in zones under tensile stress narrow with depth and close at the neutral surface. Below the neutral surface, the materials are therefore in compression. This has an important bearing on the hydrologic consequences of longwall mining. Any groundwater or surface water in contact with a given subsidence crack is prevented from traveling downward beyond the neutral surface of the deformed plate. Annual field observations from 1996 through fall 2023 verify this conceptual model in bedrock and surficial material (colluvium,

alluvium, mudflow, and debris flow deposits) where the overburden is laterally constrained.

2. Typically, uniform downwarping occurs in association with longwall mining when there is lateral constraint. Where there are steep slopes and cliffs, there is little lateral support in at least one direction, which causes the associated rocks and unconsolidated materials to deform like unconstrained beams, plates, or cantilevers as the longwall mining faces move beneath them. This lack of lateral constraint allows subsidence cracks to commonly extend completely through sandstones and other brittle units, and groundwater or surface water present near or within these cracks will likely flow through and exit into existing surface drainages. The relatively few cliffs and over-steepened slopes in the Southern Panels and Sunset Trail Mining Areas tend to provide the lateral constraint needed to produce a more uniform downwarping with fewer significant subsidence cracks observable at the surface.

3. To date, there have been no reported impacts on surface flow or induced inflows to the underground mine workings even while longwall mining directly beneath surface water features including those associated with the Southern Panels and Sunset Trail Mining Areas. A roof failure that happened while driving the E Mains southward in 2020 (temporarily capturing flow from South Prong Creek) did not occur as a result of subsidence. Details surrounding this occurrence are discussed in TR-149 and resulted in revisions to Exhibit 60E regarding main entry development.

4. Continuous annual observations find substantial weathering of previously observed subsidence cracks with edges rounding, widths reducing, and depths filling with eroded material. The only exception to these observations has been those cracks in thick, exposed, brittle sandstone units above previously mined B-seam panels (i.e., Apache Rocks) where rounding of edges and filling of cracks have occurred over time, but widths have remained relatively constant.

5. The length of time that tension cracks are expected to be visible before the effects of erosion and deposition, mass wasting, infilling, and revegetation obliterate them (duration of cracks), is a function of their location with respect to the mine geometry and type of

material in which the cracks formed. Crack duration in zones of permanent tensile stress, such as above mine boundaries and unmined pillars between longwall panels, commonly last: 1) from one to three years in colluvium, 2) from three to six years in soft, friable sandstone, and 3) many decades in hard, durable sandstone. However, cracks that form in the zone of temporary tensile stress, such as above moving longwall faces, commonly close again when the longwall moves out of their area of influence.

6. Observed mine-induced subsidence effects have been less in the Southern Panels and Sunset Trail Mining Areas than were observed annually in the Box Canyon and Apache Rocks B-seam Mining Areas dating back to 1996. The more subdued topography and the fewer cliffs and ledges of the Southern Panels and Sunset Train Mining Areas reduce the potential for rockfall/landslide areas where E-seam mining has been underway since December 2008.

7. Field visits have revealed the healing and sealing capacity of cracks in surficial material by weathering, mass wasting, and crack infilling over time. This is particularly true in the colluvium that covers much of the surface of the Southern Panels and Sunset Trail Mining Areas. The healing and sealing capacity of these materials causes softening and rounding of the crack edges as well as reduction of crack continuity and depth to a point of being nearly imperceptible within a year or two.

8. Subsidence-related effects were observed during the fall 2023 field visit at the following location(s):

    - Just south of the access road near the chain pillars on the north side of E-seam Longwall Panel E14. While the cracks showed evidence of healing and/or sealing since the fall 2022 site visit, the larger cracks were still noticeable features within the brush.

    - Newly observed cracks over the center of Longwall Panel E14 were not previously observed even though longwall mining occurred at this location in June 2022.

    Previously observed subsidence effects were not observed during the fall 2023 field visit at the following locations:

- Along the access road over the chain pillars on the north side of E-seam Longwall Panel E14 in between Crosscuts 21 and 23. With one exception, the cracks along the access road on the north side of E-seam Longwall Panel SS3 were no longer evident.

All subsidence-related features were within the expected angle of draw for the E-seam and were generally focused in areas of maximum temporary tensile stress, such as above current or recent longwall mining activities.

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____. 2011b. *Fall 2011 Subsidence and Geologic Field Observations Box Canyon, Apache Rocks, and South of Divide Mining Areas*. Denver, CO: Wright Water Engineers, Inc.

____. 2012a. *Spring 2012 Subsidence and Geologic Field Observations Box Canyon, Apache Rocks, and South of Divide Mining Areas*. Denver, CO: Wright Water Engineers, Inc.

____. 2012b. *Fall 2012 Subsidence and Geologic Field Observations Box Canyon, Apache Rocks, and South of Divide Mining Areas*. Denver, CO: Wright Water Engineers, Inc.

____. 2013a. *Spring 2013 Subsidence and Geologic Field Observations South of Divide and Dry Fork Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2013b. *Fall 2013 Subsidence and Geologic Field Observations South of Divide and Dry Fork Mining Areas*. Denver, CO: Wright Water Engineers, Inc.

____. 2014a. *Spring 2014 Subsidence and Geologic Field Observations South of Divide and Dry Fork Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2014b. *Fall 2014 Subsidence and Geologic Field Observations South of Divide and Dry Fork Mining Areas*. Denver, CO: Wright Water Engineers, Inc.

____. 2015a. *Spring 2015 Subsidence and Geologic Field Observations South of Divide and Dry Fork Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2015b. *Fall 2015 Subsidence and Geologic Field Observations South of Divide and Dry Fork Mining Areas*. Denver, CO: Wright Water Engineers, Inc.

____. 2016. *Spring 2016 Subsidence and Geologic Field Observations South of Divide and Dry Fork Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

Witt, G.D. 2016. *Fall 2016 Subsidence and Geologic Field Observations South of Divide and Dry Fork Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2017a. *Spring 2017 Subsidence and Geologic Field Observations South of Divide and Dry Fork Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2017b. *Fall 2017 Subsidence and Geologic Field Observations South of Divide and Dry Fork Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2018a. *Spring 2018 Subsidence and Geologic Field Observations South of Divide and Dry Fork Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2018b. *Fall 2018 Subsidence and Geologic Field Observations Southern Panels Mining Area (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2019a. *Spring 2019 Subsidence and Geologic Field Observations Southern Panels Mining Area (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2019b. *Fall 2019 Subsidence and Geologic Field Observations Southern Panels Mining Area (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2020a. *Spring 2020 Subsidence and Geologic Field Observations Southern Panels and Sunset Trail Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2020b. *Fall 2020 Subsidence and Geologic Field Observations Southern Panels and Sunset Trail Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2021a. *Spring 2021 Subsidence and Geologic Field Observations Southern Panels and Sunset Trail Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2021b. *Fall 2021 Subsidence and Geologic Field Observations Southern Panels and Sunset Trail Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2022a. *Spring 2022 Subsidence and Geologic Field Observations Southern Panels and Sunset Trail Mining Areas*. Glenwood Springs, CO: Wright Water Engineers, Inc.

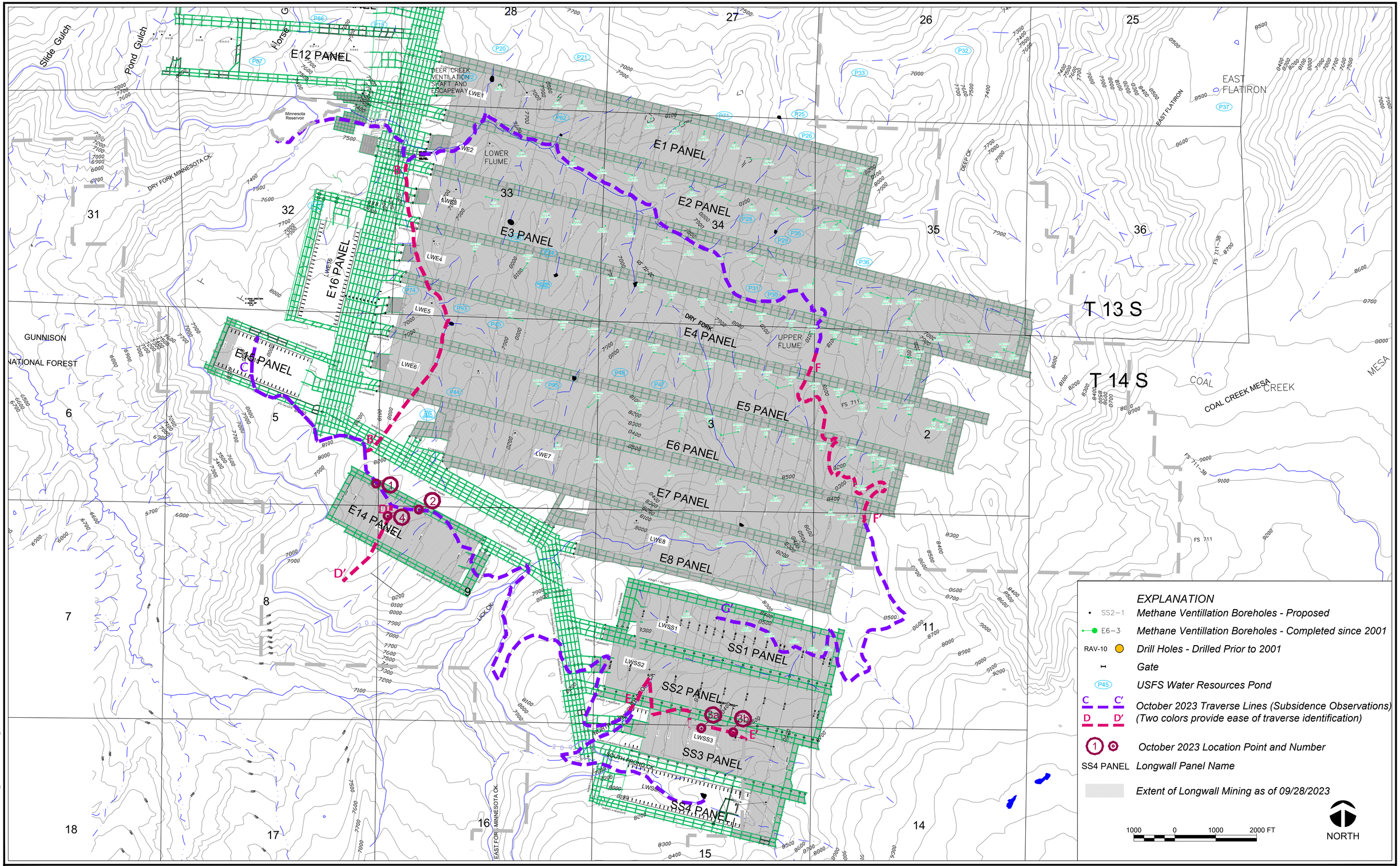
____. 2023b. *Fall 2022 Subsidence and Geologic Field Observations Southern Panels and Sunset Trail Mining Areas*. Glenwood Springs, CO: Wright Water Engineers, Inc.

____. 2023a. *Spring 2023 Subsidence and Geologic Field Observations Southern Panels and Sunset Trail Mining Areas*. Glenwood Springs, CO: Wright Water Engineers, Inc.

Wright Water Engineers, Inc. 2012. *Exhibit 60E: Subsidence Evaluation and Geologic Hazard Field Observations for the South of Divide and Dry Fork Mining Areas*. Glenwood Springs, CO: Wright Water Engineers, Inc.

____. 2021. *Exhibit 60E: Subsidence Evaluation for the Southern Panels, Apache Rocks West, & Sunset Trail Mining Areas*. Glenwood Springs, CO: Wright Water Engineers, Inc.

# MAPS




WRIGHT WATER ENGINEERS, INC.
2490 W. 26TH AVE. SUITE 100A
DENVER, CO 80211
(303)480-1700 FAX(303)480-1020

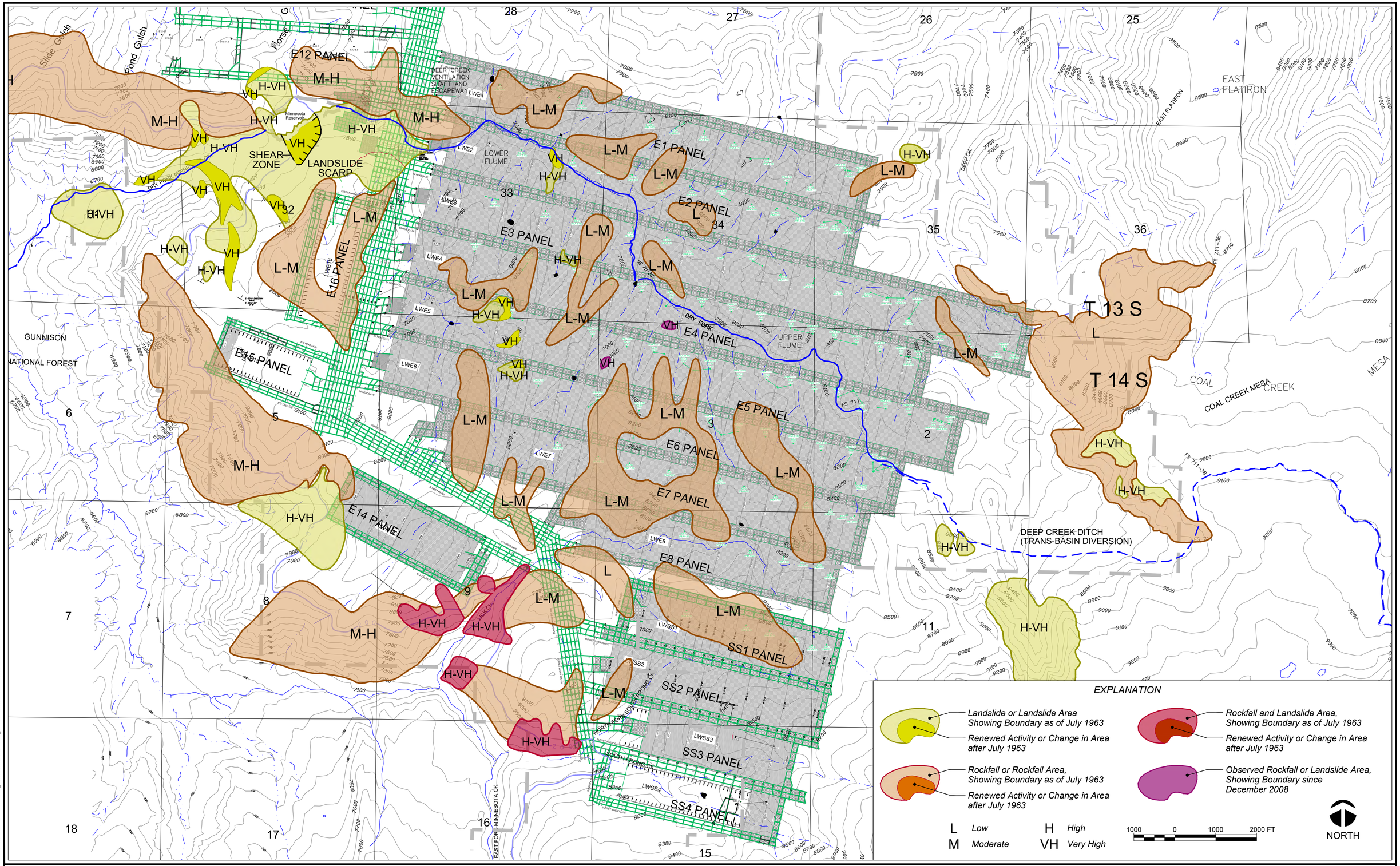
# MOUNTAIN COAL COMPANY WEST ELK MINE

LOCATIONS OF OBSERVATIONS IN THE SOUTHERN PANELS AND SUNSET TRAIL MINING AREAS - OCTOBER 2023

| DESIGN | JMK |
|---|---|
| DETAIL | LMC |
| CHECK | JMK |
| DATE | 04/29/24 |
| SCALE | 1"=1000' |

| PROJECT NUMBER | DATE | MAP |
|---|---|---|
| 831-032.914 | 04/29/24 | 1 |

Plot Date/Time: 04/30/2024, 10:36:22 AM; G:\WWE\831-032\914\CAD\01_DWGS\WWE-WORKING_01-16-24.DWG,MAP 1 LOCATIONS OF OBSERVATIONS




WRIGHT WATER ENGINEERS, INC.
2490 W. 26TH AVE. SUITE 100A
DENVER, CO 80211
(303)480-1700 FAX(303)480-1020

# MOUNTAIN COAL COMPANY WEST ELK MINE

LANDSLIDES AND ROCKFALLS IN THE SOUTHERN PANELS MINING AREA -OCTOBER 2023

| DESIGN | JMK |
|---|---|
| DETAIL | LMC |
| CHECK | JMK |
| DATE | 04/29/23 |
| SCALE | 1"=1000' |

| PROJECT NUMBER | DATE | MAP |
|---|---|---|
| 831-032.914 | 04/29/23 | 2 |

Plot Date/Time: 04/30/2024, 10:37:19 AM, G:\WWE\831-032\914\CAD\01_DWGS\WWE-WORKING_01-16-24.DWG-MAP 2-LANDSLIDES AND ROCKFALL

# APPENDIX A

## U.S. Forest Service Road and Stock Pond Inspection Forms

**Forest Service Roads**
**Inspection Form**

Date: 1-12-23
Time:
Name of Inspector: N. Poulos
Current Panel and XC Being Mined: 333
Road(s) Being Inspected:

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): |
| ☐ | ☐ | Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.): |
| ☐ | ☐ | Is there any recent evidence of potential subsidence induced slope failure? If yes, describe: |
| ☐ | ☐ | Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe: |
| ☐ | ☐ | Is mitigation needed? If yes, list suggestions: |

Notes:

no access - winter conditions

Signature of Inspector: Nico Poulos

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

**Forest Service Roads**
**Inspection Form**

Date: 2-28-23
Time: 12:00P
Name of Inspector: N. Poulos
Current Panel and XC Being Mined: 553
Road(s) Being Inspected: N/A

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): |
| ☐ | ☐ | Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.): |
| ☐ | ☐ | Is there any recent evidence of potential subsidence induced slope failure? If yes, describe: |
| ☐ | ☐ | Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe: |
| ☐ | ☐ | Is mitigation needed? If yes, list suggestions: |

Notes:
no access - winter conditions

Signature of Inspector: Nicole Poulos

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

**Forest Service Roads**
**Inspection Form**

Date: 3-13-23
Time:
Name of Inspector: N. Paulos
Current Panel and XC Being Mined: 553
Road(s) Being Inspected:

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): _____ |
| ☐ | ☐ | Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.): _____ _____ _____ |
| ☐ | ☐ | Is there any recent evidence of potential subsidence induced slope failure? If yes, describe: _____ |
| ☐ | ☐ | Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe: _____ |
| ☐ | ☐ | Is mitigation needed? If yes, list suggestions: _____ |

Notes:

no access - winter conditions

Signature of Inspector: Nicole Paulos

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

**Forest Service Roads**
**Inspection Form**

Date: 4-26-23
Time: 10:00a
Name of Inspector: N Roulo
Current Panel and XC Being Mined: Longwall move 353 - 354
Road(s) Being Inspected:

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): |
| ☐ | ☐ | Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.): |
| ☐ | ☐ | Is there any recent evidence of potential subsidence induced slope failure? If yes, describe: |
| ☐ | ☐ | Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe: |
| ☐ | ☐ | Is mitigation needed? If yes, list suggestions: |

Notes:

No access - winter conditions

Signature of Inspector: Nicole Roulo

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

**Forest Service Roads**
**Inspection Form**

Date: 5-24-23
Time: 7:15a
Name of Inspector: N. Poulos
Current Panel and XC Being Mined: SS4
Road(s) Being Inspected: Deer Creek / Dry Fork

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): |
| ☐ | ☒ | Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.): |
| ☐ | ☒ | Is there any recent evidence of potential subsidence induced slope failure? If yes, describe: |
| ☐ | ☒ | Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe: |
| ☐ | ☒ | Is mitigation needed? If yes, list suggestions: |

Notes:
normal spring run off ruts only

Signature of Inspector: Nicole Poulos

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

**Forest Service Roads**
**Inspection Form**

Date: 6-29-23
Time: 1:00
Name of Inspector: N. Poulos
Current Panel and XC Being Mined: SS4
Road(s) Being Inspected: Dry Fork + Deer Creek

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): _____ |
| ☐ | ☒ | Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.): _____ _____ _____ |
| ☐ | ☒ | Is there any recent evidence of potential subsidence induced slope failure? If yes, describe: _____ |
| ☐ | ☒ | Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe: _____ |
| ☐ | ☒ | Is mitigation needed? If yes, list suggestions: _____ |

Notes:

Signature of Inspector: Nicole Poulos

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

**Forest Service Roads**
**Inspection Form**

Date: 7.19.23
Time: 1:00 P
Name of Inspector: N. Roulos
Current Panel and XC Being Mined: SS4
Road(s) Being Inspected: Dry Fork, Deer Creek

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): _____ |
| ☐ | ☒ | Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.): _____ _____ _____ |
| ☐ | ☒ | Is there any recent evidence of potential subsidence induced slope failure? If yes, describe: _____ |
| ☐ | ☒ | Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe: _____ |
| ☐ | ☒ | Is mitigation needed? If yes, list suggestions: _____ |

Notes:

Signature of Inspector: Nicole Roulos

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

**Forest Service Roads**
**Inspection Form**

Date: 8-10-23
Time: 12:00
Name of Inspector: NPaulos
Current Panel and XC Being Mined:
Road(s) Being Inspected: Deer Creek, Dry Fork

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): |
| ☐ | ☒ | Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.): |
| ☐ | ☒ | Is there any recent evidence of potential subsidence induced slope failure? If yes, describe: |
| ☐ | ☒ | Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe: |
| ☐ | ☒ | Is mitigation needed? If yes, list suggestions: |

Notes:

hunting season is next month - lots of traffic

Signature of Inspector: Nicole Paulos

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

**Forest Service Roads**
**Inspection Form**

Date: 9-19-23
Time: 12:30p
Name of Inspector: N. Poulos
Current Panel and XC Being Mined: LWE15
Road(s) Being Inspected: Dry Fork Deep Creek

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): |
| ☐ | ☒ | Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.): |
| ☐ | ☒ | Is there any recent evidence of potential subsidence induced slope failure? If yes, describe: |
| ☐ | ☒ | Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe: |
| ☐ | ☒ | Is mitigation needed? If yes, list suggestions: |

Notes:

Signature of Inspector: Nicole Poulos

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

**Forest Service Roads**
**Inspection Form**

Date: 10/20/23
Time: 11:30am
Name of Inspector: C. Hiatt
Current Panel and XC Being Mined: LWE16
Road(s) Being Inspected: Dry fork Deep Creek

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): Old Road |
| ☐ | ☒ | Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.): |
| ☐ | ☒ | Is there any recent evidence of potential subsidence induced slope failure? If yes, describe: |
| ☐ | ☒ | Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe: |
| ☐ | ☒ | Is mitigation needed? If yes, list suggestions: |

Notes:

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

**Forest Service Roads**
**Inspection Form**

Date: 11/21/23
Time: 11:00 am
Name of Inspector: C. Hiatt
Current Panel and XC Being Mined: LWE16
Road(s) Being Inspected: Dry Fork Deep Creek

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): _____ |
| ☐ | ☒ | Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.): _____ |
| ☐ | ☒ | Is there any recent evidence of potential subsidence induced slope failure? If yes, describe: _____ |
| ☐ | ☒ | Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe: _____ |
| ☐ | ☒ | Is mitigation needed? If yes, list suggestions: _____ |

Notes:

Signature of Inspector: _____

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

**Forest Service Roads**
**Inspection Form**

Date: 12/15/23
Time: 7:31am
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: LW E16
Road(s) Being Inspected:

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): |
| ☐ | ☐ | Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.): |
| ☐ | ☐ | Is there any recent evidence of potential subsidence induced slope failure? If yes, describe: |
| ☐ | ☐ | Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe: |
| ☐ | ☐ | Is mitigation needed? If yes, list suggestions: |

Notes: No access due to weather

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

**Stock Pond**
**Inspection Form**

Date: 1-12-23
Time:
Name of Inspector: N. Poulos
Current Panel and XC Being Mined: SS3
Stock Pond(s) Being Inspected:

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): _____ |
| ☐ | ☐ | Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): _____ _____ _____ |
| ☐ | ☐ | Is there any evidence of potential subsidence induced water loss? If yes, describe: _____ |
| ☐ | ☐ | Is there water in the pond? If yes, describe: _____ |
| ☐ | ☐ | Is mitigation needed? If yes, list suggestions: _____ |

Notes:

no access - winter

Signature of Inspector: Nicole Poulos

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

**Stock Pond**
**Inspection Form**

Date: 2-28-23
Time: 12:00P
Name of Inspector: N. Poulos
Current Panel and XC Being Mined: 333
Stock Pond(s) Being Inspected: N/A

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): _____ |
| ☐ | ☐ | Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): _____ _____ _____ |
| ☐ | ☐ | Is there any evidence of potential subsidence induced water loss? If yes, describe: _____ |
| ☐ | ☐ | Is there water in the pond? If yes, describe: _____ |
| ☐ | ☐ | Is mitigation needed? If yes, list suggestions: _____ |

Notes:

no access - winter conditions

Signature of Inspector: Nicol Poulos

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

**Stock Pond**
**Inspection Form**

Date: 3-13-23
Time:
Name of Inspector: N. Poulos
Current Panel and XC Being Mined: SS3
Stock Pond(s) Being Inspected:

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): _____ |
| ☐ | ☐ | Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): _____ _____ _____ |
| ☐ | ☐ | Is there any evidence of potential subsidence induced water loss? If yes, describe: _____ |
| ☐ | ☐ | Is there water in the pond? If yes, describe: _____ |
| ☐ | ☐ | Is mitigation needed? If yes, list suggestions: _____ |

Notes:

no access - winter conditions

Signature of Inspector: N. Poulos

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

**Stock Pond**
**Inspection Form**

Date: 4-26-23
Time: 10:00a
Name of Inspector: N. Poulos
Current Panel and XC Being Mined: Longwall move 553 - 552
Stock Pond(s) Being Inspected:

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): |
| ☐ | ☐ | Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): |
| ☐ | ☐ | Is there any evidence of potential subsidence induced water loss? If yes, describe: |
| ☐ | ☐ | Is there water in the pond? If yes, describe: |
| ☐ | ☐ | Is mitigation needed? If yes, list suggestions: |

Notes:

no access - winter conditions

Signature of Inspector: Nicole Poulos

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

**Stock Pond**
**Inspection Form**

Date: 5-24-23
Time: 7:15a
Name of Inspector: N Poulos
Current Panel and XC Being Mined: 554
Stock Pond(s) Being Inspected: 109

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): _____ |
| ☐ | ☐ | Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): _____ _____ _____ |
| ☐ | ☐ | Is there any evidence of potential subsidence induced water loss? If yes, describe: _____ |
| ☐ | ☐ | Is there water in the pond? If yes, describe: _____ |
| ☐ | ☐ | Is mitigation needed? If yes, list suggestions: _____ |

Notes:

no access - winter/spring conditions

Signature of Inspector: Nicole Poulos

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

**Stock Pond**
**Inspection Form**

Date: 6-29-23
Time: 1:30
Name of Inspector: N. Poulos
Current Panel and XC Being Mined: 334
Stock Pond(s) Being Inspected: 109

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): |
| ☐ | ☒ | Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): |
| ☐ | ☒ | Is there any evidence of potential subsidence induced water loss? If yes, describe: |
| ☐ | ☒ | Is there water in the pond? If yes, describe: |
| ☐ | ☒ | Is mitigation needed? If yes, list suggestions: |

Notes:

Signature of Inspector: Nicole Poulos

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

**Stock Pond**
**Inspection Form**

Date: 7-19-23
Time: 1:00p
Name of Inspector: N.Poulos
Current Panel and XC Being Mined: 334
Stock Pond(s) Being Inspected: 109

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): |
| ☐ | ☒ | Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): |
| ☐ | ☒ | Is there any evidence of potential subsidence induced water loss? If yes, describe: |
| ☐ | ☒ | Is there water in the pond? If yes, describe: |
| ☐ | ☒ | Is mitigation needed? If yes, list suggestions: |

Notes:

Signature of Inspector: Nicole Poulos

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

**Stock Pond**
**Inspection Form**

Date: 8-10-23
Time: 1:00p
Name of Inspector: N. Poulos
Current Panel and XC Being Mined: LW move from 533 → LWE15
Stock Pond(s) Being Inspected:

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): _____ |
| ☐ | ☒ | Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): _____ _____ _____ |
| ☐ | ☒ | Is there any evidence of potential subsidence induced water loss? If yes, describe: _____ |
| ☐ | ☒ | Is there water in the pond? If yes, describe: _____ |
| ☐ | ☒ | Is mitigation needed? If yes, list suggestions: _____ |

Notes:

Signature of Inspector: Nicole Poulos

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

**Stock Pond**
**Inspection Form**

Date: 9-19-23
Time: 12:30p
Name of Inspector: N. Poulos
Current Panel and XC Being Mined: LWE15
Stock Pond(s) Being Inspected: N. Poulos

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): |
| ☐ | ☒ | Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): |
| ☐ | ☒ | Is there any evidence of potential subsidence induced water loss? If yes, describe: |
| ☐ | ☒ | Is there water in the pond? If yes, describe: |
| ☐ | ☒ | Is mitigation needed? If yes, list suggestions: |

Notes:

no stock pond w/in angle for entire 15 panel

Signature of Inspector: Nicole Poulos

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

# Monument Dam
# Inspection Form

Date: 10/20/23
Time: 12:00?
Name of Inspector: C. Hiatt
Current Panel Being Mined: LWE16
☐ Weekly Inspection ☒ Monthly Inspection

| Yes | No | |
|---|---|---|
| X | ☐ | Is mining within 1 mile of Monument Dam? |
| ☐ | X | Are there visible surface cracks on the dam?<br>If yes, indicate length and size of crack. _____. |
| ☐ | X | Is there evidence of subsided areas on or around the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | X | Are there bulges on the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | X | Are there signs of seeps on the dam?<br>If yes, indicate where and estimated flow._____. |
| ☐ | X | Are there any other potentially damaging features on the dam?<br>If yes, describe. _____. |
| ☐ | X | Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)?<br>If yes, describe. _____. |

Notes:

Signature of Inspector: Chase Hiatt

*Inspections are performed under the direction of Mike Peacock, P.E.*

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

**Stock Pond**
**Inspection Form**

Date: 11/21/23
Time: 11:30am
Name of Inspector: C. Hiatt
Current Panel and XC Being Mined: LWE16
Stock Pond(s) Being Inspected: Dry fork Deep Creek

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): |
| ☐ | ☒ | Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): |
| ☐ | ☒ | Is there any evidence of potential subsidence induced water loss? If yes, describe: |
| ☐ | ☒ | Is there water in the pond? If yes, describe: |
| ☐ | ☒ | Is mitigation needed? If yes, list suggestions: |

Notes:

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

**Stock Pond**
**Inspection Form**

Date: 12/15/23
Time: 7:31 am
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: LWE16
Stock Pond(s) Being Inspected:

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): _____ |
| ☐ | ☐ | Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): _____ _____ _____ |
| ☐ | ☐ | Is there any evidence of potential subsidence induced water loss? If yes, describe: _____ |
| ☐ | ☐ | Is there water in the pond? If yes, describe: _____ |
| ☐ | ☐ | Is mitigation needed? If yes, list suggestions: _____ |

Notes: No access due to weather

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

# APPENDIX B

## Monument Dam Inspection Forms

# Monument Dam
# Inspection Form

Date: 1-12-23
Time:
Name of Inspector: N. Poulos
Current Panel Being Mined: SS3
☐ Weekly Inspection ☒ Monthly Inspection

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is mining within 1 mile of Monument Dam? |
| ☐ | ☐ | Are there visible surface cracks on the dam?<br>If yes, indicate length and size of crack. _____. |
| ☐ | ☐ | Is there evidence of subsided areas on or around the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☐ | Are there bulges on the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☐ | Are there signs of seeps on the dam?<br>If yes, indicate where and estimated flow._____. |
| ☐ | ☐ | Are there any other potentially damaging features on the dam?<br>If yes, describe. _____. |
| ☐ | ☐ | Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)?<br>If yes, describe. _____. |

Notes:

no access - winter conditions

Signature of Inspector: Nicole Poulos

*Inspections are performed under the direction of Mike Peacock, P.E.*

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

# Monument Dam
# Inspection Form

Date: 2.28.23
Time: 12:00P
Name of Inspector: N. Poulos
Current Panel Being Mined: SS3
☐ Weekly Inspection ☒ Monthly Inspection

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is mining within 1 mile of Monument Dam? |
| ☐ | ☒ | Are there visible surface cracks on the dam?<br>If yes, indicate length and size of crack. _____. |
| ☐ | ☒ | Is there evidence of subsided areas on or around the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there bulges on the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there signs of seeps on the dam?<br>If yes, indicate where and estimated flow._____. |
| ☐ | ☒ | Are there any other potentially damaging features on the dam?<br>If yes, describe. _____. |
| ☐ | ☒ | Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)?<br>If yes, describe. _____. |

Notes:

Slopes covered in snow

Signature of Inspector: Nicolas Poulos

*Inspections are performed under the direction of Mike Peacock, P.E.*

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

# Monument Dam
# Inspection Form

Date: 3-13-23
Time:
Name of Inspector: N. Poulos
Current Panel Being Mined: 533
☐ Weekly Inspection ☒ Monthly Inspection

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is mining within 1 mile of Monument Dam? |
| ☐ | ☐ | Are there visible surface cracks on the dam?<br>If yes, indicate length and size of crack. _____. |
| ☐ | ☐ | Is there evidence of subsided areas on or around the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☐ | Are there bulges on the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☐ | Are there signs of seeps on the dam?<br>If yes, indicate where and estimated flow._____. |
| ☐ | ☐ | Are there any other potentially damaging features on the dam?<br>If yes, describe. _____. |
| ☐ | ☐ | Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)?<br>If yes, describe. _____. |

Notes:

No access - snow

Signature of Inspector: Nicole Poulos

*Inspections are performed under the direction of Mike Peacock, P.E.*

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

# Monument Dam
# Inspection Form

Date: 4.26.23
Time: 10:00a
Name of Inspector: N. Poulos
Current Panel Being Mined: Longwall move 553 to 554
☐ Weekly Inspection ☒ Monthly Inspection

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is mining within 1 mile of Monument Dam? |
| ☐ | ☐ | Are there visible surface cracks on the dam?<br>If yes, indicate length and size of crack. _____. |
| ☐ | ☐ | Is there evidence of subsided areas on or around the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☐ | Are there bulges on the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☐ | Are there signs of seeps on the dam?<br>If yes, indicate where and estimated flow._____. |
| ☐ | ☐ | Are there any other potentially damaging features on the dam?<br>If yes, describe. _____. |
| ☐ | ☐ | Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)?<br>If yes, describe. _____. |

Notes:

no access - winter conditions

Signature of Inspector: Nicole Poulos

*Inspections are performed under the direction of Jessica Wilczek, P.E.*

If cracks or other potentially damaging features occur, notify Jessica Wilczek immediately.

# Monument Dam
# Inspection Form

Date: 5-24-23
Time: 7:15a
Name of Inspector: N. Poulos
Current Panel Being Mined: SS4
☐ Weekly Inspection ☒ Monthly Inspection

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is mining within 1 mile of Monument Dam? |
| ☐ | ☒ | Are there visible surface cracks on the dam?<br>If yes, indicate length and size of crack. _____. |
| ☐ | ☒ | Is there evidence of subsided areas on or around the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there bulges on the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there signs of seeps on the dam?<br>If yes, indicate where and estimated flow._____. |
| ☐ | ☒ | Are there any other potentially damaging features on the dam?<br>If yes, describe. _____. |
| ☐ | ☒ | Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)?<br>If yes, describe. _____. |

Notes:

Signature of Inspector: Nicole Poulos

*Inspections are performed under the direction of Mike Peacock, P.E.*

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

# Monument Dam
# Inspection Form

Date: 6-29-23
Time: 2:00
Name of Inspector: N. Poulos
Current Panel Being Mined: 334
☐ Weekly Inspection ☒ Monthly Inspection

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is mining within 1 mile of Monument Dam? |
| ☐ | ☒ | Are there visible surface cracks on the dam?<br>If yes, indicate length and size of crack. _____. |
| ☐ | ☒ | Is there evidence of subsided areas on or around the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there bulges on the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there signs of seeps on the dam?<br>If yes, indicate where and estimated flow._____. |
| ☐ | ☒ | Are there any other potentially damaging features on the dam?<br>If yes, describe. _____. |
| ☐ | ☒ | Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)?<br>If yes, describe. _____. |

Notes:

Signature of Inspector: N. Poulos

*Inspections are performed under the direction of Mike Peacock, P.E.*

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

# Monument Dam
# Inspection Form

Date: 1-19-23
Time: 12:00p
Name of Inspector: N. Poulos
Current Panel Being Mined: SS4
☐ Weekly Inspection ☒ Monthly Inspection

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is mining within 1 mile of Monument Dam? |
| ☐ | ☒ | Are there visible surface cracks on the dam?<br>If yes, indicate length and size of crack. _____. |
| ☐ | ☒ | Is there evidence of subsided areas on or around the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there bulges on the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there signs of seeps on the dam?<br>If yes, indicate where and estimated flow._____. |
| ☐ | ☒ | Are there any other potentially damaging features on the dam?<br>If yes, describe. _____. |
| ☐ | ☒ | Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)?<br>If yes, describe. _____. |

Notes:

Signature of Inspector: Nicole Poulos

*Inspections are performed under the direction of Mike Peacock, P.E.*

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

# Monument Dam
# Inspection Form

Date: 9.30.23
Time: 2:00P
Name of Inspector: N. Poulos
Current Panel Being Mined: LWE15
☐ Weekly Inspection ☒ Monthly Inspection

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is mining within 1 mile of Monument Dam? |
| ☐ | ☒ | Are there visible surface cracks on the dam?<br>If yes, indicate length and size of crack. _____. |
| ☐ | ☒ | Is there evidence of subsided areas on or around the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there bulges on the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there signs of seeps on the dam?<br>If yes, indicate where and estimated flow._____. |
| ☐ | ☒ | Are there any other potentially damaging features on the dam?<br>If yes, describe. _____. |
| ☐ | ☒ | Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)?<br>If yes, describe. _____. |

Notes:

Signature of Inspector: Nicole Poulos

*Inspections are performed under the direction of Mike Peacock, P.E.*

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

# Monument Dam
# Inspection Form

Date: 9-19-23
Time: 12:30p
Name of Inspector: N. Poulos
Current Panel Being Mined: LWE15
☐ Weekly Inspection ☒ Monthly Inspection

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is mining within 1 mile of Monument Dam? |
| ☐ | ☒ | Are there visible surface cracks on the dam?<br>If yes, indicate length and size of crack. _____. |
| ☐ | ☒ | Is there evidence of subsided areas on or around the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there bulges on the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there signs of seeps on the dam?<br>If yes, indicate where and estimated flow._____. |
| ☐ | ☒ | Are there any other potentially damaging features on the dam?<br>If yes, describe. _____. |
| ☐ | ☒ | Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)?<br>If yes, describe. _____. |

Notes:

Key to peizo. holes was found

Signature of Inspector: Nicole Poulos

*Inspections are performed under the direction of Mike Peacock, P.E.*

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

**Stock Pond**
**Inspection Form**

Date: 10/20/23
Time: 11:45 am
Name of Inspector: C. Hiatt
Current Panel and XC Being Mined: LWE16
Stock Pond(s) Being Inspected: Dry fork Deep Creek

| Yes | No | |
|---|---|---|
| ☐ | ☒ | Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): |
| ☐ | ☒ | Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): |
| ☐ | ☒ | Is there any evidence of potential subsidence induced water loss? If yes, describe: |
| ☐ | ☒ | Is there water in the pond? If yes, describe: |
| ☐ | ☒ | Is mitigation needed? If yes, list suggestions: |

Notes:

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

# Monument Dam
# Inspection Form

Date: 11/21/23
Time: 12:00P
Name of Inspector: C. Hiatt
Current Panel Being Mined: LWE16
☐ Weekly Inspection ☒ Monthly Inspection

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is mining within 1 mile of Monument Dam? |
| ☐ | ☒ | Are there visible surface cracks on the dam?<br>If yes, indicate length and size of crack. _____. |
| ☐ | ☒ | Is there evidence of subsided areas on or around the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there bulges on the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there signs of seeps on the dam?<br>If yes, indicate where and estimated flow._____. |
| ☐ | ☒ | Are there any other potentially damaging features on the dam?<br>If yes, describe. _____. |
| ☐ | ☒ | Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)?<br>If yes, describe. _____. |

Notes:

Signature of Inspector: Chase Hiatt

*Inspections are performed under the direction of Mike Peacock, P.E.*

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

# Monument Dam
# Inspection Form

Date: 12/15/23
Time: 8:00 am
Name of Inspector: Chase Hiatt
Current Panel Being Mined: LWE15
☐ Weekly Inspection ☒ Monthly Inspection

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is mining within 1 mile of Monument Dam? |
| ☐ | ☒ | Are there visible surface cracks on the dam?<br>If yes, indicate length and size of crack. _____. |
| ☐ | ☒ | Is there evidence of subsided areas on or around the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there bulges on the dam?<br>If yes, indicate where and degree. _____. |
| ☐ | ☒ | Are there signs of seeps on the dam?<br>If yes, indicate where and estimated flow._____. |
| ☐ | ☒ | Are there any other potentially damaging features on the dam?<br>If yes, describe. _____. |
| ☐ | ☒ | Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)?<br>If yes, describe. _____. |

Notes: Couldn't Preform Site Inspections Because of weather

Signature of Inspector: Chase Hiatt

*Inspections are performed under the direction of Mike Peacock, P.E.*

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

# APPENDIX C

## Monument Dam Monitoring Data

# Monument Dam Survey Data

| Name | Easting 5/10/23 | Northing 5/10/23 | Elevation 5/10/23 | Easting 9/28/23 | Northing 9/28/23 | Elevation 9/28/23 | Δ Easting | Δ Northing | Δ Elevation |
|---|---|---|---|---|---|---|---|---|---|
| 6001 | 1438801.222 | 387917.891 | 7338.069 | 1438801.1 | 387917.9 | 7338.0 | 0.1 | 0.0 | 0.1 |
| 6002 | 1438840.596 | 387802.990 | 7338.691 | 1438840.9 | 387802.6 | 7338.6 | -0.3 | 0.4 | 0.1 |
| 6003 | 1438781.130 | 387855.588 | 7323.607 | 1438781.1 | 387855.6 | 7323.5 | 0.1 | 0.0 | 0.1 |
| 6004 | 1438735.039 | 387773.364 | 7305.958 | 1438735.0 | 387773.3 | 7305.9 | 0.1 | 0.1 | 0.0 |
| 6005 | 1438584.585 | 387703.800 | 7290.637 | 1438584.5 | 387703.8 | 7290.6 | 0.1 | 0.0 | 0.0 |
| 6006 | 1438479.841 | 387648.573 | 7257.507 | 1438479.8 | 387648.6 | 7257.4 | 0.1 | 0.0 | 0.1 |
| 6007 | 1439013.489 | 387697.351 | 7337.813 | 1439013.4 | 387697.3 | 7337.8 | 0.1 | 0.1 | 0.0 |
| 6008 | 1438922.397 | 387687.504 | 7340.497 | 1438922.3 | 387687.5 | 7340.4 | 0.1 | 0.0 | 0.1 |
| 6009 | 1438807.466 | 387652.855 | 7329.934 | 1438807.3 | 387652.8 | 7329.9 | 0.1 | 0.0 | 0.1 |
| 6010 | 1438656.909 | 387652.286 | 7291.444 | 1438656.8 | 387652.3 | 7291.3 | 0.1 | 0.0 | 0.1 |
| 6011 | 1438566.226 | 387543.927 | 7265.577 | 1438566.2 | 387543.9 | 7265.5 | 0.1 | 0.0 | 0.0 |
| 6012 | 1438847.096 | 387563.863 | 7335.209 | 1438847.0 | 387563.9 | 7335.1 | 0.1 | 0.0 | 0.1 |
| 6501 | 1441368.4 | 387524.7 | 7499.2 | 1441367.1 | 387525.0 | 7499.4 | 1.4 | -0.3 | -0.2 |
| 6502 | 1439617.8 | 388740.5 | 7388.1 | 1439617.8 | 388740.5 | 7387.9 | 0.0 | 0.0 | 0.2 |
| 6503 | 1440270.2 | 388520.4 | 7332.6 | 1440269.2 | 388520.5 | 7332.5 | 1.0 | -0.1 | 0.1 |
| 6504 | 1438364.0 | 385923.5 | 7627.0 | 1438363.8 | 385924.5 | 7627.2 | 0.2 | -1.0 | -0.2 |
| 7000 | 1438587.187 | 387402.465 | 7324.075 | 1438587.1 | 387402.4 | 7324.0 | 0.1 | 0.0 | 0.1 |
| 7001 | 1438836.292 | 387316.818 | 7361.494 | 1438836.2 | 387316.8 | 7361.5 | 0.1 | 0.1 | 0.0 |
| 7002 | 1438987.066 | 387197.724 | 7399.659 | 1438987.0 | 387197.8 | 7399.6 | 0.1 | -0.1 | 0.1 |
| 7003 | 1439086.087 | 387351.508 | 7381.948 | 1439086.0 | 387351.5 | 7381.9 | 0.1 | 0.1 | 0.1 |
| 7004 | 1439265.235 | 387577.993 | 7351.561 | 1439265.2 | 387577.9 | 7351.5 | 0.1 | 0.1 | 0.1 |
| 7005 | 1439353.513 | 387712.082 | 7349.913 | 1439353.5 | 387712.0 | 7349.8 | 0.1 | 0.1 | 0.1 |
| 7006 | 1439509.002 | 387790.666 | 7343.541 | 1439509.0 | 387790.6 | 7343.5 | 0.0 | 0.1 | 0.1 |
| 7007 | 1439682.027 | 387965.838 | 7358.821 | 1439682.0 | 387965.8 | 7358.7 | 0.0 | 0.1 | 0.1 |
| 7008 | 1439833.846 | 388031.063 | 7367.591 | 1439833.8 | 388031.0 | 7367.5 | 0.0 | 0.1 | 0.1 |
| 7009 | 1439781.552 | 387822.543 | 7402.601 | 1439781.5 | 387822.5 | 7402.5 | 0.0 | 0.1 | 0.1 |
| 7010 | 1439961.343 | 388080.774 | 7369.347 | 1439961.3 | 388080.7 | 7369.3 | 0.0 | 0.1 | 0.1 |
| 7011 | 1439812.488 | 387959.298 | 7400.279 | 1439812.4 | 387959.2 | 7400.2 | 0.0 | 0.1 | 0.1 |
| 7012 | 1439832.168 | 387765.233 | 7426.941 | 1439832.1 | 387765.2 | 7426.8 | 0.0 | 0.1 | 0.1 |
| 7013 | 1439927.196 | 387644.277 | 7494.894 | 1439927.1 | 387644.2 | 7494.8 | 0.1 | 0.1 | 0.1 |
| 7014 | 1439823.375 | 387604.875 | 7446.265 | 1439823.3 | 387604.8 | 7446.2 | 0.0 | 0.1 | 0.1 |
| 7015 | 1439879.8 | 387528.2 | 7498.5 | 1439878.8 | 387528.4 | 7498.6 | 1.0 | -0.2 | 0.0 |
| 7016 | 1439687.258 | 387517.206 | 7447.865 | 1439687.2 | 387517.1 | 7447.8 | 0.1 | 0.1 | 0.0 |
| 7017 | 1439778.6 | 387422.9 | 7498.5 | 1439778.0 | 387423.4 | 7498.5 | 0.7 | -0.5 | 0.0 |
| 7018 | 1439193.552 | 387386.759 | 7385.752 | 1439193.5 | 387386.7 | 7385.7 | 0.0 | 0.0 | 0.1 |
| 7019 | 1438689.528 | 387187.737 | 7367.953 | 1438689.5 | 387187.7 | 7367.9 | 0.1 | 0.0 | 0.1 |
| 7020 | 1438878.633 | 386892.254 | 7464.574 | 1438878.5 | 386892.2 | 7464.5 | 0.1 | 0.1 | 0.1 |
| 7021 | 1439258.141 | 387240.956 | 7417.908 | 1439258.1 | 387240.9 | 7417.9 | 0.1 | 0.1 | 0.0 |
| 7022 | 1439408.931 | 387207.850 | 7466.350 | 1439408.8 | 387207.7 | 7466.3 | 0.1 | 0.1 | 0.1 |
| 7023 | 1439326.321 | 387134.298 | 7458.632 | 1439326.2 | 387134.4 | 7458.6 | 0.1 | -0.1 | 0.0 |
| 7024 | 1438990.750 | 386701.557 | 7518.030 | 1438990.6 | 386701.5 | 7518.0 | 0.1 | 0.0 | 0.0 |
| 7025 | 1439690.650 | 386958.716 | 7605.821 | 1439690.6 | 386958.6 | 7605.8 | 0.1 | 0.1 | 0.0 |

# APPENDIX D

## Extent of E-seam Longwall Mining Map - Fall 2023

LWE1
LWE2
LWE3
LWE4
LWE5
LWE6
LWE7
LWE8
LWE10
LWE11
LWE12
LWE14
LWE16
LWSS1
LWSS2
LWSS3
LWSS4
GATE
POND
RTS
DRY FORK
DEEP CREEK FLATS
DEEP CREEK CROSSING
DEEP CREEK DITCH
DITCHCABIN
MINNESOTA RESERVOIR
TRAIL
ROAD
OLD ROAD
RECLAIMED
ATV TRAIL
SUNSET TRAIL
BITTER SPRINGS

T 13 S
T 14 S

## NOTES:

- *Gateroad entries for longwall panels LWE1 through LWE8 were generally developed from west to east and then longwall mined from east to west. These longwall panels were mined in order from north to south within the coal lease areas shown.*
- *The proposed western longwall panels LWE9 through LWE12 will likely be the last E Seam panels mined due to the locations along the main entries.*
- *The projected panel layout and timing were based on the best available exploration data, professional judgement, and markets at the time this map was prepared. Pillar and panel dimensions may be adjusted within the Projected Potential Mining Area and permit boundary if warranted by actual mining conditions, including coal thickness, coal quality, and geotechnical conditions to fulfill federal coal lease maximum economic recovery requirements.*

1. *See Exhibit 60E. The actual E-seam angle-of-draw has been conservatively calculated as 16.3°. (See Appendix B of the Spring 2010 Subsidence Report.) The angle of draw is measured using the greatest vertical distance between the top of the E seam at the nearest edge of each longwall panel and the ground surface elevation equal to the point of no discernable subsidence.*
2. *Also referred to as the "Projected Potential Mining Area." Although not anticipated (based on available data, as above), should mining be extended in this area and beyond the projected E-seam mining shown, the associated projected impacts of subsidence have been evaluated in Exhibits 55B & 60E.*

## LEGEND

- *Permit Area Boundary*
- *Coal Lease Boundary (Federal Lease C-1362 Excludes 24.8 Acres Under Minnesota Reservoir a.k.a. Independent Reservoir or Monument Dam)*
- *Approximate limit of the maximum predicted 19° E-seam angle of draw.[1]*
- *Maximum Projected Areal Extent of Potential Mineable E-seam.[2]*
- *Projected E Seam mining*
- *MINED AREAS*
- *PERMITTED UNMINED AREAS*

THIS DRAWING WAS PREPARED UNDER MY SUPERVISION AND REPRESENTS INFORMATION THAT IS ACCURATE TO THE BEST OF MY KNOWLEDGE

| DRAWN | |
|---|---|
| DATE | BY |
| 12/31/17 | TR-143 JAW |
| REVISED | |
| DATE | BY |
| 1-19-18 | TR-144 GBG |
| 3-19-18 | PR-15 GBG |
| 6-29-18 | PR-15 EDL |
| 2-1-21 | TR-149 GBG |
| 3-18-22 | TR-150 NP |
| 5-25-22 | SUB. NP |
| 5-25-22 | SUB. NP |
| 7-7-23 | SUB. NP |
| 4-29-24 | JAW |

ARCH WEST ELK
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Operated by Mountain Coal Company, L.L.C.
A subsidiary of Arch Resources, Inc.

# Fall 2023 Subsidence Survey Map

COORDINATE SYSTEM: NAD 27

SCALE: 0 2000 feet

FILE NO.
Spring 2023 Subsidence Map
Path: R:\ENVIRONMENTAL (ENV)\AGENCIES\CDRMS\QUARTERLY REPORTS\SUBSIDENCE

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