STATE OF COLORADO

**Musick - DNR, Jason <jason.musick@state.co.us>**

# Re: Magpie Diversion

1 message

**W D Corley, Jr.** <ajjc@att.net> Wed, Nov 6, 2019 at 4:47 PM
To: "Musick - DNR, Jason" <jason.musick@state.co.us>

Jason,
I do have some thoughts about why the Magpie Diversion needs additional repair that I have attached as a report named Magpie Diversion 2.pdf.
Doug Corley

On Thursday, October 24, 2019, 02:37:24 PM MDT, Musick - DNR, Jason <jason.musick@state.co.us> wrote:

Good afternoon Dr. Corley,

With regard to the remaining portion of the Magpie Diversion within the revoked Southfield Mine permit boundary, the Division believes that the diversion, as it presently sets, is stable and is designed to meet a 100 year/24 hour precipitation event without additional repair. As you know, the Office of Surface Mining, Reclamation, and Enforcement along with the Division conducted a LiDar survey of the diversion and it was determined that the flow depth of the diversion would be approximately 13 feet before the integrity of the diversion would be jeopardized. As such, the Division believes that a failure to the diversion is unlikely. This is also partially confirmed by the 2018 precipitation event in which the Florence rain gauge received 1.43 inches of rain in one hour (although the Southfield Mine area may have received more/less precipitation) and the Magpie Diversion was inspected and no issues were noted and functioned as designed.

The remaining portion of the revoked Southfield Mine is currently on a reduced inspection frequency of two Complete Inspections per year. One in the Spring and one in the Fall. If, as a part of those inspections, it is determined that the integrity of the diversion has been jeopardized to the point that it would require maintenance, the Division would initiate those actions.

Please let Zach Trujillo or I know if you have any additional questions or comments.

**Jason Musick**
**Senior Environmental Protection Specialist**

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**MAGPIE DIVERSION 2.pdf**
631K

# MAGPIE DIVERSION

The Magpie Diversion was designed and constructed by GEC in about 1980 as a temporary diversion for its surface mining. When Dorchester opened its underground mine later called Southfield Mine, the temporary Diversion was continued to be used. When the Southfield Mine was closed in 2001, Energy Fuels Coal, Inc. was given approval on July 24, 2001, to retain the Diversion as a permanent diversion with the specifications contained on Southfield Map 25A[1] and TR32. These new design specifications included reducing the slope of the channel, widening the channel, installing drop structures, and rip-rapping the steeper portions of the channel and the sidewalls. Following that approval the permanent Diversion was constructed. During this construction a spring was uncovered that produced running water, and the spring was developed as a permanent structure with a delivery pipeline discharging to the culvert underneath the Monarch Fan Road.

According to the Regulations of the Colorado Mined Land Reclamation Board, regulation 4.05.4(2), the construction of a permanent diversion shall be certified by a qualified registered professional engineer.[2] The only as built certification for the permanent Magpie Diversion is Southfield Map 25B.[3] This map only shows the vertical profile of the channel bottom with no certification of the channel depth, side wall slope, channel width, or sidewall rip-rap. There is no other certification of the completed construction of the Magpie Diversion.

On June 25, 2016, the developed spring structure and delivery pipeline were removed. This work was performed with a large Caterpillar excavator. The rip-rap on the northwest side wall of the Diversion was removed to allow the excavator to enter the cannel bottom. The rip-rap was not replaced leaving the bare area. Energy Fuels was repeatedly told in the monthly inspection reports to repair the bare area with rip-rap.[4]

The downstream end of the Magpie Diversion is shown on all three Southfield Maps 25, 25A, and 25B as the inlet of the 8.8 ft. corrugated metal culvert underneath the Monarch Fan Road.[1,3,6] It is important to note that the culvert does not discharge into the original Magpie drainage. It discharges all of the Magpie Diversion water into an unnamed drainage.[7] This unnamed drainage joins Magpie Creek about another half mile downstream. This means that any sediment in the Magpie Diversion is carried off the permit area and onto adjoining land owners. Additionally, Regulation 4.05.4(2)b requires that the diversion channel shall at least equal the immediate upstream and downstream existing capacities.[2] There is no documentation in the permit that the downstream unnamed drainage was ever surveyed or evaluated.

The inlet of the 8.8 ft. culvert that the Magpie Diversion empties into has been damaged and bent so that its flow properties are not equal to the ideal undamaged 8.8 ft. culvert. This damage was confirmed by the DRMS inspection report on Nov. 7, 2017, plus additional deficiencies such as insufficient channel depth and a lack of adequate freeboard.[11]

Picture 1. Damaged inlet of 8.8 ft. culvert.

The cross-sectional area of the inlet is reduced 16%.[8] The culvert outlet is also bent reducing the flow capacity.

Picture 2. Damaged outlet of 8.8 ft. culvert.

The center portion of the culvert directly underneath the haul road has been compressed so that the cross-sectional area is reduced. How much reduction in flow caused by these problems is unknown because Federal Culvert Charts do not have information covering this type of culvert inlet, outlet, and compression damage.

An additional problem is that the culvert is shown to measure 8.8 ft. on Southfield Map 25.[6] Flow capacities and water head depths have utilized a 9 ft. dimension for the culvert diameter. With the

actual culvert diameter being less than the 9 ft. used for calculating the flow capacity of the culvert, it is unknown how much water head will be required or how deep the impounded water will be at the culvert inlet for a 100 year event.

In the past the Division has agreed that the existing culvert will not pass the predicted volume of water from a 100 year event without impounding water behind the inlet. This requires the increase of the depth of water at the inlet until the water head pressure is sufficient to increase the water flow through the culvert. The true flow capacity of the existing culvert is unknown, and the depth of the impounded water is also unknown, although the hydrology report by Simons and Li predicts the depth of water at the culvert inlet would be 17 ft. for just a 10 year event.[10]

Since the construction of the permanent Diversion, there has never been a large enough 24 hour rain event to cause a significant flow of water in the Diversion. Since the 2016 removal of the rip-rap creating the bare area there has never been any significant flow of water in the Diversion channel. While the records may show that there was a 1.68 inch rain in Florence on July 24, 2018, there is no evidence at the Southfield Mine site that there was any significant flow of water in the Diversion. The photographs taken on July 25, 2018, in the DRMS inspection report[9] do not show the grass stems to be bent the day after the Florence rain. Flowing water would have left the grass flattened.


Picture 3. Magpie Diversion on July 25, 2018.[9]

I would agree that the bare area still appears stable, *but without flowing water on July 24, 2018, there is no proof that the Diversion will be stable in a 100 year event.* Please note that according to NOAA Atlas 2[13], which was in use in 2002 when TR32 was approved for the Diversion construction, a 100 year 24 hour event was predicted to be 4.67 inches for the specific Magpie drainage area. This Atlas has been superseded by NOAA Atlas 14[14], and a 100 year 24 hour event is now predicted to be 4.96 inches. Using the latest 100 year 24 hour NOAA data, the predicted flow in the Diversion would be far greater than flow depth, volume, and velocity than shown on Southfield Map 25A.

The approved engineered design of the Diversion is based on predicted 100 year event flow depth of 3.2 ft. at the bare area channel section with a flow of 529 cfs and velocity of 11.3 fps.[1] That is a lot of fast moving water. There is a second hydrology report in the Southfield permit by Simons and Li[9] that predicts a flow of 897 cfs for a 10 year 24 hour event; an even larger 100 year event was not even considered.

The OSM scan of the Diversion only depicts the results of water levels at the culvert with the depth increasing by 1 ft. increments above the bottom of the culvert. This water depth demonstration is not a hydrological study of a predicted 100 year event. There are no results of the amount of water necessary to increase the ponding effect of the 1 ft. increments. There is no hydrological demonstration of the effects of the rushing water in the Diversion such as predicted to be 3.2 ft. deep at the rip-rap bare area flowing at 11.3 fps. In fact, the OSM scan only shows a level static pond filling from below and not the dynamic flow in the channel in the 100 year event flash flood. The conclusion that the Division reports is that the flow depth would have to be 13 ft. before the integrity of the Diversion would be jeopardized.[12] I am unsure what that conclusion means since there are two main issues for potential damage to the Diversion from a 100 year event. One is simply inadequate flow capacity with flood water topping the channel banks. The second is whether the channel construction can withstand the high velocity flows of a 100 year event without excessive erosion. I think that 13 ft. deep standing water will not damage the bare area, but predicted high velocity flowing water only 3.2 feet deep will rapidly erode the dirt side wall of the channel lacking rip-rap armoring.

I cannot find any provision in the Regulations that would allow uncertified, substandard conditions to exist and to wait for erosion to occur before damage is repaired. If preventive repairs are not made and the inevitable erosion from a 100 year event occurs, the damage and cost resulting will far exceed the available bond.

In conclusion, the existing bare area where the rip-rap was removed clearly does not meet the Regulations for a permanent diversion. With no certification except for channel grade, there is no information that the construction of the permanent Diversion meets the design specifications. Finally, with the Division's confirmation that there are culvert deficiencies and with the NOAA increase in the volume of water from a 100 year 24 hour event, it is very likely that the Diversion will fail.

REFERENCES

1. Southfield Mine Map 25A, Aug. 1, 2001.

2. Regulations of the Colorado Mined Land Reclamation Board for Coal Mining, Aug. 30, 1980, as revised.

3. Southfield Mine Map 25B, Aug. 8, 2002.

4. DRMS Inspection reports, Sept. 20, 2018, Apr. 9, 2018, Feb. 2, 2018, Jan. 24, 2018, Dec. 20, 2017, Oct. 5, 2017, Sept.. 7, 2017, July 11, 2017, June 30, 2017. Apr. 26, 2017, Mar. 6, 2017, Oct. 16, 2016.

5. OSM inspection report, May 30, 2017.

6. Southfield Mine Map 25, Dec. 11, 1989.

7. USGS Rockvale Quadrant topographic map, 1959.

8. Magpie survey, John Keilers, PLS 23890, July 11, 2016.

9. DRMS inspection report, page 4, July 25, 2018.

10. Simons and Li Hydrology Report, Sept., 1981.

11. DRMS Inspection report, Nov. 7, 2017.

12. DRMS email, Jason Musick, Oct. 24, 2019.

13. NOAA National Weather Service, Atlas 2, superseded by Atlas 14, Apr. 19, 2013.

14. NOAA National Weather Service, Atlas 14, input of latitude 38.286689 and longitude of -105.166667 Nov. 5, 20019.

Signed,

W.D. Corley, Jr.
President, The Corley Company
Nov. 6, 2019