

October 14, 2016

Jim Hughes
Colorado Oil & Gas Conservation Commission
1120 Lincoln Street, Suite 801
Denver, CO 80203

**RE: McCulloch #4 Soil Gas Survey Results
La Plata County, Colorado**

Dear Mr. Hughes:

Cottonwood Consulting LLC (Cottonwood) is pleased to provide you with the results of the soil gas survey conducted in the vicinity of the McCulloch #4 temporarily-abandoned natural gas well in La Plata County, Colorado (Attached Figure). The soil gas survey methodology and associated results are summarized below.

Background

The McCulloch #4 (API# 05-067-05620) temporarily-abandoned natural gas well is located in the northeast quarter of the northwest quarter of Section 35, Township 34 North, Range 10 West, in La Plata County, Colorado. The well was drilled in 1956 by Grantham, Jackson, and Marcus Trustees and experienced mechanical difficulties either while drilling or shortly thereafter. It appears the well may not have been completed and according to Colorado Oil and Gas Conservation Commission (COGCC) the status of the well has been “temporarily-abandoned” since 1957. The original geological targets were the Pictured Cliff Sandstone estimated at 3,000 feet below ground surface (bgs) and the Mesa Verde Formation estimated at 5,500 feet (bgs). According to older COGCC records, total depth is 5,561 feet (bgs). Due to various disputes over operatorship, the well has never been produced or plugged and is now considered to be an orphan well by the State. Cottonwood was retained by the COGCC in October 2016 to conduct a soil gas survey to evaluate current site conditions and determine the presence or absence of methane seepage in the vicinity of the McCulloch #4 and to collect a gas sample from the well, if possible.

Methodology

Cottonwood was on-site to conduct the soil gas survey on October 6, 2016. Prior to the soil gas survey, Cottonwood conducted a utility locate to ensure that all underground utilities within the survey area were properly marked prior to ground disturbance.

The soil gas survey was conducted using a grid-mapping system to systematically cover the area. Soil gas measurements were collected at 50-foot intervals across the gridded areas including the McCulloch #4 temporarily-abandoned well. Cottonwood used a slide-hammer to advance a borehole to a total depth of approximately two feet (bgs) at each measurement location. Tubing

connected to a GEM5000[®] Landfill Gas Meter was lowered into each borehole to collect measurements of methane, oxygen, carbon dioxide, carbon monoxide, and hydrogen sulfide. The concentration of each gas and the associated measurement location was recorded using a Trimble GeoXT[®]. Additional observations regarding vegetation and general site conditions were recorded in a field notebook.

Cottonwood anticipated collecting a gas sample from the well for analysis of gas composition and stable isotopes of methane. Due to well head conditions, including valves and piping, Cottonwood was unable to collect a gas sample at the time of the soil gas survey. Cottonwood found the tubing master valve open and one of the production casing master valves missing. Methane was recorded venting from the production casing valve port. Additional well head equipment including valves and plugs are needed to stop the current venting and for gas sample collection.

Results

Results indicate that methane was not detected at any of the 27 measurement locations during the soil gas survey. Additionally, oxygen, carbon dioxide, carbon monoxide, and hydrogen sulfide levels were generally consistent with background levels. Vegetation appeared to be healthy in the vicinity of the survey area and no visual evidence that would suggest the presence of methane seepage was observed. The attached Figure and Table present the results of the soil gas survey. Photographic documentation of site conditions during the survey are included as Attachment 1.

Conclusions

Based on the results of the soil gas survey, it appears that methane is not seeping from the ground surface present in the vicinity of the McCulloch #4 temporarily-abandoned well.

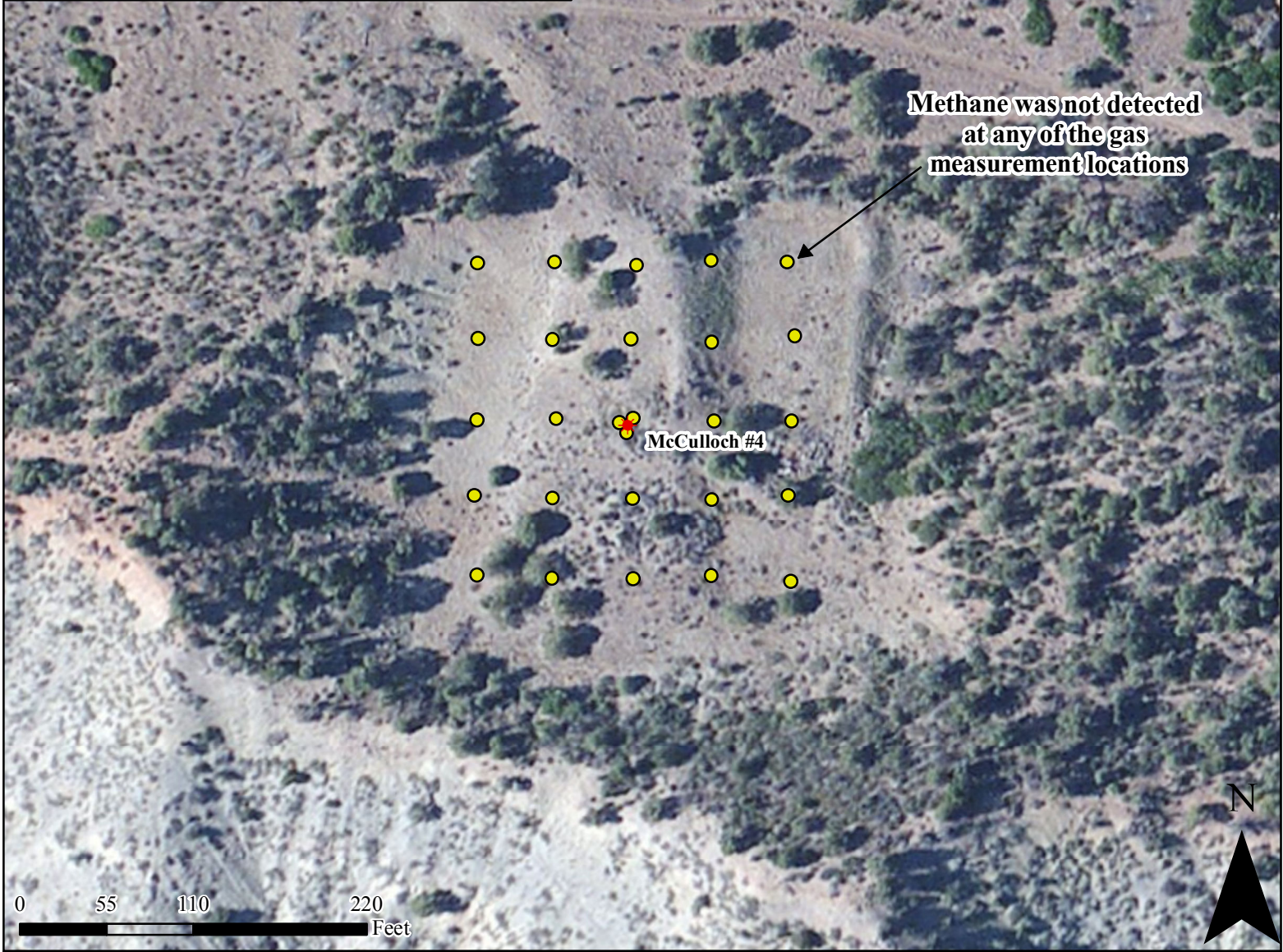
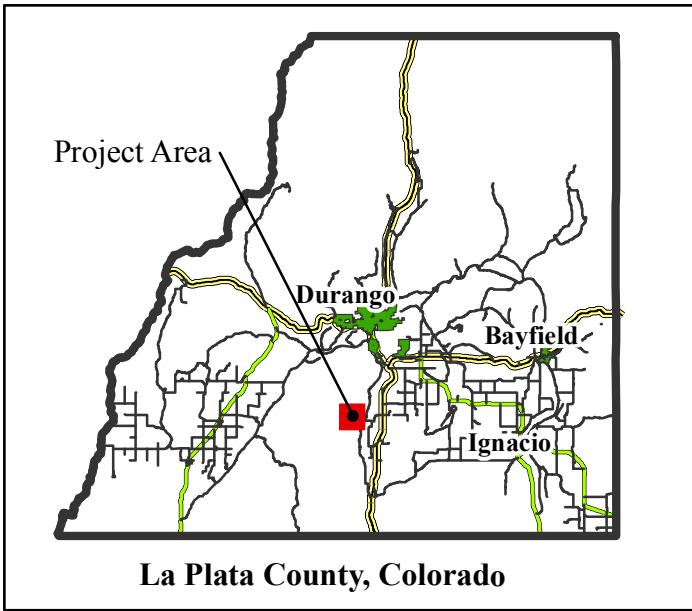
Should you have any questions regarding this cost estimate, please do not hesitate to contact me at 970-946-3761 or jharter@cottonwoodconsulting.com. We appreciate the opportunity to provide services to the COGCC.

Sincerely,



Jacob Harter, Principal
Cottonwood Consulting, LLC

Attachments: Figure – Soil Gas Survey Map
Table 1 – Soil Gas Survey Results
Attachment 1 – Photographic Documentation






<p>Legend</p> <ul style="list-style-type: none">  McCulloch #4 Well Head  Gas Measurement Locations <p>Project Area: NENW, Sec. 35, T34N, R10W NMPM, La Plata County, CO</p>	<p>Cottonwood CONSULTING </p> <p>Mapping: J. Harter, 10/10/16 Coordinate System: NAD 1983 UTM Z13</p>	<p>SOIL GAS SURVEY MAP McCULLOCH #4 COGCC</p>
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TABLE 1
SOIL GAS SURVEY RESULTS
McCULLOCH #4
COLORADO OIL AND GAS CONSERVATION COMMISSION

SAMPLE ID #	CH₄ %	CO₂ %	H₂S ppm	CO ppm	O₂ %
1	0.0	0.3	0.0	1.0	20.6
2	0.0	0.3	0.0	1.0	20.6
3	0.0	0.4	0.0	1.0	20.5
4	0.0	0.3	0.0	1.0	20.5
5	0.0	0.2	0.0	1.0	20.5
6	0.0	0.3	0.0	1.0	20.5
7	0.0	0.1	0.0	1.0	20.5
8	0.0	0.3	0.0	1.0	20.3
9	0.0	0.3	0.0	1.0	20.4
10	0.0	0.2	0.0	1.0	20.4
11	0.0	0.3	0.0	2.0	20.4
12	0.0	0.1	0.0	1.0	20.4
13	0.0	0.1	1.0	1.0	20.5
14	0.0	0.2	0.0	1.0	20.2
15	0.0	0.4	0.0	1.0	20.0
16	0.0	0.2	1.0	2.0	20.2
17	0.0	0.2	1.0	1.0	20.0
18	0.0	0.2	0.0	1.0	19.8
19	0.0	0.1	0.0	1.0	20.1
20	0.0	0.2	0.0	1.0	20.0
21	0.0	0.1	0.0	1.0	20.3
22	0.0	0.1	0.0	1.0	20.2
23	0.0	0.1	0.0	1.0	20.5
24	0.0	0.1	0.0	1.0	20.7
25	0.0	0.1	0.0	1.0	20.7
26	0.0	0.1	0.0	1.0	20.7
27	0.0	0.3	0.0	1.0	20.5

Notes:

All measurements collected on October 6, 2016.

CH₄ - Methane

- Number (GPS reference point)

CO₂ - Carbon Dioxide

ppm - Parts Per Million

H₂S - Hydrogen Sulfide

% - Percent

CO - Carbon Monoxide

O₂ - Oxygen



Photo 1: McCulloch #4 Well Head



Photo 2: Vegetation in the vicinity of the McCulloch #4, view north.



Photo 3: Vegetation in the vicinity of the McCulloch #4, view west.

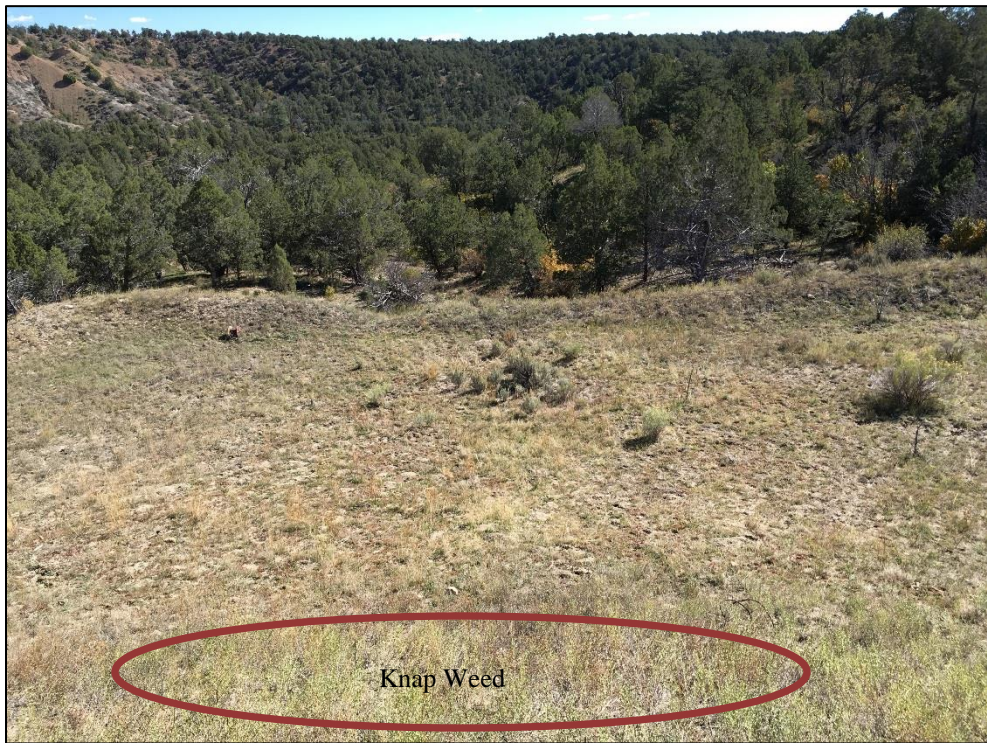


Photo 4: Location of former reserve pit, view east. Knap weed noted on fill slope to reserve pit.