

Report of
Anthony R. Ingraffea, Ph.D., P.E.
on
Crestone's Final Comprehensive Development Plan for the Operation of the
Codell and Niobrara Formations, Wattenberg Field, Boulder County, Colorado

June 26, 2018

1.0 QUALIFICATIONS

I am the Dwight C. Baum Professor of Civil and Environmental Engineering, Emeritus, at Cornell University. I hold a PhD in Civil Engineering from the University of Colorado, Boulder, an MS in Civil Engineering from the New York University Polytechnic School of Engineering, and a BS in Aerospace Engineering from the University of Notre Dame. I am a licensed Professional Engineer in the states of Texas, Colorado, and New York.

I have expertise in rock mechanics, rock fracture, hydraulic fracturing for well stimulation, design of high pressure gas pipelines, computational mechanics, experimental rock mechanics, oil/gas well drilling and cementing, and oil/gas well integrity. During the period from 1977-2004, I performed paid consultancy and sponsored research for the oil/gas industry and the federal government, including EXXON, Amoco, Schlumberger, the Gas Technology Institute, the New York Gas Group, and the U.S. Department of Energy.

I have published more than 315 technical journal articles, proceedings papers, and reports during my career. I have written 5 book chapters on computational and experimental geomechanics and hydraulic fracturing. Since 2006, I have been the Co-Editor-in-Chief of *Engineering Fracture Mechanics*, the premier journal in the field of fracture mechanics, which publishes many papers on hydraulic fracturing and rock fracture mechanics. I have won the highest American honor for fracture mechanics, the George Irwin Medal of the American Society for Testing and materials:

"The award, given by ASTM Committee E08 on Fatigue and Fracture, honors Ingraffea's pioneering and outstanding contributions to the advanced computational simulation of fatigue and fracture processes and the resulting improved understanding necessary for practical applications of fracture mechanics to the assessment of integrity in engineering structures."

I have also twice (1978, 1991) won the National Research Council/U.S. National Committee for Rock Mechanics award for outstanding research in rock mechanics, the latter specifically for research into hydraulic fracturing.

2.0 MATERIALS RELIED ON

My comments are based on the following materials/sources:

Crestone Peak Comprehensive Drilling Plan (CDP) in Boulder County, 4th Draft:
http://cogcc.state.co.us/library.html#/special_projects/crestone

COGCC: Rules and Regulations: <https://cogcc.state.co.us/reg.html#/rules>;
COGIS Database: <http://cogcc.state.co.us/data.html#/cogis>;
DAD Database: <https://cogcc.state.co.us/dashboard.html#/dashboard>;
DJ Basin Horizontal Offset Policy of June 20, 2013

FracFocus Database: <https://fracfocus.org/>, accessed April 22, 2018

OnePetro Archive: <https://www.onepetro.org/>, accessed April 22, 2018

Google Earth: <https://www.google.com/earth/>

EPA Non-Attainment Regions, Ozone Standards, 2018: www.epa.gov/sites/production/files/2018-04/documents/placeholder_1.pdf

Boulder County Open Space Maps: <https://www.bouldercounty.org/property-and-land/land-use/planning/oil-gas-development/#maps>

Repository for Oil and Gas Energy Research (ROGER);
https://www.zotero.org/groups/248773/pse_study_citation_database/items/

Kimberlite International OilField Research Site:
<https://www.kimberliteresearch.com/single-post/2017/10/24/US-Oil-Gas-Industry-Reports-More-Proppant-Per-Lateral-Foot-Equates-to-Better-Completions>, accessed April 22, 2018

Hughes, David, **Shale Reality Check**: <http://www.postcarbon.org/publications/shale-reality-check/>

City of Boulder Water Use Plan: https://www-static.bouldercolorado.gov/docs/WEP_October_Final-1-201610180831.pdf.

Preliminary Mechanical Integrity Assessment, Pennsylvania Department of Environmental Protection, April, 2018:
[http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=13413&DocName=EXPLANATION%20AND%20SUMMARY%20OF%20PRELIMINARY%20MECHANICAL%20INTEGRITY%20ASSESSMENT%20DATA%20SET.PDF%20%20%3Cspan%20style%3D%22color%3Ablue%3B%22%3E\(NEW\)%3C%2Fspan%3E](http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=13413&DocName=EXPLANATION%20AND%20SUMMARY%20OF%20PRELIMINARY%20MECHANICAL%20INTEGRITY%20ASSESSMENT%20DATA%20SET.PDF%20%20%3Cspan%20style%3D%22color%3Ablue%3B%22%3E(NEW)%3C%2Fspan%3E),
accessed April 22, 2018.

Zborowski, M. Colorado Operators: Reaping the Rewards from Sticking by “Predictable” DJ-Niobrara. *J. Petroleum Technology*, V 70, No 4, April, 2018.

Chalupka S. 2012. Occupational silica exposure in hydraulic fracturing. *Workplace health & safety*. doi: 10.3928/21650799-20120926-70

Alexander B, et al. 2016. The Development and Testing of a Prototype Mini-Baghouse to Control the Release of Respirable Crystalline Silica from Sand Movers. *Journal of Occupational and Environmental Hygiene*. doi: 10.1080/15459624.2016.1168239.

Esswein E. et al. 2013. Occupational Exposures to Respirable Crystalline Silica During Hydraulic Fracturing. *Journal of Occupational and Environmental Hygiene*. doi: 10.1080/15459624.2013.788352

American Lung Association, State of the Air 2017, <http://www.lung.org/our-initiatives/healthy-air/sota/>.

3.0 COMMENTS ON CRESTONE'S CDP

This section contains my comments on Crestone's Colorado Oil and Gas Conservation Commission's ("Commission") Comprehensive Drilling Plan ("CDP"), 4th Draft. My comments are in the order of the sections of the CDP. As background for my comments, it should be noted that Boulder County is currently in "Non-Attainment" status for the EPA's 2015 Ozone Standards (EPA, 2018). Any new wells and emissions from, or because of them, will add to this pollutant load, not lessen it. Therefore, my comments frequently focus on the likelihood of expected additional emissions resulting from the development and operation of these proposed wells. Further, wherever a source of emissions is noted in these comments, the intent is to require of Crestone the use of Lowest Achievable Emissions Rate (LAER) technology. LAER standards are required when a new stationary source is located in a non-attainment air-quality region.

Text in **bold** font is from the CDP required format. Text in *italics* is quoted material from Crestone's response to the required format.

3.1 Section 3 of the CDP

"Provide a phasing plan with the planned timing for build-out of access roads, well pads, production facilities and oil, water, and gas pipelines. High level concept of timeline with reservoir test or wildcat wells."

Proposed phases of development:

1. Planning and Permitting (July 2018 – Dec 2019): No comment.
2. Seismic studies and subsurface mapping (July 2018 – Mar 2019)

Will fully 3D seismic mapping be done in the CDP area? If yes, will Boulder County be provided with results and their interpretation to ascertain the likelihood of induced

seismicity from interaction with possibly identified faults. Will a qualified 3rd party be allowed to ascertain this likelihood? The density of the proposed development, 140 wells within about 10 square miles, and the injection of at least 1.4 billion gallons for fracking fluid requires that an assessment of potential induced seismicity be undertaken, especially because the proposed development is on the westernmost edge of the Wattenberg Field where probability of faulting is highest, Figure 1. Any significant (M_w greater than 4.0) induced seismicity creates risk of damage to above ground structures and personal injury, and damage to existing and proposed well structures and above-ground ancillary infrastructure. Damage to above or below ground structures could result in release of VOC's and methane to the atmosphere.

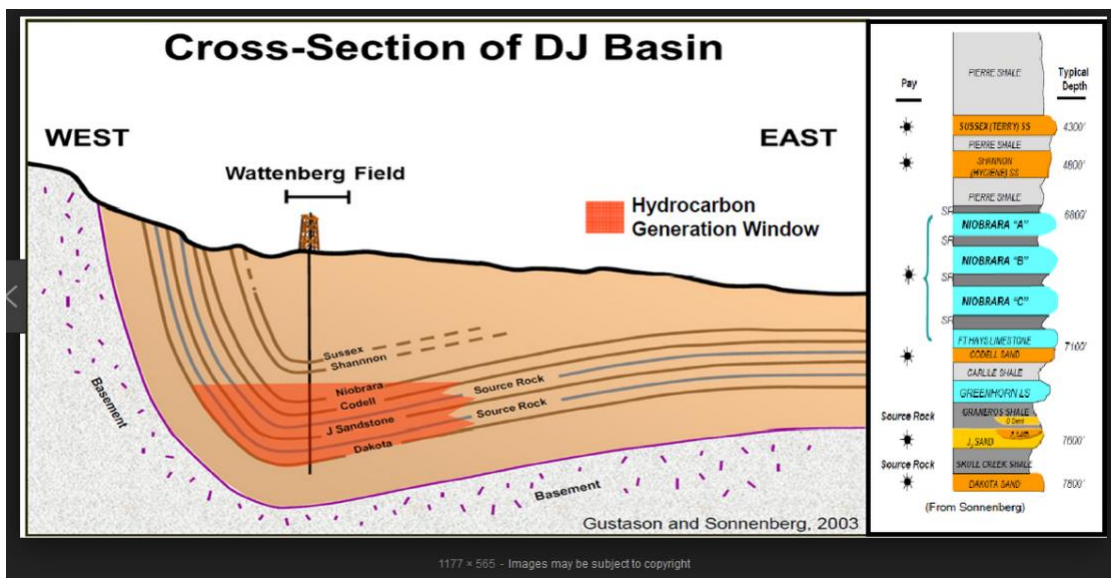


Figure 1. Proposed CDP at the westernmost edge of the Wattenberg Field has highest probability encountering faulting and increasing risk of induced seismicity.

3. Pipeline Construction (Jan 2020 – Jan 2025)

“Crestone’s intent is to have all liquid and gas pipelines in place to serve each oil and gas location at the start of production or the wells at that oil and gas location will be shut in until the pipelines are available. At this point, Crestone can confirm that this is its intent but reserves the right to modify this position if unforeseen circumstances occur that prevent the entirety of the pipeline system being placed into service prior to production from each of the final oil and gas locations within the CDP Area.”

This writeup appears to indicate that any gases produced during drilling and completion will be vented or combusted. This is unacceptable. In keeping with the spirit of reduced

emission drilling and completions (REC), a gas buster must be used during drilling, and a gathering pipeline must be in place at the start of completion so that a REC unit can separate gas in flowback and send it directly to that line. Use of a combustor rather than a true REC unit is unacceptable as it will cause emissions of CO₂, methane, and VOCs.

4. Well Pad Construction (Jan 2020 – Mar 2024): No comment
5. Drilling Operations (Apr 2020 – Mar 2024):

It will take at least one year to drill 28 wells on Section 35, and 56 wells, with two rigs, on Sections 1 and 3. Assuming there will be at most 2 rigs drilling at any time, this will require, at minimum, 3 years of continuous drilling, with concomitant noise/light/dust emissions. There is no mention of impact mitigation methods in this section, although “sound walls” are mentioned, but not technically described, in Section 4 of the CDP.

As noted under 3., above, a gas buster connected to a gathering line must be used during drilling to capture any gas encountered. This is best practice that is above and beyond minimum permitted practice which is, according to COGCC Rule 317. General Drilling Rules, m.:

“Flaring of gas during drilling and notice to local emergency dispatch. Any gas escaping from the well during drilling operations shall be, so far as practicable, conducted to a safe distance from the well site and burned.”

It should be noted that Crestone has received a NOAV (10/25/2017) for violation of Rule 912, Venting or Flaring of Natural Gas.

There is no mention of well design in this section. Assuming the casing and cementing designs will follow COGCC Rule 317. General Drilling Rules, once again best practice is above and beyond minimum permitted practice with respect to well logging, which, according to Rule 317, p., requires cement bond logging (CBL) of only the production or intermediate casing:

“Requirement to log well. For all new drilling operations...A cement bond log shall be run on all production casing or, in the case of a production liner, the intermediate casing, when these casing strings are run.”

Best practice is to run a CBL in the surface casing to minimize the risk of failure of the cement to isolate utilizable domestic fresh water.

It is well known that a significant percentage of modern shale gas/oil wells leak gases into the bradenhead. For example, in a recently completed survey (Preliminary Mechanical

Integrity Assessment, Pennsylvania Department of Environmental Protection, April, 2018) of over 7,000 modern shale gas wells in Pennsylvania, it was found that:

"About 30 percent of wells had gas present outside production casing. In some instances, this occurs due to an approved well design that allows for engineered vents. In a properly designed and operated well, gas is kept to the well footprint, and won't flow into a water supply. "

COGCC regulations require bradenhead spaces to be plumbed for a vent with a gage and periodically tested. If the vent is closed between tests, and there is gas flow into the bradenhead, then there is the possibility of a pressure build up that could cause gas migration into utilizable domestic fresh water. If the vent is left open between tests, and there is gas flow into the bradenhead, then there will be venting of gases into the atmosphere, exacerbating ozone formation and climate change. Once again, best practice is to plumb the bradenhead vent into a pipeline that can capture any gas flows.

There is no mention in the CDP concerning pre-drilling baseline testing of private underground water supplies within and near the boundaries of the proposed CDP area. Best practice again demands that pre-drilling baseline testing be performed on all such supplies according to the Rule 318A, f.

6. Completions Operations (Apr 2021 – Dec 2024):

"The completion process dramatically enhances the volume of recoverable natural gas and oil from the formation by pumping (sic) large volume of water and sand into the well and adjacent rock formation."

This process should be called what it is: frac'ing or fracking. The large volumes mentioned should also include chemicals, not just sand and water, and must be quantified. As of April 22, 2018, Crestone and/or its service providers had reported to FracFocus (<https://fracfocus.org/>) its water use on only 63 of its 1,214 producing wells in Weld County. The average water used in each of those 63 wells was 9.1 million gallons, while the use ranged from 4.1 to 15.5 million gallons. On the three proposed Sections, each of which will have wells with ten thousand-foot laterals, an average water use per well of 10 million gallons means transport of over 1,400 million gallons of water and chemicals to those pads over a proposed period of 3.6 years. Crestone must declare how that water will be delivered: by pipeline or by truck, at 8,000 gallons per load. For comparison, that 1,400 million gallons is about 7% of the water consumed by the city of Boulder over the same period of time. (https://www-static.bouldercolorado.gov/docs/WEP_October_Final-1-201610180831.pdf).

The scale of this proposed operation also means transport of about 1 million tons of sand to the three pads over a proposed period of 3.6 years, Figure 2 and Zborowski (2018). For comparison, that is a tonnage of sand equivalent to the weight of 10 of the largest nuclear aircraft carriers of the US Navy (https://www.naval-technology.com/features/feature-the-10-biggest-aircraft-carriers_4067861-4067861/). Crestone must state how many unit trains and truckloads will be required to transport this tonnage of sand to these proposed pads. A rough estimate, assuming 25 tons of sand per truck load, and 8,000 gallons per water/chemical tanker, is 40,000 sand truck deliveries, and 175,000 water/chemical truck deliveries, each trip emitting diesel pollutants.

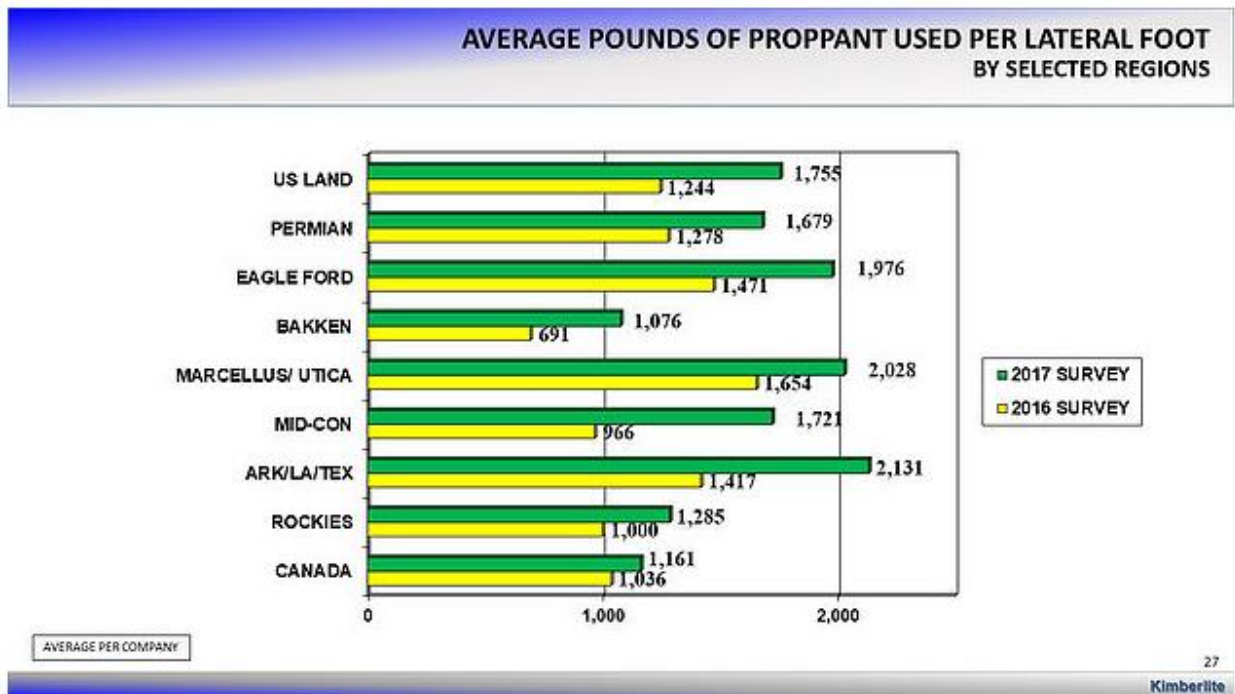


Figure 2. Proppant use trend by region. Note use of about 0.6 tons per foot of lateral in the Rockies region. <https://www.kimberliteresearch.com/single-post/2017/10/24/US-Oil-Gas-Industry-Reports-More-Proppant-Per-Lateral-Foot-Equates-to-Better-Completions>

“The completion process takes approximately 7 days per well.”

Assuming there is only one completion unit operating at any one time among the three proposed Sections, this means that completion operations will require, at minimum, 1000 days, with concomitant, admitted increased noise, light, and traffic impacts, when compared to the drilling phase. In addition, there will be silica dust pollution impacts that will also travel beyond the disturbed areas (Esswein *et al.*, 2013; Chalupka, 2012; Alexander *et al.*, 2013). There is no mention of mitigation methods against silica dust here

or elsewhere in the CDP. It should be noted that Crestone has received a NOAV (10/25/2017) for violation of Rule 85, Odors and Dust control.

“Sound walls” are mentioned but not technically described in Section 4 of the CDP.

“Please note that the Section 1 and Section 3 potential Oil and Gas Locations are designed so that two (2) drilling rigs could be located on site at the same time. Section 35 is designed for one drilling rig.”

This sentence is meaningless in the context of completion activities: drilling rigs do not participate in completion activities.

7. Interim Reclamation / Production (Jan 2022 – Jan 2052):

“The initial product flowing to the surface is the water used to complete the well. After several days of flowing water, the well slowly begins to flow hydrocarbons.”

The initial flowback liquid is not “water”. Rather it is a mixture of fracking fluid, which contains water, chemicals, and proppant, and any “produced” water encountered during the completion phase, and hydrocarbons. This flowback period could last much longer than “several days”, and there is no mention here of additional equipment necessary to separate the flowback into its constituents. Nor is there mention here of the use of “green completion” equipment to separate gases from the flowback and send them directly to pipeline rather than to flare or to venting. Reduced emission completion (REC) units should be used to reduce methane flaring and venting, and this is described, but limited, later under Rule 216.d.(1)-(3) - Procedure: later in the CDP.

8. Final Reclamation (Jan 2052 – Jul 2056): No comment

3.2 Section 4 of the CDP

Describe the conceptual well pad and facility locations, as well as planned pipeline routes.

“A potential Oil and Gas Location will require a temporary area of approximately 15-20 acres during drilling and completion operations to accommodate equipment, environmental controls, and mitigation measures, such as sound walls.”

The topographic map and other maps supplied with this draft CDP clearly show the disturbed area much larger than 15-20 acres at the Unit 1 location.

Describe the estimated well count and tank count at each oil and gas location and production facility

Well Pad	Well Count	Storage Tanks	Wellbore Direction	Wellbore Length
CPR Unit 1H-B169	28	0	North	2 sections
	28	0	South	2 sections
CPR Unit 35H-P269	28	0	North & South	2 sections
CPR Unit 3H-A169	28	0	North	2 sections
	28	0	South	2 sections
CDP TOTAL	140	0		

This table indicates zero storage tanks, yet in section 7 of the phasing description one finds:

“When a majority of the production is hydrocarbons, the well is switched from flowing into onsite temporary tanks to flowing into the pipeline transporting the product to the Hub, Crestone’s Central Gathering Facility located in Weld County, Colorado.”

Crestone must clarify that, although “...there will not be permanent hydrocarbon storage tanks...”, temporary (for years, potentially) storage tanks for flowback will be used. These tanks cannot be vented to the atmosphere. Rather, LAER vapor recovery technology must be used for all storage tanks, including temporary tanks, and other sources of fugitive or vented emissions.

Describe the use and location of any planned centralized Oil and Gas Facilities and underground injection facilities.

“As stated above, all liquids (oil, condensate, and produced water) produced by Crestone wells within the CDP will be transported via pipeline to the Hub.”

This sentence is contradicted later in section 5 of the CDP where one finds the following statement:

“Where pipeline is available at our facility pad locations, produced water will be transported to a centralized production facility and then transported via truck from that facility to an authorized licensed disposal facility or transported by truck directly from the facility pad to an authorized licensed disposal facility.”

This inconsistency should be corrected in Crestone’s Final CDP. Either a pipeline for transportation off site of all liquids will be available when needed, or Crestone must ask for permission to employ a large diesel trucking fleet to move the liquids.

3.3 Section 11 of the CDP

Proposed best management practices or mitigation to minimize adverse impacts to resources such as air, water, or wildlife resources; and

Identify appropriate Rule 603 best practices

“No tanks will be utilized on location.”

No permanent hydrocarbon storage tanks will be used; however, temporary storage tanks will be used to contain flowback, and these would be subject to a catastrophic event such as flooding or seismicity.

Rule 216.d.(1)-(3) - Procedure:

(3) The operator(s) shall provide a summary of the proposed identified measures to minimize adverse impacts.

C. Green Completions

“In the anticipated absence of a viable gas sales line, the flowback gas shall be thermally oxidized in an emissions control device (ECD), which will be installed and kept in operable condition for least the first 90 days of production pursuant to CDPHE rules.”

This sentence is confusing in that one has been led to believe at this point in the CDP that viable gas sales lines are “anticipated”. Perhaps what was meant was *“In the unanticipated absence...”*. Nevertheless, if a gas sales line is not immediately available, then “thermally oxidized” is a deceptive term meaning “burned”, as in a vapor combustion unit (VCU), a combustor, Figure 3, rather than a flare stack. A combustor reduces light pollution, but still emits noise pollution and “burns” the gas less than perfectly, thus producing CO₂ and CH₄ emissions. It is a poor substitute for a reduced-emissions-completion (REC) unit, Figure 4.

R. Tank specifications –

“Crestone will not be using storage tanks at any of the facilities in the CDP Area.”

As noted above, this is an incorrect statement since Crestone states that it will be using temporary storage tanks for flowback fluids.



Figure 3. (a) Example of a combuster (Vapor Combustion Unit) used for burning gases during flowback. From <https://gcollc.com/the-beast-3200>. (b) Combuster in night operation in Colorado.



Figure 4. Example of a truck-mounted reduced emission completions (REC) unit. Photo from <http://www.ipieca.org/resources/energy-efficiency-solutions/units-and-plants-practices/green-completions/>.

“The expected benefits of an approved Final CDP to the Town of Erie and Boulder County include the following non-inclusive list of items which will evolve as this CDP process progresses:

- *Engineering review of all 95 current producing oil and gas wells within the boundaries of the CDP for potential plugging and removal”*

This is the first mention in the CDP about existing wells in the proposed development area. An engineering review of current producing wells cannot be considered a “benefit”. It is a mandatory process resulting from ongoing economic and regulatory activities. Given the increasingly heightened concern about “frac hits” in the industry (see for example, <https://www.denverpost.com/2018/03/08/berthoud-oil-spill-cause-report/>; 175 papers addressing the topic of “frac hits” have appeared in the industry archive, OnePetro, in the last 2 years) caused by high-density development (average lateral spacing among the 140 proposed wells is only about 150 feet) and increased use of frac fluid volumes (estimated 10 million gallons per well, see above), it is imperative that Crestone be required to evaluate the potential for “frac hits” among their proposed 140 wells and the existing 95 current producing wells, and ALL other non-producing wells in the CDP area, including possible abandoned and lost wells. This evaluation must follow the procedures declared in the COGCC’s “DJ Basin Horizontal Offset Policy, June 20, 2013” on all these wells. Failure to follow these mandatory procedures creates the risk of a frac hit that could result in a blowout through an existing well, and consequent impacts on the environment and human health from blowout materials which would include methane, VOC’s, BTEX materials, and frac fluid chemical additives.

Figure 5 shows known wells, producing, abandoned, and plugged and abandoned in the proposed CDP area. Note that there are a few dozen abandoned wells in the area, and that few, but not all, of these abandoned wells have been plugged. To emphasize the importance of this issue, Figure 6 overlays these wells on the “Conceptual Directional Wellbores Map” from the CDP. It is quite clear from this image that many existing wells of all types will be “near” many of the proposed laterals. This “nearness” must be evaluated for potential interaction for each existing well and nearby laterals. Note in particular that there are many existing wells in close proximity to single family residences and within, or in close proximity to, residential developments. For example, Figure 7 shows the surface locations of nine known wells within, or in close proximity to, the Kenosha Estates residential development in the southeast corner of the CDP area. Also shown are the spud dates and the maximum depth of these wells. The depths of all these wells are similar to the depths of the laterals proposed in the CDP.

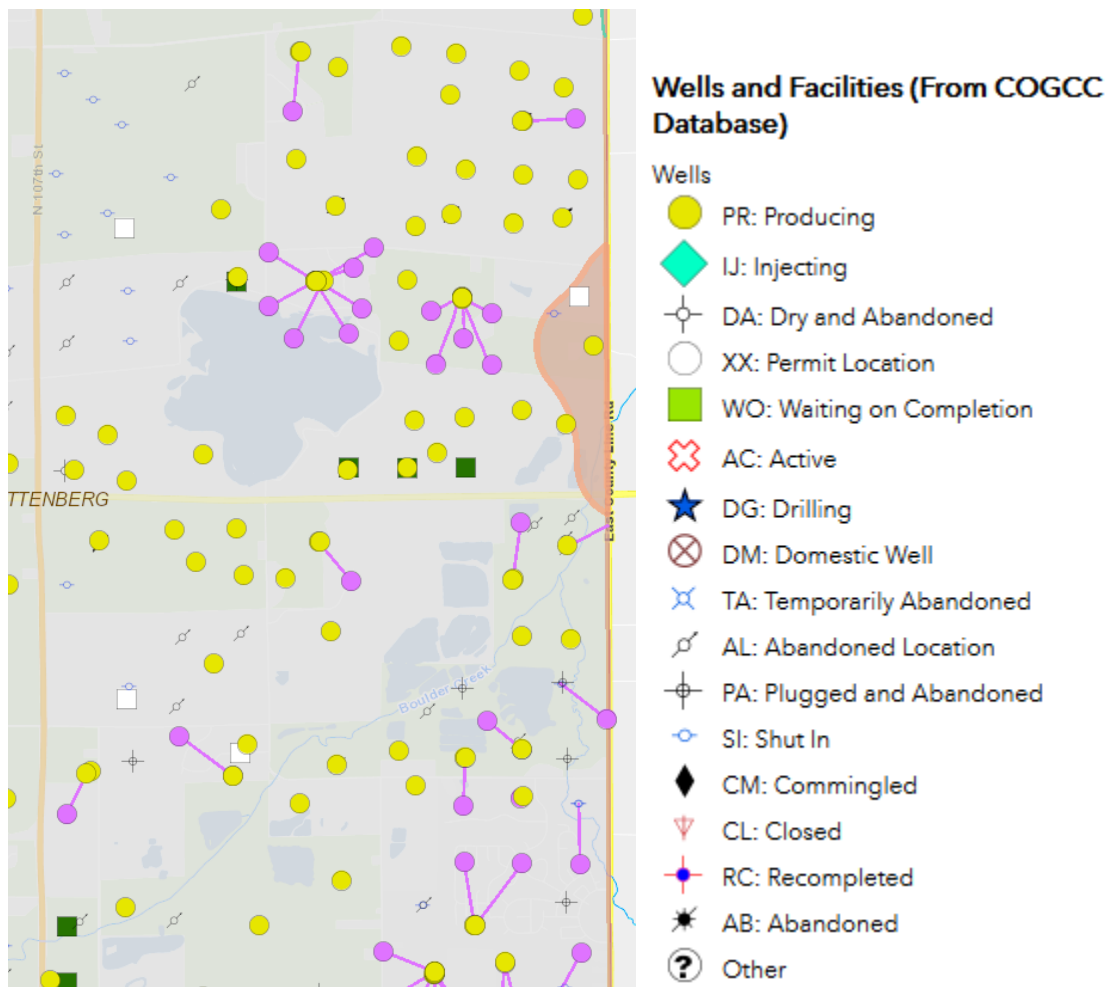


Figure 5. Wells, producing, abandoned, and plugged and abandoned in the proposed CDP area. From www.bouldercounty.org/property-and-land/land-use/planning/oil-gas-development/#maps.

4.0 SUMMARY

This proposed CDP by Crestone for Boulder County is unprecedented in scale and is a portent of overwhelming “modern” oil/gas development in the county. The completion of the proposed 140, Generation 3, wells will require more water, fracking chemicals, and proppant than used previously in all the existing 779 wells (this total number according to COGIS DAD, accessed May 11, 2018) in the county. These very long-lateral wells will consume at least 1.4 billion gallons of water and produce more flowback waste than produced by all previous wells in the county combined. Crestone has not made clear its intentions for acquisition of water, or for its transport to the CDP area: new water pipelines, or at least 175,000 diesel delivery truck trips with



Figure 6. Overlay of existing well locations in the proposed CDP area on the “Conceptual Directional Wellbores Map”.

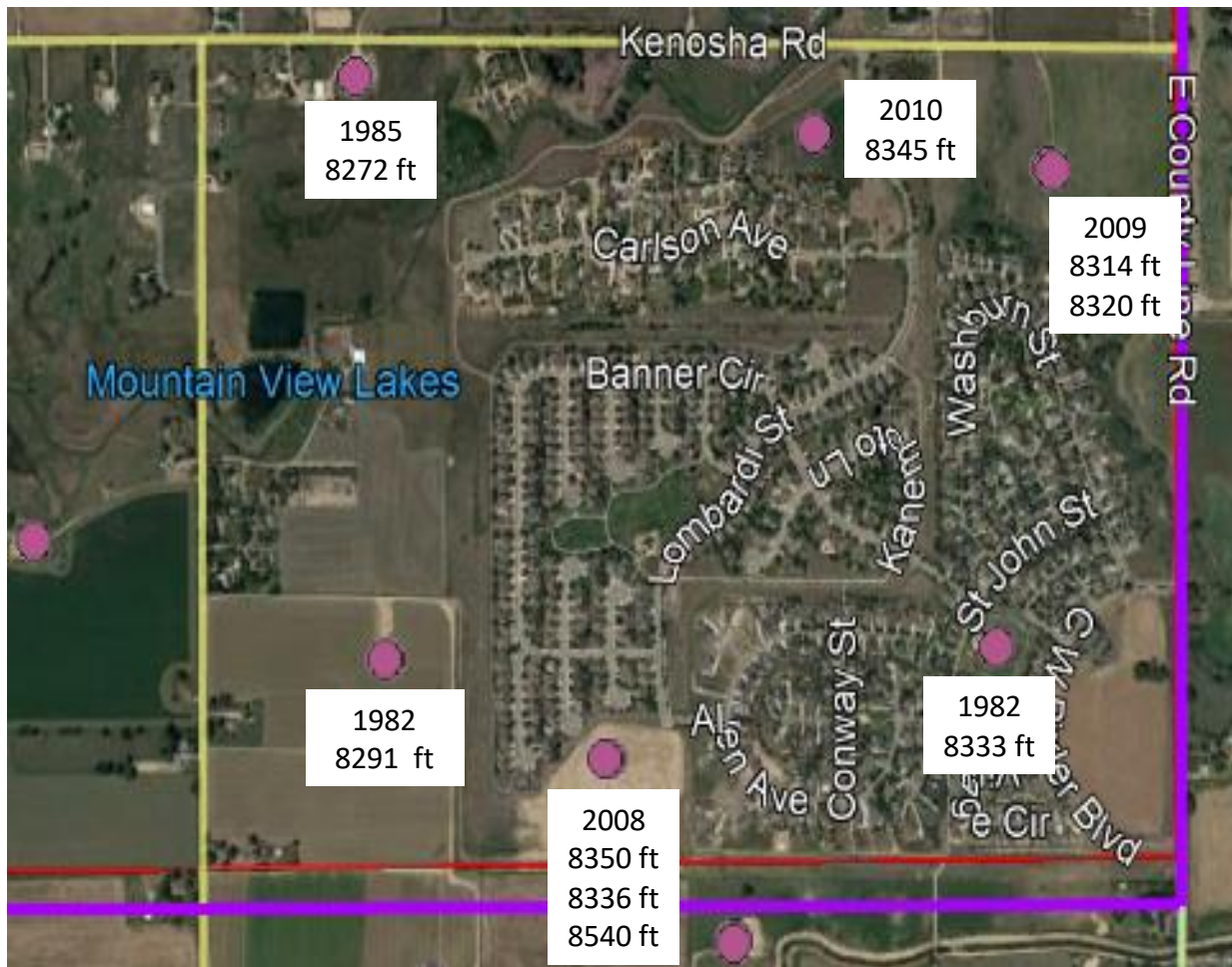


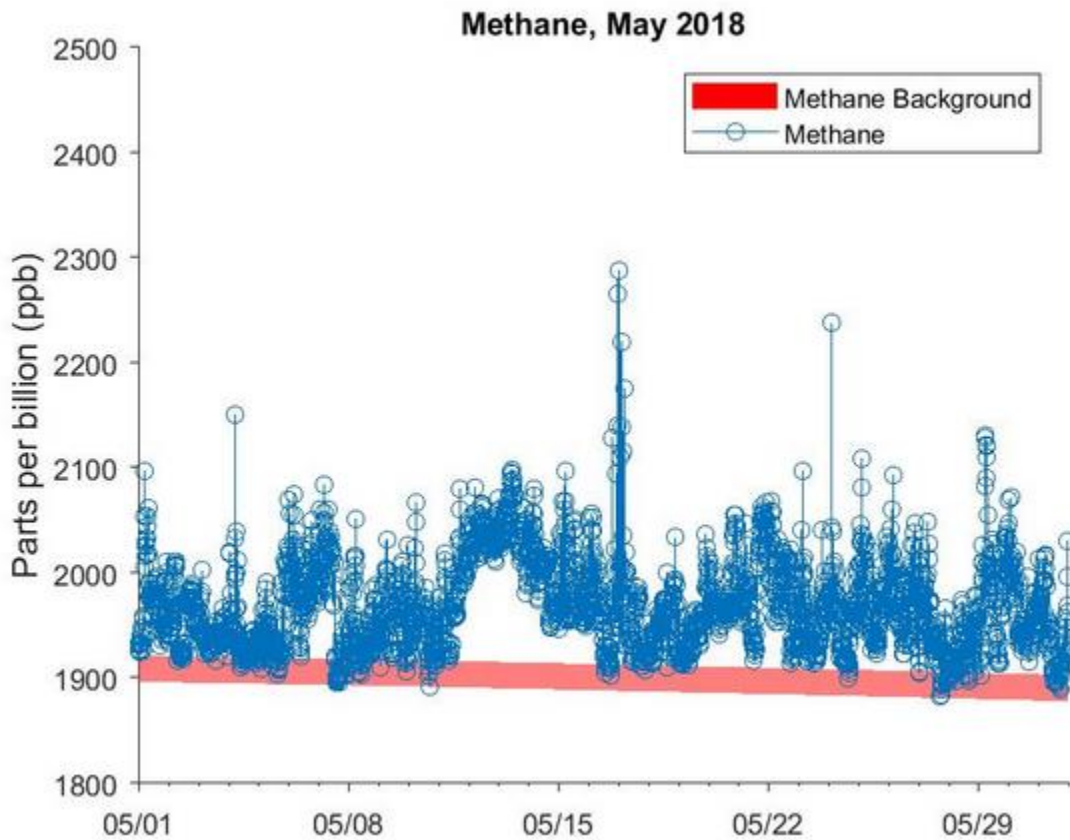
Figure 7. Detail of southeast corner of CDP area showing surface location spud date, and maximum depth of 9 existing wells within, or in close proximity to, the Kenosha Estates residential development. These existing wells, and possible other abandoned and lost wells, are at risk of frac hits from the wells proposed in the CDP. Compare this image to the proposed laterals shown Figure 6.

concomitant emission of air pollutants? The wells will also consume at least a million tons of proppant, with tens of thousands of diesel truck trip deliveries with concomitant emission of air pollutants. The CDP does not mention plans for mitigation of silica dust migration offsite.

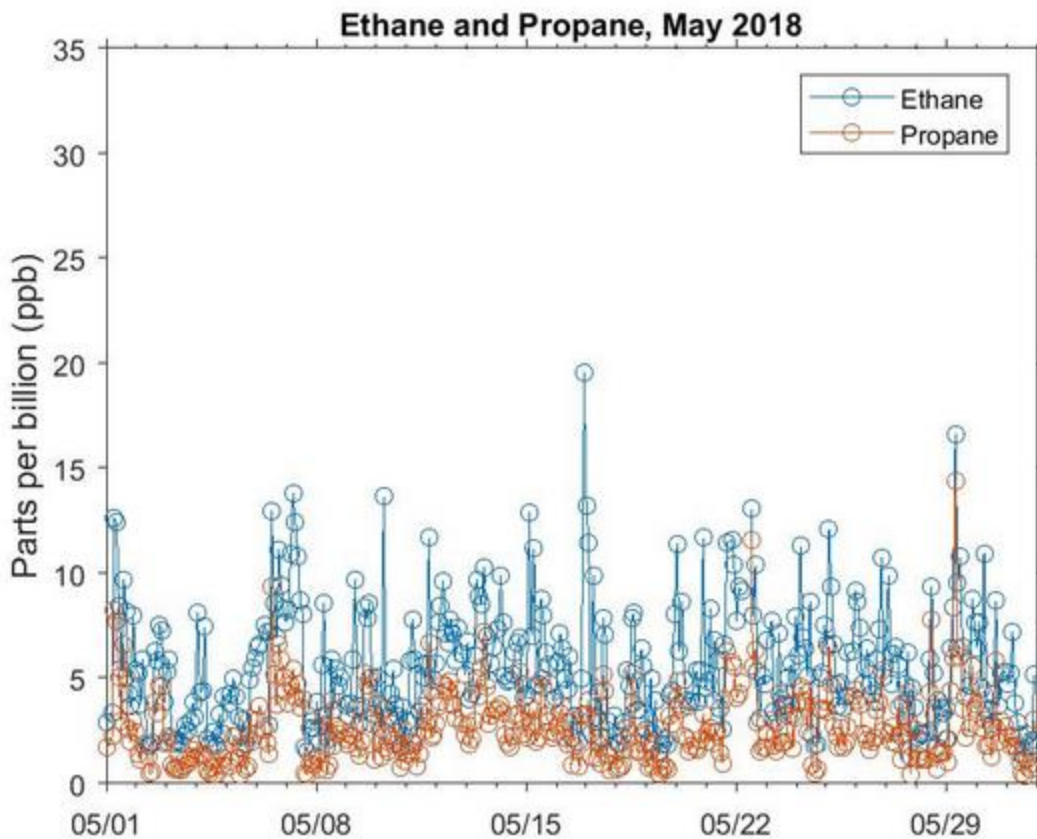
The spatial intensity of the proposed wells, with only about 150 feet of spacing between laterals, makes “frac hits” among them and with the many existing known and abandoned and unknown wells probable, with the possibility of blowouts with serious environmental and health impacts. Crestone’s plan to perform an “engineering review” of only the 95 producing wells in the CDP area is inadequate.

Crestone appears to waver on its commitment to have sales lines in place for both oil and gas before well completion. Consequently, it leaves open the possibility of “burning” gases during the flowback phase using combustors rather than flaring. Emissions of CO₂, CH₄ and VOC’s will result from this less than best practice. Crestone also appears to be allowing the venting of gases during the drilling phase rather using best practice capturing of those gases.

In all the circumstances noted herein where gaseous emissions can occur, Crestone must be required to use Lowest Achievable Emissions Rate (LAER) technology. LAER standards are required when a new stationary source is located in a non-attainment air-quality region, such as Boulder County. Recent data taken by INSTARR at the Boulder Reservoir, Figure 8, show elevated levels of methane and VOC’s. Analysis by INSTAAR scientists of this concentration data along with wind direction and velocity measurements taken at the reservoir clearly show a correlation between these elevated concentrations and oil/gas operations in Weld County. Methane and these VOC’s are precursors to ground-level ozone formation, and ozone is a well-known human health hazard. Currently, 90% of the state’s population is exposed to unhealthy air from high ozone pollution, and Denver was ranked the 11th most polluted city in the nation for ozone levels in 2017 (Am. Lung Assoc, 2017). In 2017, Boulder county received an “F” grade for high



(a)



(b)

Figure 8. Most recent data reported by INSTAAR for methane (a) and ethane and propane (b) concentrations measured at Boulder Reservoir.

ozone days from the American Lung Association.

The proposed development by Crestone will not decrease the emission of criteria pollutants, will not decrease methane, ethane and propane emissions, will not reduce CO₂ emissions, and will not decrease ground-level ozone formation, and the number of “F” days. Its presence in Boulder County will increase all of these. The proposed development will make Boulder County a less healthy place to live and work.