



Land Use

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**BOULDER COUNTY
BOARD OF COUNTY COMMISSIONERS
AND PLANNING COMMISSION SPECIAL SESSION
June 5, 2013 – 5:00 PM
Hearing Room, Third Floor
Boulder County Courthouse**

Docket DC-12-0003: Amendments to Oil and Gas Development Regulations

Public Hearing for the Board of County Commissioners and Planning Commission to consider proposed amendments to Article 12 of the Boulder County Land Use Code (oil and gas regulations), to include a phasing program for Development Plan Review applications or permits. *Public testimony will be taken. Action Requested (by Planning Commission only): Recommendation to the Board of County Commissioners*

Staff: Kimberly Sanchez, Planning Division Manager - Land Use Department
Jeff Robbins, Outside Counsel on Oil and Gas Issues

AGENDA

1. COUNTY STAFF PRESENTATION

- a. Proposed text amendments to Article 12 of the Land Use Code – Kim Sanchez, Land Use / Jeff Robbins, Outside Counsel
- b. Inspection and monitoring options – Pam Milmoie, Boulder County Public Health

2. PLANNING COMMISSION AND COUNTY COMMISSIONERS Q&A

3. PUBLIC COMMENT REGARDING PROPOSED REGULATIONS (3-min. allowance per individual speaker. Time may be pooled (up to 12 minutes maximum) provided all individuals who are donating time are present. Anyone wishing to exceed 12 minutes must contact the Land Use Department with a request for consideration prior to the hearing.

4. PLANNING COMMISSION DELIBERATION / RECOMMENDATION TO BOARD OF COUNTY COMMISSIONERS (Board of County Commissioners will be excused)

Please note: The Board of County Commissioners will hold a public meeting to discuss and take action on the proposed amendments on **June 6, 2013 at 3:30 p.m.** The opportunity to provide public testimony will be at the joint Board of County Commissioners and Planning Commission public hearing on June 5, 2013. No additional public testimony will be taken on June 6, 2013.

PACKET CONTENTS:

Item	Pages
o Land Use Department Memo	2-7
o Proposed text amendments to Article 12 of Land Use Code: "Phasing Plan" (Attachment A)	A1-A3

- Summary of Air Quality Monitoring Studies (Attachment B)

B1-B4

- Public Health Inspections Capacity (Attachment C)

C1

Summary

Following the May 16, 2013 Board of County Commissioners public hearing on transportation-related items associated with oil and gas development (transportation impact fee and associated regulation changes), the Board of County Commissioners took additional public comment regarding any issues related to oil and gas development in Boulder County. This was done in response to requests by the public to have an opportunity to address the county commissioners on other aspects of oil and gas development. The public raised a number of issues and questions for the County to consider primarily related to the imminent expiration of the current moratorium on oil and gas development, and the Board shared their thoughts, concerns, and ideas in response.

The Board continued their discussion at a public meeting on May 21. At this public meeting instead of extending the moratorium, they directed staff to pursue the idea of permitting oil and gas development in a phased manner once the moratorium on new oil and gas development is lifted on June 10. As part of a “phased-in” approach, the Commissioners also requested an inspection and monitoring system to ensure compliance with the new oil and gas regulations and to identify any public health impacts.

A phased approach to oil and gas development would temper the pace of new development, which would in turn allow the County and other agencies to carefully monitor the initially approved wells to ensure that the County’s new land use regulations are sufficiently protective of public health, safety, and welfare and of the land use goals identified within the newly adopted regulations. At today’s, June 5th, joint Board of County Commissioners and Planning Commission public hearing, staff is proposing amendments to Article 12 (the newly adopted oil and gas regulations that will go into effect on June 10, 2013) to include such a phasing plan to address these on-going concerns.

Background

On February 2, 2012, the Board of County Commissioners enacted a temporary moratorium on the intake and processing of applications for oil and gas operations. This six-month moratorium was then extended until February 4, 2013 in order for staff to update the Boulder County Comprehensive Plan and 20-year old Development Plan Review (DPR) regulations to ensure that the development of new oil and gas operations within unincorporated Boulder County is regulated in a manner to ensure protection of the environment, and the health, safety and welfare of the county’s citizens, based upon a more informed assessment of industry activities and trends, anticipated associated land use impacts, and an appropriate regulatory response at the County level.

Over the past 15 months the County has undertaken an intensive public process consisting of 22 public meetings, hearings, and open houses, and including a vast amount of input from the public and extensive legal review both from within the county and from outside attorneys with an expertise in oil and gas matters in order to develop and adopt new oil and gas regulations. Throughout the entire public discussion, the Planning Commission and County Commissioners explored all options available to the county while listening intently to the comments and concerns from residents about potential health, safety and environmental impacts of allowing new oil and gas development in Boulder County.

New oil and gas regulations (contained in Article 12 of the Land Use Code) were approved December 13, 2012, with the Board of County Commissioners adopting Resolution 2012-142 on December 20, 2012. On January 24, 2013, the Board extended the temporary moratorium on Boulder County's processing of applications for oil and gas development, which was set to expire on February 4, 2013, to June 10, 2013 in order for staff to prepare for the necessary implementation of the regulations. (See <http://www.bouldercounty.org/dept/landuse/pages/oilgas.aspx> for more information on the complete history of the oil and gas development regulations.)

Recent Developments

May 16 and May 21, 2013 Public Meetings

At the recent public meetings on May 16 and May 21, the Board of County Commissioners heard from the public and discussed number of continuing issues related to oil and gas development. The issues raised by the Commissioners include:

1. **Cumulative effects of increased oil and gas development on land, surrounding land uses, public facilities and services, water, and air** – the concern regarding the impacts that oil and gas development will have on the county incrementally and over the long-term
2. **Unknown risks of increased oil and gas development on public health, safety, and welfare**– the need for more data on impacts of oil and gas development on Boulder County residents and areas of greater population density
3. **Inspection and enforcement program** – the need to maximize the use of limited resources available for inspections necessary to ensure compliance with the new Article 12 regulations, particularly those concerning air quality
4. **Administrative needs and concerns** – the concern remains that administratively the County may not be in a position to be able to effectively process a large increase in the number of oil and gas facilities and therefore a phasing plan could be an effective measure to allow new oil and gas development in a manner that ensures adequate protection of the goals of the Land Use Code

During these discussions, the Board of County Commissioners identified “phasing” or limiting of oil and gas wells approved in Boulder County as an idea to explore. They expressed that a phased approach to near term oil and gas development would temper the pace of new development, which would in turn allow the County and other agencies to closely monitor the initially approved wells to ensure that the County's new land use regulations are sufficiently protective of public health, safety, welfare and the land use concerns addressed by the Code, and directed staff to pursue amendments that phase in or allocate permits.

The Board also emphasized that taking on this issue is not a single year effort, but energy must continue to be put into the County's “multi-pronged” approach to addressing oil and gas issues including:

- Changes to state and federal legislation
- Changes to Colorado Oil and Gas Conservation Commission (COGCC) rules
- Changes to state Air Quality Control Commission (AQCC) rules
- Statewide initiatives
- Gaining more authority for local governments to regulate oil and gas development.

Proposed Amendments to Article 12: Phasing Plan

Purposes of Phasing Oil and Gas Development in Boulder County

At the May 21 public meeting, the Board of County Commissioners directed staff to explore the idea of permitting oil and gas development in a phased manner, allowing only a limited number of wells in a given period, once the current moratorium on new oil and gas development expires on June 10. The idea behind “phasing in” oil and gas development is that it may help mitigate the risks associated with concentrated impacts to air and water quality, surrounding land uses and public health and the environment. From an administrative perspective, phasing would also assist in ensuring that adequate staff resources exist to process these applications. The phasing plan that staff has developed would control the number of applications in the pipeline while reviewing proposed oil and gas operations under the County’s newly adopted regulations.

There are multiple purposes for a “phased-in” approach to oil and gas development:

- Protect public health and safety by controlling the pace of, and therefore the land use and related impacts associated with, new oil and gas development
 - Protect air quality by limiting cumulative impacts on air pollution resulting from the release of volatile organic compounds, hazardous air pollutants, and greenhouse gases
 - Protect water quality by limiting the potential for contamination of underground sources of drinking water and surface waters resulting from spills, faulty well construction, or other means; as well as limiting the potential adverse impacts from discharges to surface waters
- Ensure appropriate systems and staff are in place to process and inspect new oil and gas operations for compliance with the County’s regulations, given that the County has limited resources to conduct reviews and needs to be certain adequate resources are available to satisfactorily review new DPR applications
- Allow the County to review the effectiveness of its new oil and gas regulations in successfully mitigating the impacts of oil and gas development
- Confirm that the available capacity of existing public facilities is not exceeded (e.g., county transportation infrastructure)
- Allow for the orderly provision of public services, including emergency response functions such as those provided by the County Sheriff, affected fire protection districts, and other first responders
- Allow adequate time to further review, research, and understand potential impacts and risks associated with hydraulic fracturing
- Allow for study of Boulder County wells where impacts are observed and scientifically studied, including air and water impacts
- Allow for full implementation of recently completed and still ongoing state and federal rulemaking concerning oil and gas development, particularly by AQCC and EPA, which rules are anticipated to mandate greater protection of public health and the environment

Expectations for Future Oil and Gas Activity in Boulder County

The average number of wells the Colorado Oil and Gas Conservation Commission (COGCC) permitted in Boulder County per year over the past 10 years (2003-2012) was 17. Annual totals during that time period ranged from 6 to 29 wells. Cumulatively during that decade, COGCC permitted a total of 173 wells in the county. (<http://cogcc.state.co.us/>)

It is difficult to predict with any accuracy the number of wells our operators will want to drill in Boulder County since drilling activity is driven by a multitude of factors, including commodity prices. Nevertheless, the consultant team the County retained to study the anticipated impacts of additional drilling on Boulder County's road system made some assumptions that are useful here for the purposes of discussion. Fellsberg, Holt, & Ullevig / BBC Research & Consulting (FHU/BBC) estimated a "drill out" period of about 16 years with a cumulative total of 609 new wells, or an average of 38 wells per year over that period¹. While the actual number of permits Industry seeks each year will undoubtedly fluctuate (perhaps even substantially), this estimate of 38/year on average implies that the County can reasonably expect an uptick in drilling.

The demand for "horizontal wells" is also on the increase. These are wells that are drilled down to the formation and then move horizontally through the formation containing the oil and gas resources. Overall horizontal wells are different than traditional vertical wells, and because of that we can expect increased and more consolidated impacts from multiple wells per pad and a less distributed pattern. In Weld County, the number of horizontal wells has increased each of the past five years:

Year	Number Wells
2008	3
2009	7
2010	76
2011	300
2012	888

Based on data from COGCC in 2012, 42% of oil and 21% of gas that was produced in Weld County came from horizontal wells up from 20% and 7% in 2011.

Noble Energy, who has been very active in Weld County and is one of the two primary operators with substantial holdings in Boulder County, plans to continue their activity. On Noble Energy's website (<http://www.nobleenergyinc.com>), they state:

"We drilled approximately 85 horizontal Niobrara wells in 2011; drilled approximately 200 horizontal wells in 2012; and plan to drill approximately 300 horizontal wells in 2013. We are focused on further accelerating the development of Wattenberg and continue to test the exploration opportunities in northern Colorado and southern Wyoming."

In a report Noble posted on-line, they state they are planning on accelerating development and drilling 500 wells per year in 2016².

While to date these operations most recently have occurred outside of Boulder County, the Wattenberg field extends into the eastern portion of Boulder County and similar pressures for development of the resource are expected here as well.

Proposed Phasing Plan

Staff is proposing a phasing plan over a 24-month period after the moratorium is lifted, which would control the number of applications per operator that can be processed at any given time. As

¹ Boulder County Oil and Gas Roadway Impact Study, prepared by Felsburg Holt & Ullevig in association with BBC Research and Consulting- <http://www.bouldercounty.org/doc/landuse/dc120003staffrec20130124.pdf>

² Noble Energy 2012 Analyst Conference Presentation, December 6, 2012-
www.nobleenergyinc.com/Operations/US-Onshore/DJ-Basin-265.html

proposed the phasing plan would allow County staff to process one oil and gas facility³ at a time per operator. Operators would be required to register to establish their identities with the County, and once registered, each operator would be allowed the opportunity to have one DPR application processed at a time. The goal is not to prohibit or unreasonably delay new oil and gas exploration or drilling, but instead to allow each operator and mineral estate owner the opportunity to reasonably develop portions of its mineral estate at all times in a manner consistent with ensuring protection of County land use concerns and goals and consistent with protection of the public health, safety and the environment. Staff believes too that the proposed phased program would allow operators to develop their leased mineral estates consistent with past and current operational programs.

The proposed phasing plan language is to be inserted at Section 12-400(C) of Article 12, in the newly adopted oil and gas development regulations. Edits were also made to the enforcement section (Section 12-1300) and definitions (Section 12-1400) of Article 12. (See Attachment A.)

The applications could be either the Standard DPR or Expedited DPR, but there would be incentive to use the Expedited DPR review – and hence provide the County with the more protective measures. The time it takes to process an application (approximately 1 ½-2 months for EXP DPR; approximately 5-8 months for STD DPR) would dictate how many oil and gas facilities could be reviewed per year. Staff notes that additionally, in practice Boulder County currently has only two primary operators (Encana and Noble).

Inspection and Monitoring Program

As part of the phased-in regulatory program the Commissioners also requested staff explore an inspection and monitoring program of air and groundwater to evaluate the effectiveness of the regulations and inform improvements in the future. Boulder County Public Health staff will present some possibilities for the Planning Commission and Board of County Commissioners to consider, including:

- 1) increasing inspection capacity
- 2) collecting air and water quality sampling data to identify potential health risks
- 3) conducting and participating in more studies

Staff will be seeking input regarding what efforts are useful, what will yield the best results, and ultimately what the Board(s) would like to have in place before wells are drilled. (See Attachments B and C.)

Text Amendment Criteria Review

Pursuant to Article 16-100 of the Land Use Code, no text amendment shall be adopted by the Board of County Commissioners unless the Board has determined that:

1. the existing text is in need of the amendment;
2. the amendment is not contrary to the intent and purpose of this Code; and
3. the amendment is in accordance with the *Boulder County Comprehensive Plan*.

Based on the discussion above, staff finds the criteria for text amendments in Article 16-100.B. of the Land Use Code are met.

³ Oil and Gas Facility means “[a]n individual well pad built with one or more wells and operated to produce liquid petroleum and/or natural gas, including associated equipment required for such production.” Staff suggests using a per “facility” rather than a per “well” approach as this correlates with actual operational practices and is consistent with how the new regulations were structured.

Staff Recommendation to Planning Commission

The overall goal contained within the newly adopted oil and gas regulations (Article 12) has been to work within the land use authority provided to counties by enacting the most protective regulations governing new oil and gas operations while at the same time recognizing the extent of state authority over oil and gas operations. Staff has attempted to create processes that address areas of great local importance but harmonize application of the local regulations with the state. The addition of a proposed phasing plan to Article 12 will help temper the pace of new development in order to allow the County and other agencies to carefully monitor the initially approved wells to ensure that the County's new land use regulations are sufficiently protective of the land use goals established within the regulations, and of public health, safety, welfare and the environment.

Staff recommends that the Planning Commission APPROVE AND RECOMMEND TO THE BOARD OF COUNTY COMMISSIONERS APPROVAL of Docket DC-12-0003: Amendments to Oil and Gas Development Regulations and the official record of the Docket before the Commission with its staff comments, public testimony, and Commission discussion/action.

ATTACHMENT A

**PROPOSED TEXT AMENDMENTS TO ARTICLE 12 OF
LAND USE CODE: “PHASING PLAN”**

substantial modification under Section 12-1200(D) of this Article. Any substantial modification to a non-conforming use shall require a new approval under this Article.

- C. The County recognizes that proposed new oil and gas operations may have received APD approval from the COGCC during the development of and prior to the effective date of this Article. For these applications, the County encourages the use of the expedited development plan review process. Accordingly, oil and gas operations with APD approval prior to the effective date of this Article that otherwise qualify for expedited development plan review may be processed as expedited development plan review applications.

12-400 General Application Procedure for Expedited DPR and Standard DPR

- A. **Development Plan Review Required.** All oil and gas operations on public and private land within the unincorporated areas of Boulder County shall comply with this Article. Prior to the commencement of any oil and gas operations in the unincorporated County, a development plan review application must be submitted and approved in accordance with this Article. No other form of discretionary land use review under this Code is required for oil and gas operations covered by this Article 12. Development plan review approval is also required prior to the issuance of any County building permits, or associated grading, access, floodplain, or other County permits necessary for the oil and gas operation. Oil and gas operations which may not require a building or other associated County permit must still obtain development plan review approval under this Article.
- B. **Community Engagement.** Boulder County requires Applicants to engage with local communities, residents and other stakeholders at each phase of an oil and gas operation, starting prior to exploration or development activity, in order to provide sufficient opportunity for comment on plans, operations and performance, and to listen to concerns of the community, and to address all reasonable concerns as a result of a proposed operation.
- C. **Phased Process.** During the initial two year period following the effective date of these regulations ("Phasing Period"), new oil and gas facilities will be processed pursuant to the provisions of this paragraph. Prior to submitting a development plan review application, each operator shall register with the County land use department on the operator registration form. During the Phasing Period, the County will process one development plan review application at a time for each registered operator. The development plan review application may be expedited or standard and may be for a single proposed well or for a well pad with multiple proposed wells, in the discretion of the operator. After receipt of an application from a registered operator, the County will not accept additional applications from that operator until the processing of the current application is completed.
- D. **Expedited Development Plan Review Process.** The expedited development plan review process is the County's process for Applicants who voluntarily choose to meet its objective criteria and to engage in most effective performance technologies and practices in the planning, development and operation of new or substantially modified oil and gas operations. The process identifies specific objective criteria for oil and gas operations. The expedited development plan review process is optional and, while Applicants are encouraged to use it, this Article also offers a standard development plan review process for proposed operations that cannot meet the expedited development plan review criteria or for Applicants who choose the standard development plan review process. The expedited development plan review process is an administrative process that only requires review and decision by the Director.

12-1300 Enforcement

If the County determines at any time that there is a violation of an approved development plan permit, the Director shall be entitled to commence one or more of the following enforcement measures and remedies.

- A. Written Order Suspending Development Plan.** The Director may issue a written order to the Applicant (or [owneroperator](#), Applicant, or agent, as applicable) identifying the violation and suspending the approved development plan and all activity otherwise allowed by the development plan. If the violation presents an immediate threat to the health, safety or welfare of the public, the Director may immediately issue the written order to the Applicant in writing and, upon receipt, the Applicant shall cease all activities and operations immediately until the violation is remedied. In all other instances, prior to issuing a written order, the Director shall provide written notice to the Applicant describing the violation, and stating a reasonable time within which the violation must be corrected. If, within that time period, the Applicant has not either corrected the violation or filed a written appeal with the Board of County Commissioners, the written order shall be delivered to the Applicant in writing and, upon receipt, the Applicant shall cease all activities and operations immediately until the violation is remedied. Any appeal to the Board of County Commissioners of the threatened or actual issuance of the written order shall be acted upon pursuant to Section 12-1300(B) below.
- B. Appeal Hearing Before Board of County Commissioners.** If the Applicant files a timely appeal with the Board of County Commissioners of the Director's determination to issue a written order suspending the development plan, the Board shall schedule a hearing on the appeal at the soonest possible time of which the Applicant shall receive reasonable prior notice. If the Board confirms at the hearing that the violation has occurred and has not been corrected, the Board in its discretion may confirm issuance of a written order suspending the development plan or the determination to draw upon the financial guarantee. The Board, in its discretion, may also give the Applicant additional time to correct the violation, or may specify the time at which the Director may take appropriate action to have the violation corrected.
- C. Other Enforcement Remedies.** In addition to the foregoing enforcement measures, Boulder County has the right to any and all other enforcement measures and remedies provided by law, including but not limited to seeking relief through the courts to enforce an approved development plan review, or to stop or abate any oil and gas operations occurring or about to occur without the requisite development plan or other county approvals.

Occupied Structure. Any building or structure that requires a certificate of occupancy or building or structure intended for human occupancy.

Oil and Gas Facilities.

The site and associated equipment used for the production, transportation, treatment, and/or storage of oil and gas and waste products; or

An individual well pad built with one or more wells and operated to produce liquid petroleum and/or natural gas, including associated equipment required for such production; or

Gathering lines, and ancillary equipment including but not limited to drip stations, vent stations, pigging facilities, chemical injection stations and valve boxes; or

Temporary storage and construction staging yards in place for less than six months; or

Any other oil and gas operation which may cause significant degradation.

Oil and Gas Operations. Exploration for oil or gas, including but not limited to conventional oil and gas; the siting, drilling, deepening, recompletion, reworking, refracturing, closure or abandonment of an oil and gas well; oil and gas facilities; construction, site preparation, reclamation and related activities associated with the development of oil and gas resources.

Oil Well. Well capable of producing crude petroleum oil.

Operation. Oil and Gas Operations.

~~Owner or Operator or~~ **-Applicant.** Person who has the right to drill into and produce from a pool and to appropriate the oil or gas produced either for such ~~owner or~~ Applicant or others.

Permanent Equipment. Equipment located onsite for a duration greater than six months effective one year after the drilling and completion of a well.

Person. Any individual, partnership, corporation, association, company, or other public or corporate entity, including but not limited to the State or Federal governments, and any of their political subdivisions, agencies, or instrumentalities.

Pit. Any natural or man-made depression in the ground used for oil or gas exploration or production purposes excluding steel, fiberglass, concrete or other similar vessels which do not release their contents to surrounding soils.

Platted Building Envelope. Area of subdivided land within a buildable lot within which all site structures, buildings and other hardscape elements shall be contained, except driveways.

Regulation(s). Article 12 of the Boulder County Land Use Code.

Referral Agency. An agency, organization, or technical consultant deemed appropriate and necessary, by the County, to review an application and provide professional analysis and recommendations, including without limitation other County offices and departments, municipal, state, or federal agencies having an interest in or authority over all or part of the application or permit, and professional or legal consultants.

ATTACHMENT B

AIR QUALITY MONITORING STUDIES SUMMARY

Pending Air Quality Monitoring Studies

(Updated May 2013)

CDPHE's Monitoring in Platteville (Ongoing)

CDPHE conducts air quality sampling and analysis from a network of 60 monitoring sites across the state to identify air quality issues and trends. The monitoring site in Platteville provides a representation of emissions from oil and gas activities. Since 2003, monitoring of air toxics associated with oil and gas has shown a significant reduction. Benzene, for example, was tested at 4 parts per billion in 2003 and 0.6 parts per billion in 2012. Sampling in 2012 was conducted during winter versus summer months. Additional data is necessary, captured under like conditions, to confirm this result.

University of Colorado (CU) – National Science Foundation Study (2013 – 2018)

This is a CU-led research project to study the effects of natural gas development in the Rocky Mountain region. The five-year, multi-institution project is funded by the National Science Foundation's and includes research on water use, water quality, air quality, human health, and socioeconomic effects. The project began in 2013 and will also include citizen measurement of air and water quality.

Colorado State University, Garfield County Gas Emissions Study (2013 – 2016)

Colorado State University's Atmospheric Science Department is conducting a study of emissions from gas well development in the region of Garfield County. This three-year study, begun in 2013, is sponsored by Garfield County and local industry. It will quantify emissions of air toxics, ozone precursors, and methane from well drilling, hydraulic fracturing, and flowback. The study will also examine near-field dispersion of emissions and the ability of dispersion models to reproduce measured concentration fields. The study will also assess concentrations of pollutants at various setback distances but is not anticipated to assess the health impacts of those concentrations. The study is being conducted on-site in partnership with industry to understand emissions from different types of oil and gas operations. Results may reflect a "best-case" scenario, as opposed to normal operating conditions.

CDPHE North Front Range Oil and Gas Emissions Study (2014 – 2016 or 17)

CDPHE will fund an oversee Colorado State University in conducting an emissions and dispersion study similar in concept to the Garfield County Study. The North Front Range Study is not, however, anticipated to include an analysis of concentrations of pollutants at various setback distances. A health component is being considered if available funding allows. Sources and locations to be monitored will be determined by a technical panel, but may include development, production, and processing activities related to oil and gas. The study will commence in 2014 and conclude in 2-3 years. Results may reflect a “best-case” scenario, as opposed to normal operating conditions.

Front Range Air Pollution and Photochemistry Experiment (FRAPPÉ) (proposed summer 2014)

The National Center for Atmospheric Research (NCAR) is proposing this study to characterize and understand summertime air quality in the Northern Front Range Metropolitan Area (NFRMA). The FRAPPÉ campaign will involve a series of coordinated C-130 flights and ground-based measurements that address the following main science question: *What are the factors controlling NFRMA surface ozone and are current emission controls sufficient to reduce ozone levels below the National Ambient Air Quality Standards?* FRAPPÉ will be closely linked to two other campaigns taking place in the Front Range at the same time. The first is the NASA DISCOVER-AQ (DAQ) aimed at improving satellite capability to interpret air quality conditions near the earth’s surface, via deployment of two instrumented NASA aircraft, and remote sensing and in-situ ground equipment. The other campaign is the proposed FRONTPORCH - an investigation of meteorological and hydrological processes in the Colorado Front Range. These three missions together provide an outstanding opportunity to study and characterize local air quality at a level of detail not possible previously.

Completed Studies

Boulder County Public Health Air Toxics Monitoring Study (2006-07): In partnership with the University of Colorado (CU), Boulder County Public Health (BCPH) installed air quality monitors in five locations across the county to better understand the presence and behavior of air toxics along the foothills. The study was funded by a \$500,000 grant from the EPA in 2006-2007. It provides a baseline to assess changes in emissions of air toxics over time. <http://www.bouldercounty.org/env/air/pages/airtoxics.aspx>

National Oceanic and Atmospheric Administration Hydrocarbon Emissions Characterization in the Colorado (Erie Tower Study) and Methane Leakage Studies (2012): In 2012, the National Oceanic and Atmospheric Administration (NOAA) published a study using data collected from the air quality monitoring tower in Erie. Using this monitored data, researchers concluded that oil and gas emissions may be significantly higher than what is included in the CDPHE inventory of emissions for Weld County. This could lead to an incorrect assessment of the emission controls that are needed to reduce ozone formation along the Front Range. Also in 2012, NOAA researchers identified methane leakage rates at oil and gas operations to be 4%, and they now estimate that the rates may be higher. Earlier studies by the EPA indicated a lower leakage rate of 2.4%. Princeton University suggests that shifting to natural gas from coal-fired generators has immediate climatic benefits, as long as the cumulative leakage rate from natural-gas production is below 3.2%. <http://www.agu.org/pubs/crossref/pip/2011JD016360.shtml> and <http://www.nature.com/news/methane-leaks-erode-green-credentials-of-natural-gas-1.12123#/ref-link-4>

Colorado School of Public Health Impact Assessment (2011): Colorado School of Public Health researchers analyzed ambient air sample data collected from monitoring stations commissioned by Garfield County Department of Public Health in Battlement Mesa. Researchers used EPA methodology to estimate non-cancer health impacts and excess lifetime cancer risks for hydrocarbon exposure. The report concludes that health risks are greater for people living closest to wells and urges a reduction in those air emissions. http://www.garfield-county.com/public-health/documents/19_HIA_2nd_draft_appendix-d.pdf

Carnegie Mellon Study of Life Cycle Greenhouse Gas Emissions (2011): This study estimates the life cycle of greenhouse gas (GHG) emissions from the production of natural gas from the Marcellus shale formation in the Appalachian Basin. Researchers compare these emissions with national average natural gas emissions produced in the year 2008, prior to any significant Marcellus shale development. The study concludes that the development and completion of a typical Marcellus shale well using hydraulic fracturing results is roughly an 11% increase in GHG emissions relative to average domestic gas (excluding combustion) and a 3% increase relative to the life cycle emissions when combustion is included.

<http://iopscience.iop.org/1748-9326/6/3/034014>

CDPHE Erie Well Study (2012)

From late July to late August 2012, the Colorado Department of Public Health and Environment, Air Pollution Control Division, conducted air sampling adjacent to natural gas well completion activities in Erie, Colorado. The purpose of the sampling was to measure air emissions that may be associated with the well completion activities near Erie and Red Hawk Elementary schools. Concentrations of likely oil and gas-related compounds, such as ethane and propane, were found to be higher at the Erie sites than in downtown Denver, but lower than in Platteville, where greater oil and gas activity is taking place. Toluene and benzene levels were higher at one Erie monitor than the other, likely due to emissions from truck traffic. The study includes a health risk screening assessment of benzene emissions, which provides a prediction of hypothetical health risks. It identified a risk of cancer 4.5 times higher in Erie than in downtown Denver (8.7 per million in Erie versus 1.9 per million). [EPA's 2005 National-Scale Air Toxics Assessment](#) estimates that all 285 million people in the U.S. have an increased cancer risk of greater than 10 in 1 million.

ATTACHMENT C

PUBLIC HEALTH INSPECTIONS CAPACITY



Public Health

Environmental Health Division

Public Health Inspections and Monitoring for Phasing Oil and Gas Operations

Inspections and Enforcement Capacity

Sample job position to build current staff capacity and expertise through local term staffing support during phased implementation of county Development Plan Review of Oil and Gas Operations.

Expertise sought includes: engineering, environmental health, and oil and gas expertise and experience.

Assignment Options:

- Inspections of permitted operations (new and existing)
- Permit application review (including negotiation with industry, engaging consultants on retainer, researching control options)
- Response to complaints (surge capacity and staff development)
- Proactive research of risks areas for air and water quality

