

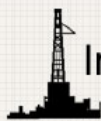
ADDENDUM INDEX

EXH.#	DOCUMENT DESCRIPTION	PAGE #
1	University of Colorado Law School, Intermountain Oil and Gas BMP Project Web Page, January 27, 2015.	1-3
2	National Association of Regional Councils Report – Local, Regional, and State Government Perspectives on Hydraulic Fracturing-Related Oil and Gas Development; Prepared By Samuel Gallaher, PhD Student at School of Public Affairs, University of Colorado Denver, Graduate Research Fellow at the Buechner Institute of Governance (excerpts), full report available at: http://narc.org/wp-content/uploads/Government-Perspectives-on-Oil-and-Gas-Development-Full-Report-2013-Gallaher.pdf	4-16
3	Energy Boomtown & Natural Gas: Implications for Marcellus Shale Local Governments & Rural Communities; NERCRD Rural Development Paper No. 43, 63 pp., Prepared by Jeffrey Jacquet, January 2009 (excerpts), full report available at: http://aese.psu.edu/nercrd/publications/rdp/rdp43	17-22
4	Colorado Oil & Gas Association Rule 510 Statement, Prepared By Jamie L. Jost, Managing Shareholder at Jost & Shelton Energy Group, P.C., General Counsel for The Colorado Oil & Gas Association.	23-32
5	The Center for Science and Democracy at the Union of Concerned Scientists Report – Science, Democracy, and Fracking: A Guide for Community Residents and Policy Makers Facing Decisions Over Hydraulic Fracturing.	33-52
6	State of Colorado, Colorado Department of Public Health and Environment Letter Regarding Earth Guardians Request for Rulemaking, April 7, 2014.	53-54
7	Los Angeles Times Article: Message is mixed on Fracking, July 28, 2013.	55-58
8	Colorado Oil and Gas Conservation Commission, 2 CCR 404-1 – Statement of Basis, Specific Statutory Authority, and Purpose Re New Rules and Amendments to Current Rules (2008 Amendments) (excerpts), full copy available at: http://cogcc.state.co.us/	59-65

9	New York State Department of Health Study: A Public Health Review of High Volume Hydraulic Fracturing for Shale Gas Development, December 17, 2014 (excerpts), full report available at: http://www.health.ny.gov/press/reports/docs/high_volume_hydraulic_fracturing.pdf	66-83
10	Physicians, Scientists and Engineers for Health/Energy: Impediments to Public Health Research on Shale (Tight) Oil and Gas Development, May 2013.	84-85
11	National Public Radio State Impact: Lifelong Gag Order Imposed on Two Kids in Fracking Case, By Susan Phillips, August 1, 2013.	86-88
12	Pro Publica: EPA's Abandoned Wyoming Fracking Study One Retreat of Many, By Abrahm Lustgarten, July 3, 2013.	89-92
13	Longmont Times Article: Most Oil, Gas Measures Die During Colorado Legislature's 2013 Session, By John Fryar, May 8, 2013.	93-95
14	National Public Radio Broadcast: Close Encounters With Gas Well Pollution; Host Broadcasters: Melissa Block and Robert Siegel, May 15, 2012	96-102
15	Health Impact Assessment for Battlement Mesa, Garfield County, Colorado, conducted by members of the faculty and staff of the Department of Environmental and Occupational Health, Colorado School of Public Health (CSPH), September 2010 (excerpts), full report available at: http://www.garfield-county.com/public-health/documents/1%20%20%20Complete%20HIA%20without%20Appendix%20D.pdf	103-122
16	U.S. Environmental Protection Agency News Release: EPA Releases Draft Findings of Pavillion, Wyoming Ground Water Investigation for Public Comment and Independent Scientific Review; EPA Contact Larry Jackson; December 8, 2011.	123-124
17	Pro Publica: EPA Finds Compound Used in Fracking in Wyoming Aquifer, By Abrahm Lustgarten, November 10, 2011.	125-126
18	U.S. Environmental Protection Agency Draft Report Regarding Pavillion, Wyoming Groundwater Investigation for Public Comment and Independent Scientific Peer Review, December 8, 2011; Contact Person Richard Mylott, Public Affairs.	127-135

19	Bloomberg BNA: EPA Says Wyoming to Complete Investigation Of Possible Contamination Near Pavillon, Wyoming, By Alan Kovski, June 21.	136-140
20	U.S. Environmental Protection Agency News Release: EPA Initiates Hydraulic Fracturing Study: Agency Seeks Input From Science Advisory Board, March 18, 2010; Contact Person Enesta Jones.	141
21	Pro Publica: EPA Wants to Look at Full Lifecycle of Fracking in New Study, By Nicholas Kusnetz, February 9, 2011.	142-143
22	U.S. Environmental Protection Agency: Power Point Slides Regarding EPA Study of Hydraulic Fracturing and Drinking Water Resources.	144-161
23	Akron Beacon Journal: Article Regarding EPA Study on Fracking Threat to Water Will Take Years, By Bob Downing, January 18, 2013.	162-164
24	Physicians, Scientists and Engineers for Health/Energy: Working Paper – Toward an Understanding of the Environmental and Public Health Impacts of Shale Gas Development: An Analysis of the Peer-Reviewed Scientific Literature, 2009-2014, By Jake Hays and Seth B.C. Shonkoff, January 2015.	165-184
25	Pro Publica Surveys Some Recent Research on Potential Health Implications of Hydro Fracking: Drilling for Certainty - The Latest in Fracking Health Studies, By Naveena Sadasivam, March 5, 2014.	185-188
26	Environmental Health Perspectives, Volume 123, Number 1, January 2015: Proximity to Natural Gas Wells and Reported Health Status-Results of a Household Survey in Washington County, Pennsylvania, By P. M. Rabinowitz, I. B. Slizovskiy, V. Lamers, S. J. Trufan, T. R. Holford, J. D. Dziura, P. N. Peduzzi, M. J. Kane, J. S. Reif, T. R. Weiss, and M. H. Stowe.	189-194
27	Environmental Health Perspectives, Volume 122, Issue 4, April 2014: Birth Outcomes and Maternal Residential Proximity to Natural Gas Development in Rural Colorado, By L. M. McKenzie, R. Guo, R. Z. Witter, D. A. Savitz, L. S. Newman, and J. L. Adgate.	195-204
28	Physicians, Scientists and Engineers for Health/Energy Water Studies Summary: Surface and Groundwater Contamination Associated with Modern Natural Gas Development, October 2014.	205-206

29	University of Colorado Boulder: CU-Boulder Researchers Confirm Leaks From Front Range Oil and Gas Operations, May 7, 2014.	207-210
30	Colorado State University Report Regarding Characterizing Air Emissions from Natural Gas Drilling and Well Completion Operations, By Jeff Collett, Department of Atmospheric Science.	211-237
31	Rocky Mountain Mineral Law Foundation – Federal Onshore Oil & Gas Pooling & Unitization, Book 1; Mineral Law Series, Volume 2014, Number 4; Article on Pooling and Unitization: A History Perspective and an Introduction to Basic Vocabulary, By Bruce M. Kramer.	238-264
32	U.S. Energy Information Administration: North Dakota Aims to Reduce Natural Gas Flaring, Principal Contributors: Philip Budzik and Michael Ford, October 20, 2014.	265-266
33	National Center for Biotechnology Information Abstract: Impacts of Gas Drilling on Human and Animal Health, 2012.	267-268
34	Denver Business Journal: KC Fed: 50% of Energy Firms Planning Big Spending Cuts, Layoffs This Year, By Heather Draper, January 15, 2015.	269-270
35	The Scottish Government – News: Moratorium Called on Fracking, January 28, 2015.	271-273
36	Declaration of Ava Farouche (with maps).	274-278
37	Colo. Rev. Stat. §§ 34-60-102, 34-60-106.	279-288



Intermountain Oil and Gas BMP Project

COMMUNITIES

Many communities in the Intermountain West are facing challenges that come with oil and gas development, as development can have both negative and positive environmental, economic and social impacts on communities. Unlike previous oil and gas developments, the recent push has brought a large number of wells within close proximity to more heavily populated areas. Establishment of a working relationship with industry can help to both address and resolve issues stemming from development, and lay the foundation for an ongoing dialogue between community stakeholders and industry. Since an informed community is crucial to clear communication and cooperation among interested parties, this page is intended to provide communities with the resources they need for successful planning, coordination with industry, and navigation of regulations that apply to oil and gas operations.

Community members may also visit this website's Resources pages.

- The [Development Process](#) page provides an overview of oil and gas development.
- The [Wildlife](#), [Water Quality](#), [Air Quality](#), and [Vegetation](#) resource pages provide specific information about the potential impacts of development on each resource.
- The [Reclamation](#) page can help communities plan development with reclamation in mind.
- The [Geographic Information Systems](#) page links the user to downloadable data, open-source software, and various maps that can help communities document and examine impacts to effectively manage development in their area.



A well located within a neighborhood in Weld County, CO.

CONSTRUCTIVE ENGAGEMENT / COLLABORATIVE PROCESSES

Constructive engagement is an approach that brings communities, local governments, environmental groups and oil and gas companies together to address social and environmental issues through cooperative, non-adversarial partnerships. These partnerships may not always be appropriate or effective, but knowing what they are and how they work can give communities an alternative to conflict and litigation.

A constructive engagement process may include the following forums:

- Community advisory committees
- Independent constructive engagement organizations
- Participatory studies, such as NEPA environmental impact assessments or baseline development studies
- Participatory monitoring or oversight committees
- Grievance resolution systems and procedures

Introduction to Constructive Engagement

For more information, see CDR Associates' [CE Powerpoint](#) on the [Workshop](#) page.

Though many communities may only require open lines of communication and a good working relationship with industry, a more formal collaborative process can be a useful approach to finding solutions to contentious issues. Collaborative processes inform stakeholders, foster discussion between parties in a non-adversarial environment with the help of a facilitating, neutral party, and allow stakeholders themselves to explore and develop solutions to their problems.

Whether communities turn to collaborative process or other forms of constructive engagement to address development issues, it is important for the process to involve all stakeholders from the beginning, to establish the process' legitimacy, to make use of facilitation and technical advice as needed, and to address the economic, social and environmental concerns of the community.

PLANS AND AGREEMENTS

The following plans and agreements address natural gas development in identified geographic areas. The areas may vary in size, but all address development on a scale larger than a single well permit site. Two of the plans are established in statute or regulations; the other plans and agreements are processes independently initiated between communities and industry. All are intended to form good working relationships between communities and the oil and gas industry.

COMPREHENSIVE DRILLING PLAN

A comprehensive drilling plan (CDP) is a Colorado specific plan that identifies expected oil and gas development within a specified geographic area, the potential impacts, and measures to mitigate those impacts on public health, safety, and the environment. Operators voluntarily initiate and enter

For more information on Comprehensive Drilling Plan, see the [Battlement Mesa case study](#).

COMMUNITY RESOURCES

In addition to leadership and cooperation amongst stakeholders, community planning requires information about projected population growth, hydrology, infrastructure, service provision, community character, costs and fiscal impacts, and more. In addition to political and regulatory dynamics, this technical information is vital to smart community growth. For communities experiencing oil and gas development, this information is needed to accurately assess potential impacts of the development and lead to successful negotiation between community stakeholders and industry.

The following organizations can provide funding, technical assistance, and other support to communities who wish to work with industry to form a plan for development.

UNION OF CONCERNED SCIENTISTS



The Union of Concerned Scientists promotes evidence-based decision making. Their [Science, Democracy and Fracking Toolkit](#) provides practical advice and resources to help communities to identify critical questions and get scientific information needed to weigh the prospects and risks of shale oil and gas development in their region.

RED LODGE CLEARINGHOUSE

A project of the Natural Resources Law Center, the [Red Lodge Clearinghouse](#) provides a wide range of resources for participants in collaborative process involving natural resources issues. The site provides information about federal laws, upcoming events and training, stories of successful and not-so-successful collaborations, and access to technical assistance and facilitation. Additionally, the site provides valuable guides: a [collaboration handbook](#), a [guide to grant-writing](#), tools for [environmental problem-solving](#), and more.



EARTHWORKS OIL & GAS ACCOUNTABILITY PROJECT

The Earthworks Oil & Gas Accountability Project (OGAP) works with tribal, urban and rural communities to protect their homes and the environment from the devastating impacts of oil and gas development. OGAP provides information useful to communities and individual landowners, including workshops, fact sheets, best management practices, and model regulations. The OGAP's guide for landowners, [Oil and Gas at Your Door?](#), details landowners' legal rights and offers information about the oil and gas development process. OGAP has offices in Colorado, Montana and New Mexico.

into a CDP, but are required by the [Colorado Oil and Gas Commission](#) (COGCC) to develop the CDP in participation with the [Colorado Parks and Wildlife](#) (CPW), [Colorado Department of Public Health and Environment](#) (CDPHE), local governmental agencies, and surface owners. Operators may determine the issues that are addressed in the CDP while being encouraged to provide detailed information. CDPs typically cover the activities of one operator, although operators are encouraged to develop joint plans covering the proposed activities of multiple operators where appropriate. Once a CDP is approved, the operator is not required to submit Form 2A to identify impacts of development and that otherwise must be approved by the COGCC before a drilling permit can be issued. A CDP can be valid for six years after approval.

GEOGRAPHIC AREA PLAN

A Geographic Area Plan (GAP) is a Colorado-specific planning tool for addressing cumulative impacts from oil and gas development. The GAP covers entire gas fields or geologic basins and can include activities of multiple operators in multiple sub basins or drainages over a period of ten years or more. The plan is intended to assist the [COGCC](#) to adopt basin specific rules that address unique geologic or hydrological features. The COGCC first publishes a notice of intent to initiate a GAP which then allows for a public participation process. The COGCC then consults local governments and other agencies such as the [CPW](#), the [CDPHE](#), County Commissions, and local government designees. The COGCC also considers any local government comprehensive plans or other long range planning tools for the GAP. This plan may include development scenarios, designate units, adopt spacing orders, implement sampling or monitoring plans, or require consolidation of facilities.

The Colorado legislature authorized use of GAPs in 2008, but no GAPs have been prepared to date.

COMMUNITY DEVELOPMENT PLAN

A community development plan (CDP) is a plan made between the community being affected by oil and gas development and the operator. This plan is a voluntary agreement that identifies the potential impacts of development on the environment and on community well-being. The CDev'tP also includes best management practices to be implemented by the operator to address those impacts agreed upon by community members and the company. The goal of a CDev'tP is to initiate a relationship between community and operators that will promote transparency, reduce conflict, and give the community an opportunity to participate in decision making regarding oil and gas development in their area.

For examples of CDPs in Colorado, see [The Rifle, Silt and New Castle Community Development Plan](#) and [Oil and Gas Development in Battlement Mesa](#)

WATERSHED AGREEMENT

Watershed agreements are non-binding agreements created between corporations and communities. The primary goal of a watershed agreement is to allow for development of natural resources, specifically oil and gas, while ensuring the protection and reclamation of the watershed health. In such an agreement, companies adhere to best management practices that protect the watershed by defining baseline water quality conditions and maintaining or improving these conditions over the development period. Companies may agree to hire a third-party that oversees monitoring and studies of the water quality throughout the development process. For oil and gas development, BMPs may include, green fracturing, fracture tracing, clustered development well pad spacing, and closed loop drilling systems, among many others.

For an example of a watershed agreement in Colorado, see [Community Spotlight: The Watershed Plan for the City of Grand Junction and the Town of Palisade](#).

GOOD NEIGHBOR AGREEMENT

A Good Neighbor Agreement (GNA) is an agreement between a community and a corporation whose development poses a pollution threat for that community, usually in the form of water or air pollution. In a GNA, which can be legally binding, companies agree to disclose all potential pollution producing activities while also using best management practices that mitigate any unnecessary pollution. Best management practices are implemented by the company, on the basis that the community members agree to abstain from protesting or legal action that could delay or stop the development process. As part of the agreement, community members typically have input and decision making power regarding the company's operations.

For an example of a Good Neighbor Agreement, see the [Stillwater Good Neighbor Agreement](#).

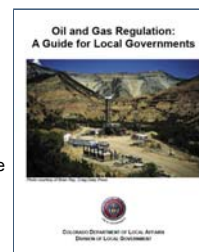
WILDLIFE MITIGATION PLANS

A wildlife mitigation plan (WMP) is another Colorado-specific plan. Like CDPs and GAPs, it is based in COGCC rules. Unlike these other large-scale plans, a WMP has a single resource focus: to avoid, minimize and mitigate impacts from oil and gas activities to wildlife. A WMP is developed by an operator and the Colorado Division of Wildlife (CDOW) with consideration of landowners, but little or no general community input.

More information on WMPs see the "Landscape Approach" on the [Wildlife Resource Page](#)

OIL AND GAS REGULATION: A GUIDE FOR LOCAL GOVERNMENTS

In this report, the Colorado Department of Local Affairs provides municipalities and local governments a general guide on the issues surrounding oil and gas development, industry practices, and the regulatory authority of local governments over development. The report also addresses the impacts on communities that are not typically considered, such as loss of affordable housing or tourism revenue. This guide encourages collaboration among local governments, the Colorado Oil and Gas Conservation Commission, and industry representatives. Descriptions of mitigation strategies and case studies that give examples of these strategies are also included in the document. This guide is a great resource for communities who are interested in having a hand in the regulation of oil and gas development in their area.



GUIDE FOR LANDOWNERS IN AREAS OF COAL BED METHANE DEVELOPMENT

The Region 8 Coordinated Regional Natural Resource Monitoring and Training Program team developed a guide, titled [Land and Water Inventory Guide for Landowners in Areas of Coal Bed Methane Development](#), for interested landowners, which describes coal bed methane extraction processes, the positive and negative effects landowners might encounter if coal bed methane is extracted on or near their property, and potential disposal and use options for produced water. The guide encourages landowners to investigate who owns the mineral rights associated with their property, to negotiate surface use agreements with the mineral rights owner, and to document the land and water resources on their property prior to extraction commencement. The guide also briefly describes best engineering practices (BEPs) and best management practices (BMPs) so that landowners can be informed during, and possibly influence, the development process.

OIL AND GAS REVENUE ALLOCATION TO LOCAL GOVERNMENTS IN EIGHT STATES

Rapidly growing oil and gas production has raised substantial revenues for governments across the United States. [This report](#) describes key sources of oil and gas revenues for local governments in eight states, and assesses whether existing policies are providing sufficient revenue to manage increased service demands associated with a growing oil and gas industry.

MEDIATION AND FACILITATION RESOURCES

- [CDR Associates](#)
- [Meridian Institute](#)
- [U.S. Institute for Environmental Conflict Resolution](#)
- [Colorado Council of Mediators and Mediation Organizations](#)
- [Association for Conflict Resolution](#)
- [Ruckelshaus Institute of Environment and Natural Resources](#)
- [Wyoming Agriculture and Natural Resource Mediation Program](#)
- [Utah Dispute Resolution, Community Mediation](#)
- [Montana Mediation Association](#)

For more resources go to the [Red Lodge Clearinghouse Facilitation Directory](#).

COLORADO

[Center of the American West](#)
[CommunityViz](#)
[Rocky Mountain Land Use Institute](#)
[Western Colorado Congress and Grand Valley Citizens Alliance](#)

MONTANA

[Greater Yellowstone Coalition](#)
[Northern Plains Resource Council](#)

NEW MEXICO

[New Mexico Environmental Law Center](#)
[San Juan Citizens Alliance](#)

UTAH

[Utah Department of Community and Economic Development](#)
[Utah Office of Rural Development](#)
[Utah League of Cities and Towns](#)
[Utah Department of Natural Resources, Division of Oil, Gas, and Mining](#)
[Utah Department of Environmental Quality](#), see "Citizens" and

MASTER DEVELOPMENT PLAN

A Master Development Plan (MDP) for federal lands and minerals is often used in the development of multiple proposed oil and gas wells that are in close proximity to each other and have similar producing zones. MDPs are useful when drilling is certainly going to occur and covers an area with homogeneous geologic and environmental characteristics. They are not very efficient on smaller, or individual, exploratory sites. MDPs are similar to Geographic Area Plans (GAPs) in that they analyze and plan development of a large scale oil and gas production site. The main focal points of MDPs are on the drilling plans and surface use plans of at least two or more potential well sites, typically characterized by clustered well pads. A description of required infrastructure for each well is included and covers more general development such as roads, pipelines, and storage of waste fluids. Individual operators submit MDPs to the Bureau of Land Management and include the environmental assessment required by the National Environmental Policy Act along with any information that may be required by local regulation. A MDP is usually submitted in conjunction with an Application for Permit to Drill (APD), and any deficiencies or pending corrections to the APD usually do not effect the approval of the MDP. Overall, MDPs give a comprehensive look at development and help to reduce redundancy in planning, paperwork and applications. BMPs may be voluntarily included or required as conditions of approval.

For an example of a MDP see: [The Proposed Whitewater Unit Master Development Plan for Mesa and Delta Counties](#)

"Stakeholders" tabs

[Utah Department of Humanity and Arts](#)

WYOMING

[Plan-IT Wyoming](#)
[Powder River Basin Resource Council](#)
[Wyoming Rural Development Council](#)
[Wyoming Business Council](#)
[Wyoming Community Foundation](#)

REGULATORY BODIES AND RELEVANT REGULATIONS

Oil and gas development in a community may be regulated by federal, state and local law as well as all levels of government agencies. For a general introduction to oil and gas regulation, see the Red Lodge Clearinghouse (RLCH) [Oil and Gas Resource Development](#) page, especially Process Essentials: Federal, State and Local Regulation. This RLCH webpage includes information on planning, leasing and permitting of development as well as the assessment of impacts under the National Environmental Policy Act (NEPA). For a more detailed summary of laws and regulations applicable to oil and gas development, see the [LAWS](#) pages of our web site.

THE BUREAU OF LAND MANAGEMENT

The Bureau of Land Management (BLM) is the primary authority for regulating development of oil and gas on federal lands and of federally-owned oil and gas, regardless of the land ownership. Other land management agencies, e.g., the U.S. Forest Service, U.S. Fish and Wildlife Service, and National Park Service, participate in leasing and development decisions on lands that they manage. Because of their role in oil and gas development, coordination with the BLM is usually extremely important. Some useful links to BLM resources include:

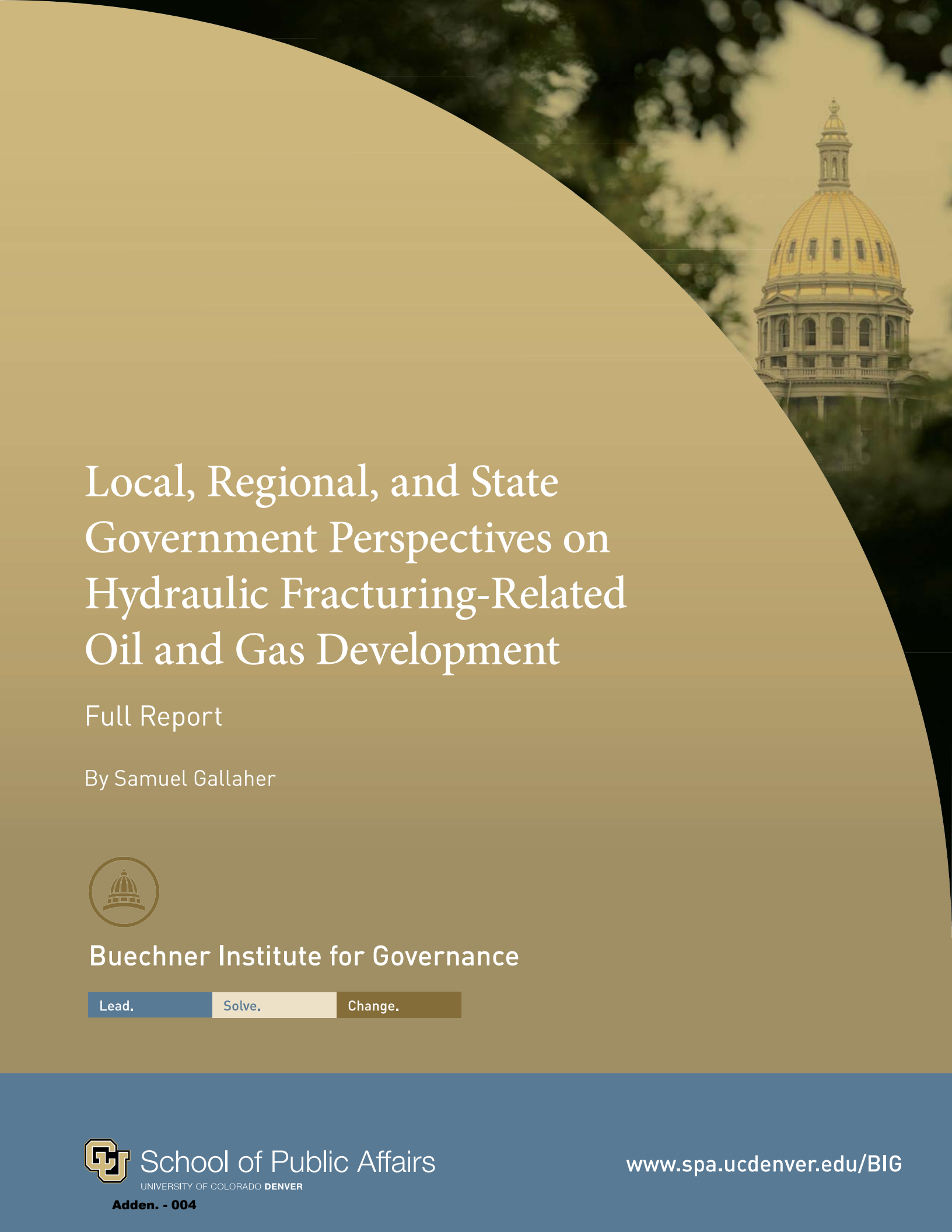
[Colorado Resource Advisory Council](#)
[Colorado Oil and Gas](#)

[Montana Oil and Gas Information](#)
[Montana Oil and Gas Lease Sale Information](#)

[New Mexico Oil and Gas Information](#)

[Utah Oil and Gas Leasing Information](#)
[Utah Planning and RMPs Information](#)

[Wyoming BLM Oil and Gas Leasing information](#)
[Wyoming BLM Planning Documents](#)



Local, Regional, and State Government Perspectives on Hydraulic Fracturing-Related Oil and Gas Development

Full Report

By Samuel Gallaher



Buechner Institute for Governance

Lead.

Solve.

Change.



School of Public Affairs
UNIVERSITY OF COLORADO DENVER

Adden. - 004

www.spa.ucdenver.edu/BIG

For more information about the Buechner Institute for Governance, go to:
www.spa.ucdenver.edu/BIG

Local, Regional, and State Government Perspectives on Hydraulic Fracturing-Related Oil and Gas Development

Extended Summary

By Samuel Gallaher

PhD Student at the School of Public Affairs, University of Colorado Denver
Graduate Research Fellow at the Buechner Institute for Governance

Acknowledgements

The investigator would like to thank The Wirth Chair in Sustainable Development and the Colorado Energy Group, Inc. for their consultation in creating the survey and comments on initial drafts of the report. The National League of Cities and the National Association of Regional Councils (NARC) for support in the distribution of the

survey. Additional thanks to NARC for providing initial information on regional issues and access to meeting notes. Jennifer Kagan for commenting on initial drafts. Finally, thanks to the Buechner Institute for Governance and Dr. Brian J. Gerber for support and general guidance throughout the research endeavor.

Buechner Institute Mission Statement

Our mission is to enhance the understanding and achievement of efficient, effective and just governance in Colorado and the nation. We accomplish this mission by serving as a community resource, providing objective policy research and program evaluation, expert technical assistance, leadership and professional development training, and forums for the civil discussion of public issues.

INTRODUCTION

The United States is in the midst of an extraordinary oil and natural gas development boom. The use of hydraulic fracturing and horizontal drilling (referred in this pilot study to as fracking-inclusive development) has opened numerous shale and other porous formations to oil and gas development in nearly every region of the continent (U.S. Geological Survey, 2013). Reserves lay underneath rural and metropolitan areas alike. The Energy Policy Act of 2005 signaled the beginning of a national focus on hydraulic fracturing regulation. In 2007, states with fracking-inclusive development began updating their rules and regulations to address hydraulic fracturing related technologies and processes (Colorado Oil and Gas Conservation Commission, 2008; Railroad Commission of Texas, 2006; Railroad Commission of Texas, 2007). As the oil and gas boom gained momentum, and moved into populated areas unfamiliar to development activity, a national debate ensued over the costs and benefits of fracking-inclusive development. Potential benefits of developing the oil and gas reserves include multi-billions of dollars to industry, individuals, and governments; U.S. oil independence; and employing the natural gas as a bridge fuel between gasoline and renewable resources (Congressional Research Service, 2012). Common concerns heard nation-wide include ground and surface water contamination, air pollution, and surface degradation (Congressional Research Service, 2012; Congressional Research Service, 2009). At the local level, the debate over costs and benefits of fracking-inclusive development is more nuanced (Rodgers, Fogle, Kelsey, Lembeck, Pifer, Whitmer, and Wulforth, 2008; Anderson and Theodori, 2009).

Core management of oil and gas development issues is the responsibility of local governments, however because oil and gas plays span jurisdictions, both local and regional perspectives are needed. Industry will inevitably move through communities as new oil and gas reserves are discovered, developed, and depleted. What is left in the wake of development is uncertain. Empirical evidence shown in this report and anecdotal evidence from the disputes between local and state governments around the country indicate great care and research is needed to find mutually beneficial policies for communities and industry.

Previous studies by the Community & Regional Development Institute at Cornell and Pennsylvania State University's Marcellus Education Team and our initial discussions with the National Association of Regional Council (NARC) staff indicate multiple

areas of local concern (Christopherson and Rightor, 2011; Rogers et al., 2008). These include boom-and-bust economic cycles; local wealth capture issues such as training the local workforce for employment in the oil and gas industry; housing, social service, and public school needs for a rapidly-expanded population; public safety and nuisances from increased truck traffic and drill sight operations; emergency management at the drill site; environmental concerns such as air quality, water use, and water contamination; surface damage and reclamation from road use, erosion, pipelines, and drill pads; land use issues such as setbacks, zoning, surface rights; and informing and working with the public and industry to develop mutually beneficial policy solutions or agreements. Because local governments vary in their regulatory structures and management experiences, not every community faces the same issues; a policy or management approach which works well for one area of the country or state may not work for another. In general, local governments and regional planning organizations are seeking help. This pilot study focusses on development-related issues from local government and regional planning organization perspectives.

ABOUT THE PILOT STUDY

Given the potential positive and negative impacts of oil and gas resource extraction on local communities, the purpose of this study is to develop a better understanding of the above issues and their potential solutions from a local and regional governance perspective. To do so we contacted local government and regional planning officials, with the aid of nationally reaching member organizations, to determine their perception of issues and management solutions, via interviews and surveys, associated with recent oil and gas development. The selection of officials was not a random probability sample. Survey and interview respondents were from a convenience sample of local and regional government representatives in Colorado, Wyoming, New Mexico, Texas, Ohio, Pennsylvania, New York, West Virginia, and North Carolina. While these states are not an exhaustive list of those with current or potential fracking-inclusive oil and gas development, they do provide an arguably national representation of oil and gas industry experiences, concerns, and regulatory approaches.

An electronic survey and semi-structured phone interviews were used to collect perspectives from local government and regional planning representatives from each selected state. The survey and phone interviews questions revolved around the above

social, economic, and environmental issues, and focused on problem perceptions of and management options for each topic. Survey responses were given on a seven-point Likert scale ranging from Strongly Agree to Strongly Disagree.

Overall, eighty-one respondents completed the forty-four question electronic survey. Survey respondents were local government representatives (67%), regional and state government representatives (23%), and members of advocacy organizations (10%). Seventy-five percent of respondents were from metropolitan areas; the remainder represented rural communities. Ninety-three percent of the responses came from five of the nine target states — North Carolina (31%), New York (26%), Wyoming (15%), Colorado (14%) and Texas (7%). New Mexico, Ohio, West Virginia, and Pennsylvania representatives made up the remaining seven percent. Finally, the respondents were divided by their state's oil and gas industry maturity. Respondents from states with a mature oil and gas industry, compared to a nascent industry, will likely have more familiarity with local and state debates, and as a result, may have better developed regulations or management strategies related to fracking-inclusive development. Thirty-eight percent of the survey respondents represented states with a mature oil and gas industry and 62% of respondents represented communities in states with a nascent oil and gas industry. Five phone interviews with subject matter experts (SMEs) from regional planning organizations and local governments provided approximately 10 hours of contextual information about their specific experiences which the survey could not provide.

HYDRAULIC FRACTURING-RELATED DEVELOPMENT ISSUES

The following section is an executive summary of the issues addressed and description of key questions used in this research to understand local governments' and regional planning agency's perceptions of each issue. This section is followed by, key findings from the research and then a discussion of recommendations.

Short and Long-term Economic Impacts

The economic benefits of oil and gas resource extraction are incentives for local, state, and national governments to support fracking-inclusive development. Wealth capture (e.g. taxes, jobs) and boom-and-bust cycles are key topics related to local economies. Not all communities have the same wealth capture mechanisms in-place and so may experience

an imbalance of benefits and costs from oil and gas development. In addition, the duration of potential economic and population growth is a local and regional concern. Localities who experience a rapid industry-driven growth in economy and population may experience an equally rapid decline in economy and population as local resources are extracted and the industry moves on (Brown et al., 2011). This is commonly referred to as a boom-and-bust cycle. We asked questions related to understand current wealth capture mechanisms and how boom-and-bust cycle concerns are impacting local government economic investment strategies. We also inquire into ways local governments are mitigating boom-and-bust cycle concerns.

Land-Use and Local Control

Fracking-inclusive development and land-use issues span environmental and economic debates. Land-use issues include road damage, road maintenance, and environmental nuisance issues (e.g. noise, light, and dust). Local control issues include property right conflicts between surface and mineral owners and jurisdictional conflicts between state, local governments, and industry. Land-use and local control issues were addressed through questions related to potential land use problems, the status quo of individual property rights and lease agreements, and potential policy solutions to reduce land-use conflicts.

Community Capacity and Social Dynamics

The potential temporary nature of fracking-inclusive development that can cause fluctuation in local economies and and population raises concerns for community planning and can disrupt local social dynamics. Furthermore, if the local population is not impacted, there may be an influx of temporary workers who stay in work camps near the wells. Additionally, there is concern about the truck traffic to and from the well negatively impacting public safety. These factors have the potential to impact housing, social services and other city services, and create animosity between residents and industry employees. This research focused on four broad areas of community capacity and dynamics. These areas were i) housing with respect to potential temporary population growth; ii) public services such as schools, social services, and police with respect to rapid increase in demand; iii) paying for increased services; and iv) integrating the new workforce into the community.

Emergency Management

Emergency response is a specific local investment and capacity issue. During different phases of the operation (i.e. drilling, fracturing, or extraction) there are numerous potential hazards. Many of these include chemicals or explosive materials that are unique to oil and gas development. Because of this, special training for the local first responders may be necessary. We asked respondents if their emergency responders have had any specific training regarding potential hazards at the well site.

Environmental Concerns

Environmental issues related to fracking-inclusive development range from air pollution and water pollution, water use and supply for fracturing, produced water treatment and storage, erosion, and noise and light pollution from well site operations. Substantiation and importance of these environmental issues is a continual, and often divisive, discussion between community members, governments, and industry representatives. We asked questions focused on each of these with respect to the perception of the problem, the efficacy of current regulations aimed to mitigate these issues, and the source and impact of disagreements on developing policy solutions.

Information and Communication

The last issue area we focussed on is potentially the most important when it comes to developing management and policy solutions: gathering and sharing accurate and complete information and open communication between stakeholders. Policy and management discussion can be divisive; stakeholders may have been misinformed or are entrenched in particular points of view. Policy outcomes vary across municipalities and states. While any of these outcomes may be the appropriate solution for the given community, the number of disputes and lawsuits which occur afterward provide evidence that not all parties are satisfied. This research asked questions about the perceptions of the quality and level of communication public officials have with other stakeholders, the utility of public meetings to inform and gather information from the public, and the most commonly used communication tools employed by governments to inform the public about fracking-inclusive topics.

KEY SURVEY AND INTERVIEW FINDINGS

Survey responses are grouped by the respondents' geographic region, the level of government the respondent represents, if the respondent is from a rural or non-rural community, and if the respondent is from a state with a mature or nascent industry. The greatest variation in problem perception is found between local and non-local government respondents and between respondents from nascent and mature industry states; highlighting the contextual nature of issues related to hydraulic-fracturing and oil and gas development. Whether the identified variation in survey responses is due to actual differences in problem susceptibility, information, or perception; the findings point to a need for further investigation. The key findings are divided by the six issue groups described above.

Short and Long-term Economic Impacts Summary Results

Survey and SME interviews suggest local economies will be drastically impacted by fracking-inclusive development – survey responses indicate this is a greater concern for local government representatives than regional or state level respondents. Results also suggest some of the anticipated impacts are negative; there is general concern over local wealth capture and boom-and-bust cycles. Sixty-one percent of all survey respondents believe their workforce is not trained to work in oil and gas industry that uses hydraulic fracturing, and 47% of all respondents agreed that their area's tax structure is adequate for communities to benefit from the industry. Adding to this general concern, survey respondents indicate boom-and-bust cycle mitigation planning has not occurred; only thirty-one percent of respondents agreed that regional or county investment plans for income from development have been discussed to reduce boom-and-bust cycle issues.

Finally, results suggest there are large differences in problem perception between respondents from nascent and mature industry states and local and non-local government respondents. Differences in opinion between local and nonlocal governments were greatest with respect to perceptions of wealth capture capability, taxes and fees returning to local governments, investment planning for boom-bust cycles, regional energy planning importance, and local economy impacts. The largest differences between mature and nascent industry state respondents were local workforce training, wealth capture capability, investment planning for boom-bust cycles, the perception of workforce training levels, and regional energy planning importance.

Land Use Summary Results

Results suggest a general concern that development-related damage to the landscape dramatically offsets the economic benefits of shale development. Local government representatives and those from states with a nascent oil and gas industry agreed between 25 and 30 percent points more than their counterparts. One SME interviewee portrayed their road conditions were like “a third world country” due to development-related use. Another SME indicated they were required to upgrade local road to handle the trucks, but portrayed the issue positively because of the added work to the area.

Respondents from mature industry states are less confident than respondents from nascent industry states that financial bonds between town and oil and gas companies work as solution to damage issues. Furthermore, local government representatives and respondents from nascent industry states feel less comfortable with the current regulatory structures and processes related to well placement and operation times than their nonlocal government representative and mature industry state counterparts.

Finally, results suggest that individuals or governments entering into leases with oil and gas operators are not able to create contracts which provide the individual or government with the maximum benefit possible from development. Respondents from states with a mature industry and non-local government respondents agree more that the leaser knows how to devise a contract to yield the maximum benefits. Similarly, survey respondents are not confident that landowners surrounding the drill site are financially reimbursed for nuances related to oil and gas development.

Community Capacity Summary Results

Results suggest government representatives are concerned about development-related population growth having an impact on the local housing market. Within this issue Local government representatives agree over twice as often as non-local government representatives that local housing will be affected by population growth. Respondents from mature industry states are less concerned than respondents from states with a nascent industry.

There was broad consensus among respondents that local policing is needed to ensure road safety is preserved in light of increased truck traffic due to development. SMEs and survey respondents were also concerned that the wealth

captured from resource extraction would not be enough to cover increased demand on schools, social services, emergency personnel and other infrastructure; though this issue is less of a concern for respondents from states with a mature oil and gas industry.

Emergency Management Summary Results

Results suggest emergency responders are not being trained for development-specific hazards ahead of industry’s arrival. SME interviews, analyses of survey responses indicate regions where fracking-inclusive development is newer have less emergency management training. Results also suggest there is a disconnect in problem perception between local and non-local government representatives: Local government respondents agreed only 22% of the time compared with non-local government representatives who agreed 42% of the time that emergency responders were trained for development related hazards.

Environmental Issues Summary Results

Results suggest environmental issues such as air quality, water use and supply, and water contamination, is a concern for government representatives. Respondents from states with a nascent oil and gas industry, especially local government representatives, are more concerned than respondents from states with a mature industry and non-local government’s representatives. Survey results indicate disagreements and lack of information are hampering water protection policy development at the local level more so than at the regional or state level. Similarly, states with a nascent oil and gas are more concerned than respondents from mature industry states that a lack of information about fracking-inclusive development processes is impeding water protection policy.

Communication Summary Results

Survey responses indicate that states with nascent industries lack the communication methods necessary to develop solutions to development-related concerns such as environmental quality or public safety. Local governments, especially those from states with a nascent industry believe lack of communication is a barrier to developing policy or management solutions. Results also suggest that regardless of the states’ industry maturity, local governments communicate less, and are not as involved in hosting development-specific meetings as their regional planning organization and state representative counterparts.

Results also suggest public meetings, particularly meetings focused on fracking-inclusive development issues, are the most effective ways to understand community, industry, and government issues and extend information about fracking-inclusive development to stakeholders.

RECOMMENDATIONS FOR LOCAL AND STATE GOVERNMENTS AND REGIONAL PLANNING ORGANIZATIONS.

Our findings highlight the highly contextual nature of hydraulic fracturing and shale development across the United States. Local government representatives view problems differently than regional planning organization and state government representatives. Officials from metropolitan communities have different problems and understanding of fracking-inclusive policies and impacts than do officials from more rural areas. Therefore two broad recommendations are for state governments and regional planning organizations:

- Increase the number of fracking-inclusive development meetings that include multiple government, industry, and public representatives to understand local-level issues and for government representatives and agents to share management successes and failures.
- Actively seek out and engage local governments who have little or no experience in fracking-inclusive development in regional discussions with local government officials from municipalities and counties with development experience prior to industry's arrival.

Based on the survey and interview results a few specific areas of focus for state, regional and local collaboration and information sharing sessions should include:

- Protecting local economies from boom-bust-cycles through improved wealth capture mechanisms and ways in which to invest in community development opportunities and infrastructure that can support fracking-inclusive development and other local economies.
- Educating the public, particularly land and adjacent land-owners of well locations, on fracking-inclusive development processes.
- Educating land and mineral owners on their legal rights when entering into lease agreements with industry.

- Revisiting water use and water contamination monitoring and protection strategies and policies.
- Revisiting air quality protection strategies and policies, especially in populated areas.

FUTURE RESEARCH

This report represents an initial exploratory study of local and regional governance issues on the topic of fracking. This is important because prior work in this area has not attempted to examine distinctions between local and regional officials, nor has there been a comprehensive review across the range of the substantive public management issues addressed here. While the small sample size and nonprobability sampling process is a limitation, the report represents an important step for further systematic, broadly-based sampling to provide additional information on these policy questions.

It is important to note that many concerns, as shown in this report, are dependent on the nature of the landscape and local geology, regulatory structure, or other factors inherently specific to the jurisdiction or location where the drilling occurs. For example, an issue which has received minimal attention and is a concern for many communities is the boom-and-bust economic cycle a municipality or county may experience through the course of fracking-inclusive development. The number of potential wells and their life cycles are finite as is the revenue captured through drilling. The more efficient a corporation is at entering an area and drilling, the more drastic impacts may be realized on revenue, roads, schools, housing, social services, job training, property values, etc.; any investment by the government or community members must take into account this life cycle and possibility of economic fluctuation. However, there are multiple factors which influence how a local government may address economic lifecycle issues, such as: state and local development regulatory structures, severance or other taxes, local political context and public opinion, impacts on other local economies, local workforce employability in industry-related jobs, or the amount and recoverability of oil and gas reserves in the area. Systematic research and collaboration between organizations and institutions will improve our understanding of these complex issues and aid in the successful regulation and management of oil and gas development.

Table of Contents

Extended Report Summary	i
Full Report: Introduction	9
Fracking-Inclusive Development Issues	13
Analysis and Results	15
Discussion of Survey and Interview Results	26
References	29
Appendix 1: Rural-Urban Continuum	30
Appendix 2: Pairwise Correlations of Select Survey Results	31
Appendix 3: Overall Percent Agreement/ Disagreement of Survey Questions	32
Appendix 4: Survey	35
Appendix 5: Phone Interview Questions	40
Appendix 6: Disclaimer	42

INTRODUCTION

The oil and gas industry is experiencing a revolution. New extraction methods that employ both horizontal drilling and hydraulic fracturing (referred to as fracking-inclusive development in this report) have opened vast resources of oil and gas across the United States that were previously unreachable in tight sand and shale deposits thousands of feet below the surface. Examples in the U.S. include the Eagle Ford Shale and Barnett Shale plays in Texas, the Niobrara Shale play in Colorado, the Marcellus Shale play in New York, Pennsylvania, Ohio, and West Virginia and the Bakken Formation in North Dakota. As the oil and gas industry expands its operations into these tight sand and shale deposits, it may also move into highly populated communities inexperienced with oil and gas development. As seen in public debates and newspaper reports, citizens and the local governments of communities who have not experienced the activities associated with oil and natural gas drilling and extraction are often shocked by the impact the industry has on their day-to-day lives. As a result disputes between citizens, government, and industry have sprung across the United States.

The new techniques and/or drill site locations have moved governments, community members, and industry and environmental groups into deliberations of how, where, and when to regulate the fracking-inclusive oil and gas extraction processes. Within almost every state where oil and gas reserves have been identified in shale or tight sand deposits, there are active discussions and conflicts over issues associated with the oil and gas extraction and periphery processes. State and national level debates largely hinge on the costs and benefits of fracking-inclusive development to the environment, public health and safety, and the economy. Local debates focus more closely on public safety, land-use and local control, community impacts, as well as environmental and economic concerns. Debates in some states are contentious. In Longmont, Colorado, for example, counties and municipalities are moving against state authority (Healy, 2012); in New York state-wide bans are years old and are set until further information is available (New York DEC, 2013; New York State Assembly, 2013). Even Texas, known for its oil and gas industry, has had disputes at the local level in Dallas (Mosqueda, 2013) and a brief moratorium in Flower Mound (Kofler, 2010). Bans and moratoria are often based on a lack of information regarding the impacts that hydraulic fracturing may have on local air quality, drinking water sources, and water consumption.

Even though most jurisdictions in the United States have not moved to ban fracking-inclusive oil and gas development, they are still concerned and are working to manage and find solutions with the industry and community to mitigate the negative impacts associated with the expansion of drilling operations. The majority of the states targeted in this report have some regulatory structures in place to address fracking-inclusive development with specific policies that address environment and health concerns, but they often lack policies that manage a litany of development-related issues that dramatically affect municipalities and counties. These issues include:

- Boom-and-bust economic cycles and local wealth capture mechanisms
- Housing, social service, and public school needs for a rapidly-expanded population;
- Public safety and nuisances from increased truck traffic and drill sight operations;
- Emergency management at the drill site;
- Environmental concerns such as air quality, water use, and water contamination;
- Surface damage and reclamation from roads use, erosion, pipelines, and drill pads;
- Land use issues such as setbacks, zoning, surface rights; and
- Informing and working with the public and industry to develop mutually beneficial policy solutions or agreements.

State governments and state regulatory agencies are not deliberately ignoring these issues. Rather, these issues are often under the jurisdiction of city and county governments. As such, local governments and regional planning agencies are seeking regulatory guidance.

The purposes of this pilot study and resulting report are three-fold. First is to identify local and regional concerns and how those concerns vary across the United States. Second is to highlight topics for further research to help governments and



Energy Boomtowns & Natural Gas: Implications for Marcellus Shale Local Governments & Rural Communities

NERCRD Rural Development Paper No. 43
January 2009, 63 pp.

Prepared by Jeffrey Jacquet



© 2009

The Northeast Regional Center for Rural Development
The Pennsylvania State University

7 Armsby Building, University Park PA 16802-5602
814/863-4656(phone); 814/863-0586(fax)
nercrd@psu.edu | www.nercrd.psu.edu



Cornell University

PENNSTATE



Table of Contents:

01 Introduction & Executive Summary

04 Part One: The Boomtown Impact Model

- 05 The Boomtown Narrative
- 08 Challenges to Local Governments
- 12 Government and Community Reaction to Boomtown Growth
- 13 Economic Impacts
- 19 Social Impacts
- 23 Criticisms of the model
- 24 The Bust

25 Part Two: The Case Study of Sublette County Wyoming

- 27 Historical and Cultural Context
- 29 Employment and Demographic Impacts
- 34 Impacts to Economic Activity
- 40 Impacts to Local Governments
- 42 Social Impacts
- 44 Fit to the Boomtown Model

46 Part Three: Implications for the Marcellus Shale:

- 46 The Recent Demand for Natural Gas Drilling
- 49 Applicability of Marcellus Shale Development to the Boomtown Model
- 54 Implications for Local Government and Communities

57 Bibliography

Table of Figures:

- 06 Figure 1: Gillette, Wyoming entrance sign, circa 1975.
- 07 Figure 2: Gilmore's Problem Triangle
- 09 Figure 3: Gilmore and Duff's (1974) population projections for Sweetwater County, Wyoming
- 16 Figure 4: Cover of a 1981 Police Magazine
- 26 Figure 5: A Map of The Sublette County Area of Wyoming that depicts the two major gas fields
along with the towns of Big Piney, Marbleton and Pinedale. From BLM 2008, p. 1-5
- 28 Figure 6: Monthly Drilling Activity in Sublette County, by Field January 2000 to January 2008
- 29 Figure 7: An estimate of the Workforce Requirements throughout the process of drilling a well
in Sublette County. From Jacquet 2006, p. 7
- 30 Figure 8: Monthly Sublette County Employment Among Residents 01/90 to 07/07
- 30 Figure 9: Monthly Sublette County Unemployment Rate 01/90 to 02/07
- 31 Figure 10: Change in Age and Sex Distribution among Sublette County Residents 2000-2007
- 32 Figure 11: Workers lay pipelines among drilling rigs in Sublette County, WY. Circa Summer 2006
- 33 Figure 12: Sublette County Population 2000-2007
- 33 Figure 13: Average Wage by Industry in Sublette County 2001-2007
- 34 Figure 14: Total Taxable Sales by Industry in Sublette County 2005-2008
- 36 Figure 15: New Housing Units in Sublette County, Wyoming 2000-2008
- 36 Figure 16: Average Sales Price of Residential Homes, by Sublette County Location 2000-2008
- 37 Figure 17: Direct Oil and Gas Revenue for Sublette County and Towns 2001-2006
- 38 Figure 18: Scatter Plot of Monthly Sublette County EMS Runs and Drilling Rigs in Sublette
County 2001-2007
- 39 Figure 19: Trends in Correlation between Drilling Rigs and EMS runs in Sublette County
- 39 Figure 20: Average Daily Traffic Marbleton, WY. Town Limits 2000-2006
- 47 Figure 21: A Map Depicting the location of the Marcellus Shale Formation.
- 48 Figure 22: Monthly U.S. National Gas Price and Drilling Rig Count
- 51 Figure 23: A map of the Marcellus Shale in New York State and recent wells.

Introduction & Executive Summary

The Marcellus Shale Natural Gas Reserve located in the Northern Appalachia region of the Northeast United States holds a great potential for wide-scale natural gas development. As of 2009, development of the Marcellus Shale is in preliminary stages; however, the social and economic implications of large-scale development on the region's patchwork of rural communities and small towns are currently being considered by state and local officials, researchers, and citizens in the region.

Energy Boomtowns

The impacts of energy extraction on small towns were extensively studied during the 1970s and 1980s, when rural areas of the western United States underwent a period of significant energy development. While more than 25 years old, these studies represent the most recent wide-scale analysis on the effects of energy development in the United States. A number of social and economic trends emerged from this work and a so-called "*Boomtown Impact Model*" took shape among researchers studying the development in these rural communities. The model posits that rural communities are often overwhelmed by rapid population influxes associated with the energy development and that energy development often provides a number of unique opportunities and challenges to communities and local governments.

Local governments are often caught unprepared by the waves of new growth and are at a dis-

advantage to mitigate potential growth problems. Some of these disadvantages include a lack of information, growth volatility, lack of jurisdiction, conflict between long-term residents and new residents, resistance to new government policy or planning strategies, shortage of staff or expertise, and a lack of or lag in sufficient revenue. Boomtown research has shown that *economic impacts* can be mixed, as some sectors or communities will benefit much more than others. Businesses or residents not directly tied to the energy industry may have to deal with inflationary or employment pressures while not seeing gains in revenue. Job growth can be stratified, as while new jobs will be created, not all workers will be suited for or interested in these jobs. Expectations for economic benefits are often unrealistically high, and while economic and job growth does occur, these expectations are not met. A significant body of literature shows that boomtowns can harbor disproportionate increases in social problems such as crime, mental health problems, community dissatisfaction, education shortfalls, and other indicators. Research shows that certain groups of people will have different social reactions to rapid growth, depending on their stature in the community and whether they were residents before the growth occurred.

Natural Gas

In addition to this prior boomtown research, Natural Gas developments that are similar in scope to the Marcellus Shale are currently underway in the western United States in places such as Wyoming, Colorado, and Texas. Evidence from the case study of Sublette County, Wyoming is presented here that shows natural gas drilling today can produce many of the same effects as are outlined in the boomtown model, at least provided that the impacted community is sufficiently small. The natural gas drilling process requires substantial populations of transient workforces as well as resident workforces that put strains on housing and government services. Inflation and other cost of living pressures in Sublette County appear similar to pressures described in the classic boomtown model, as is the realization of significant gains in job and economic growth for those persons able to participate in sectors related to the energy industry.

The Marcellus Shale

The Marcellus Shale region undoubtedly differs in many critical respects from the community experiences that form the Boomtown Model, as well as contemporary examples, especially in the areas of population size and distribution, transportation, history, and sheer size of the potential resource. However, there are also a large number of key similarities as the equipment, workforces, organization, and process used in the extraction of the natural gas remain nearly identical across the industry, and many communities in the Marcellus Shale region are sufficiently small and rural in that nearby large scale development would likely produce a number of similar effects as have been documented in other areas. It is most likely that the Marcellus Shale development will produce different effects on different areas, with community size and isolation as key factors that determine the effects. The Boomtown model and these examples can provide useful information when trying to assess and prepare for the positive and negative social and economic impacts that will likely be faced by communities in the Marcellus Shale region.

The histories suggest that Marcellus Shale communities need to take the current opportunity to form task forces to organize information and oversight structures in their communities. Such task forces can help to define providers of services, jurisdictions, and authorities among local governments and service providers while creating relationships with private sectors and energy companies. Communities need to define the historical patterns of service demand and identify capacities for growth, and then prepare mitigation strategies for when these thresholds are crossed. Perhaps most importantly, communities should prepare for the volatile nature of energy development and design long-term strategies that produce both short term mitigations and long term investments in their communities.

It is the goal of this paper to provide information that will assist officials, researchers, and citizens engaged in Marcellus Shale to better analyze and prepare for both the positive and negative impacts facing their communities. This paper is organized into three areas, (1) a compendium of summaries and prominent research on the Boomtown Impact Model, (2) a comprehensive overview of the contemporary example of natural gas drilling in the area of Sublette County, Wyoming, and (3) a discussion on the similarities and contrasts to, and some of the implications for, the Marcellus Shale region.