

TITUSVILLE, PA

UTICA SHALE STRATEGIC PLAN

SEPTEMBER 2014



CMK Planning, LLC

COME BACK TO WHERE IT ALL STARTED

We have been drilling here since 1859 – We get it!





Come Back to Where It All Started...

This Titusville Utica Shale Strategic Plan was funded through a grant from the Pennsylvania Department of Community and Economic Development (DCED) through the "Discovered in PA, Developed in PA" (D2PA) Program.

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Completed: July 2014





Come Back to Where It All Started...

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Come Back to Where It All Started...

Chapter 1

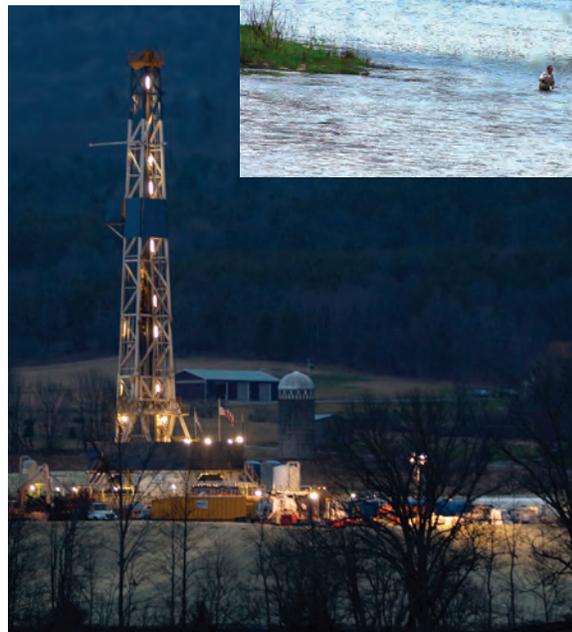
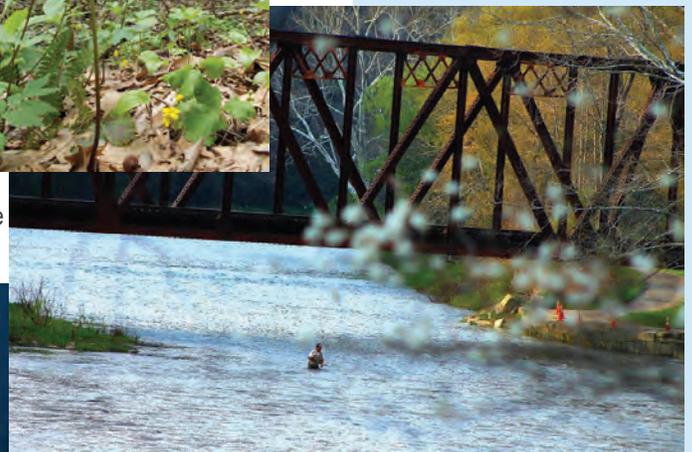
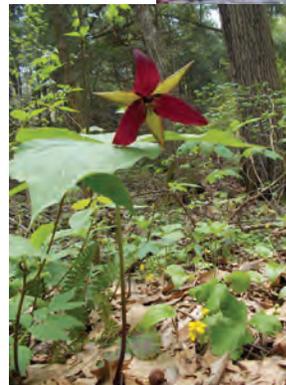
EXECUTIVE SUMMARY

This planning process researched, analyzed and compiled an enormous amount of data, and recognizes that new information on the oil and gas industry is being published daily—just Google Utica or Marcellus Shale or other key industry words and the data will be overwhelming. This process also included an extensive number of interviews with officials in Pennsylvania who are already experiencing oil and gas drilling to learn from their experiences, so that the Titusville Study Area can repeat the good experiences, deflect the bad ones, and take a proactive approach to preparing for this second energy boom.

The planning process also involved interviews or meetings with representatives from oil and gas companies, experts in the field, key stakeholders in the Titusville Study Area, and others to collect relevant data on the impacts of the industry. It was very difficult to synthesize all of this information into a brief and meaningful report. References are provided frequently throughout the report for more detailed research on specific subjects. [Appendix C](#) summarizes the references utilized.

The purpose of this Strategic Plan is to help the Titusville Study Area prepare to welcome the oil and gas industry back into the region where it all started centuries ago, to spur economic development, create jobs, revitalize this area of Pennsylvania, preserve the environment, and to make it all a very positive experience for everyone. The Strategic Plan identifies and prescribes some Best Practices to preserve and enhance the local environment and other quality of life assets that are cherished by all residents of the Study Area.

The history of this area demonstrates that the oil and gas industry can be a major economic boom for employment, entrepreneurship, ancillary businesses, income levels, education and training opportunities, and existing businesses. It can produce an economy that keeps our children and grandchildren in the area. With the knowledge this area already has, experiences of other areas experiencing unconventional drilling, and the technological advances available today, the Titusville Study Area can help create the second great oil and gas economy!!





Come Back to Where It All Started...

Implementation

Although this report was prepared for the City of Titusville and the Titusville Redevelopment Authority, these two entities cannot implement all of the recommendations without assistance from local, county, regional, and state partners, as well as stakeholders in the private sector. Many of the recommendations require local municipalities to work either alone or through county or regional organizations to accomplish tasks critical to prepare for oil and gas industry.

Discussions were held as part of this process with representatives from the Northwest Commission. The Northwest Commission, as the regional coordinating entity for the Commonwealth's Partnership for Regional Economic Performance (PREP) program, is able to serve as a "clearinghouse" between each of the region's counties and the assortment of economic, community, and workforce development stakeholders that are part of the northwestern PREP network. By utilizing all or parts of the PREP network through its coordinating apparatus, the action steps to be taken can be done with greater efficiency and engagement by those organizations most immediately affected. Counties in the Titusville Study Area (Crawford, Warren and Venango) also have some responsibilities to facilitate the work in the various municipalities within the Study Area. And of course, the City of Titusville, as well as the other municipalities within the Study Area, has some responsibilities to prepare for the oil and gas industry, as do municipalities in all of northwestern Pennsylvania.



It is understood that major activity with the oil and gas industry is likely two to three years in the future, although that is dependent on a number of variables, over which the Study Area has little impact. This window of time provides the perfect opportunity for the Study Area to begin the process of preparing for the industry to arrive by undertaking needed studies, updating plans and codes, compiling baseline data, educating property owners and the public, and preparing guidelines to assist municipalities and property owners with working with oil and gas companies.

The following recommendations are made as a summary of Best Practices resulting from the research conducted over the past six months.

Collect and document baseline data and keep it current

Baseline data should be collected and documented for the Titusville area, and also for all municipalities in northwestern Pennsylvania:

BASELINE DATA

- **Water quality** – at surface water and drinking water wells (municipalities, DEP, property owners, watershed groups)
- **Roadways** – conditions and monetary values for repair (municipalities, counties, PennDOT)
- **Traffic counts** (municipalities, counties, PennDOT)
- **Existing housing** – supply, conditions, prices (municipalities, housing authorities)
- **Agricultural areas** – (Farm Bureau, municipalities, Penn State Extension)
- **Tourism assets** – (Crawford County CVB, national agencies, State, counties)
- **Environmentally-sensitive areas** – floodplains, wetlands, habitats, forests, steep slopes, view sheds, groundwater recharge areas and wellhead protection zones, riparian corridors (environmental groups, watershed groups, municipalities, counties, State)
- **Available sites and buildings inventory** – industrial sites, brownfields, warehouses, housing complexes, potential rail sidings (TRA, economic development agencies, counties, region, state, realtors)
- **Air quality** – (DEP, municipalities, counties)
- **Existing workforce training programs** – (Workforce Investment Boards, economic development agencies)
- **Undocumented wells** – abandoned, orphan, unplugged – (DEP, counties, municipalities)





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The Northwest Commission and the PREP network can facilitate the collection and maintenance of data on two fronts. The Northwest Commission can provide direct outreach to the county planning agencies in the region, as well as state-level organizations such as DCNR, DEP, and PennDOT, to bring stakeholders together for the purpose of coordinating and collecting environmental and infrastructure information.

The PREP network, working in conjunction with the TCDA, can bring together economic and workforce development stakeholders to compile information germane to economic, community, and workforce development while also seeking additional funding for more comprehensive regional efforts. The Titusville Redevelopment Authority, working with a variety of economic development partners, should facilitate the collection of this data for the Study Area.

Update or Create Appropriate Community-Wide Plans

Current comprehensive plans are needed to establish baseline conditions, anticipate future development, and develop strategies to implement identified projects or initiatives. The following plans should be addressed:

BASELINE CONDITIONS

- **Comprehensive/Land Use/Master Plans for municipalities** – these should be updated if not current or developed if not available. Existing plans may need to be consolidated into a comprehensive plan. (City of Titusville, counties, municipalities)
- **Wellhead protection plans** – (municipalities with water systems)
- **Stormwater Management Plans** (municipalities and counties)
- **Corridor plans** – (municipalities and counties)
- **Transportation** – plans including truck routes, railroads, bridges (municipalities, PennDOT)
- **PHARE Plans** – Pennsylvania Housing Affordability and Rehabilitation Enhancement Program (Pennsylvania Housing Finance Agency, municipalities, housing authorities)
- **Emergency Services Plans** – (Municipal and county EMS, gas companies)
- **911 Plan** – (counties)
- **Capital Improvements Plan** – (municipalities)
- **GIS System** – (counties, municipalities)

The PREP network's lead economic development agencies for each county can work together to develop a plan for a common approach in coordinating, collecting, and disseminating the information needed to update or create appropriate community-wide plans across the region in conjunction with county planning and appropriate governmental stakeholders. By introducing a level of commonality in the collection and dissemination of vital community information across a wide area, future updates and changes can be done with greater efficiency and with better coordination between jurisdictions when applicable.

The City of Titusville should consolidate its existing plans into a new Comprehensive Plan for the City, and should prepare a current Capital Improvements Plan. A PHARE plan for the City should also be undertaken, with the Housing Authority taking the lead.





Come Back to Where It All Started...

Update Codes and Ordinances

Current zoning codes, subdivision regulations (SALDOs), and other development regulations should be reviewed and updated as needed to properly address the needs of the oil and gas industry. Codes should be easy to read and interpret, readily available (preferably on-line), and user-friendly.

- *Zoning codes (municipalities and counties)*
 - *New zoning districts to protect or enhance natural assets (municipalities and counties)*
 - *Specifications for setbacks, buffers, landscaping, noise abatement, and other measures desired of industries (municipalities and counties)*
 - *Current and updated zoning maps (municipalities and counties)*
- *SALDOs (municipalities and counties)*
- *Site plan review (municipalities and counties)*
- *Historic preservation districts or other special district designations (municipalities and counties)*

The Northwest Commission, through its regional planning role, can facilitate a discussion with the region's planning stakeholders to encourage counties and municipalities in the region to update or create the needed codes and regulations to achieve their respective visions for their communities.

The City of Titusville should review its zoning code and SALDO to assure that they contain adequate provisions to accommodate the oil and gas industry while protecting natural assets and residents.

Prepare Guideline Documents

Counties referenced in this study that are already experiencing drilling have prepared sample documents for their municipalities to use with oil and gas companies and property owners. Other counties should begin to prepare similar documents. Rather than recreating new documents, municipalities should review those that already exist and adapt them to meet their specific needs. Some examples include:

DOCUMENT REVIEW

- *Road Use Bonding/Maintenance Agreement*
- *Natural Gas Leasing*
- *EMS Training Manuals*
- *Natural Gas Seismic Considerations*
- *Fleet Applications for CNG*
- *Predrilling Testing and Monitoring of Surface and Ground Water*
- *Well and Equipment Setbacks for Protected Uses and ROWs*
- *Site Management and Remediation*

The Northwest Commission, working with the region's planning stakeholders, can begin the process of coordinating the collection and dissemination of this information. Additionally, the PREP network can be utilized through county and local economic development organizations to further spread the information to maximize outreach.

The TCDA should work with the City of Titusville and other municipalities in the Study Area to adopt guidelines for the Titusville area.





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Undertake Specific Studies or Initiatives

Specific initiatives are needed to prepare for the oil and gas industry and they should be started soon. They include:

Identification of potential locations for rail sidings and transload facilities. The TRA has some space available along the OC&T Lines property. Space studies should be completed and preliminary designs prepared, so that funding can be sought on short notice. Other potential sites in the northwestern Pennsylvania area should also be identified (Northwest Commission, TRA and counties)

Identification of truck routes. Working with the School District, counties and PennDOT, the TCDA and municipalities should identify the best routes for truck traffic that will minimize conflicts with school busses and other local traffic. The Northwest Commission should initiate these discussions in other areas of their region. (TCDA, Titusville Area School District, Northwest Commission, other school districts, municipalities, PennDOT, counties)

Identification of pipeline locations. Working with the larger oil and gas companies, the TCDA and regional economic development partners should identify general locations for future pipelines, then bring in the municipalities to refine those locations. (TCDA, economic development partners, counties, Northwest Commission, municipalities, gas companies)

Construction of CNG Fueling Stations. The TCDA should continue working with CNG station providers to identify and construct at least two CNG stations in the Titusville Study Area. The Northwest Commission and the NWPA Incubator Association should expand that effort into the northwestern Pennsylvania region in coordination with the PREP network. These organizations can also facilitate discussions with fleet vehicle operations to switch to CNG to further spur and support CNG station development. (TCDA, CNG station providers, Northwest Commission, PREP)

Rural Gasification. The Northwest Commission should facilitate meetings with the necessary parties, including legislators and utility providers, to begin the discussion of providing a rural gasification program so that property owners and residents benefit directly from the oil and gas that is being drilled in this area. In addition, all parties should facilitate discussions regarding expanding the commercialization of natural gas beyond CNG stations--to chemical industries, plastics companies, CNG powered equipment for manufacturing, etc. (Northwest Commission, economic development partners, utility providers, legislators)

Expansion of Lodging facilities and housing supply. The TCDA should continue to work with interested developers to construct new lodging facilities, as well as new residential subdivisions, in the Titusville Study Area. Rehabilitation programs and conversion of vacant buildings into housing should also be investigated. The Titusville Housing Authority should address potential impacts on housing for low- and moderate-income households and identify strategies to assure that adequate housing is provided. The Northwest Commission should facilitate or encourage these types of initiatives in the greater region. (TCDA, private developers, Housing Authorities, Northwest Commission)

Work with Labor Unions. Labor unions in Pennsylvania are aware of and supportive of the oil and gas industry. Local unions should be contacted and meetings facilitated to assure that local union members are properly trained for oil and gas jobs. This initiative should then be extended to the region. (TCDA, labor unions, workforce training providers, Northwest Commission)

Enhance workforce training programs and facilities. This critical initiative is underway in many ways in the Titusville Study Area. Efforts should continue with all workforce partners to strengthen the Workforce Investment Board, identify and enhance existing workforce training programs, add supplemental workforce training programs as needed, continue to coordinate with the Titusville Area School District to encourage oil and gas careers and programs, continue to work with the University of Pittsburgh—Titusville and Bradford--regarding oil and gas programs, and continue to involve statewide and regional workforce training and entrepreneurial development programs. Also, continue to work with local VoTech schools in the area, many of which have added oil and gas programs to their curricula. (TCDA, Titusville Area School District, WIB, University of Pittsburgh, workforce training providers, VoTech schools)





Come Back to Where It All Started...

Hire Local campaign. To best benefit the residents of the area, oil and gas companies should be encouraged to hire local people. For this to happen, local workers must be properly trained, not only in the oil and gas industry, but also in work ethics, occupational health and wellness, how to advance in a career, and other soft items associated with being employable. As this is accomplished in the local workforce, a Hire Local campaign should be initiated. (TRA, workforce training providers, Titusville Area School District, oil and gas companies)

Identify and pursue ancillary businesses. The TRA should continue to identify and recruit oil and gas ancillary and support services to the Titusville area, to existing office space in the Towne Square building and to existing buildings in Titusville Opportunity Park, as well as to the other available vacant facilities within the Titusville Study Area. The TRA should continue to provide building owner information to interested parties. (TRA, building owners)

Enhance the environment. Encourage existing environmental groups to identify proactive initiatives and strategies to protect key environmentally-sensitive areas, air and water quality, working with the oil and gas companies to achieve positive and reasonable results. (Environmental groups, Muni's, Counties)

Identify and plug undocumented wells. Working with DEP, counties should attempt to identify undocumented wells in the Study Area, providing incentives if possible for property owners to come forward with information, and begin a program to plug those wells. This information should be readily available to the oil and gas industry. (counties, DEP, property owners)

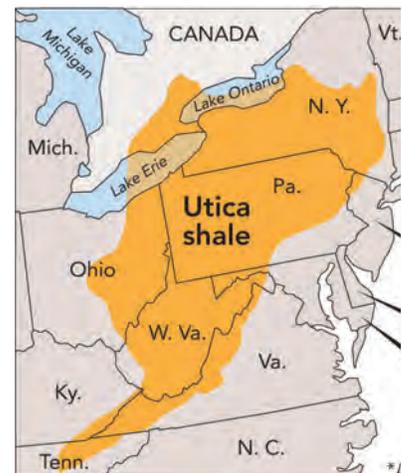
Maintain and continue to enhance public education and awareness programs. The public must be provided with correct facts. The TRA has undertaken many initiatives to inform the public about the potential oil and gas industry in the area, and should continue to do so. Posting information on websites, educational sessions, media stories—all should continue along with any new initiatives to keep the public aware of what is happening. A clearinghouse for oil and gas related information should be identified locally, the TRA, and regionally. (TRA, Northwest Commission)

Maintain and enhance medical services. The Titusville Area Hospital is actively involved with the TRA regarding the potential oil and gas industry. The TRA should continue to work with the hospital and other health care providers in the Study Area to identify the needed resources to expand the existing Emergency Room services at the hospital, and to assure that primary care physicians and health services are readily available in the community. (TRA, Titusville Area Hospital, health care providers)

The following chapters in this Strategic Plan explore each of these areas in greater detail.

Conclusion

This planning effort is the first of its kind in Pennsylvania. For the first time, we have had the opportunity to learn from the success and challenges that others have faced, and to plan for potential oil and gas development in the Study Area and in northwestern Pennsylvania. While it is anticipated that Utica gas development could change the economic future of the Study Area for the better, vigilance and preparedness are needed to assure that potential problems are pro-actively avoided. Yes, we aspire for two outstanding outcomes—economic growth and success with jobs for our residents, and the simultaneous improvement in our quality of life. We want to be the outstanding example to other areas of how to approach the opportunity of natural gas development, achieve the successes, and manage the challenges. This **Titusville Utica Shale Strategic Plan** is just the start.





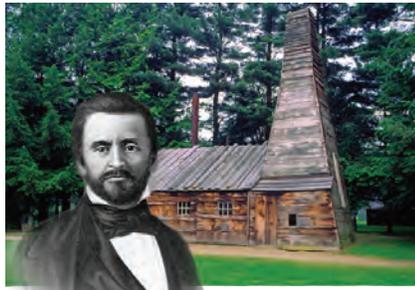
Come Back to Where It All Started...

Chapter 2

INTRODUCTION

The tag line **“Come Back to Where It All Started”** has special significance for this planning process. A little history...

In 1796, Jonathan Titus of the Holland Land Company surveyed the land that eventually became Titusville. Lumber became the primary industry in the early 1800s, with at least 17 sawmills operating in the area. Titusville was a slow-growing community until the 1850s, when petroleum was discovered. Oil was known to exist here, but there was no practical way to extract it. It was mainly used for medicinal purposes for both animals and humans.



In the late 1850s, Seneca Oil Company (formerly the Pennsylvania Rock Oil Company) sent Edwin Drake to Titusville to start drilling on leased land south of Titusville, near what is now Oil Creek State Park. Drake hired a salt well driller, William A. Smith, to start drilling. After many difficulties, they struck oil in 1859, launching the modern oil industry in the Oil Creek Valley, and changing the world forever.

The impact was immediate. The industry grew as transportation was needed to get the oil to market, resulting in the construction of a railroad called the Oil Creek & Titusville Lines in 1865. Oil-related businesses exploded with eight refineries built between 1862 and 1868. Several iron works were built to manufacture drilling tools, and Titusville grew from 250 residents to around 10,000 almost overnight. Pipelines were laid from the oil fields directly to the rail lines in 1865 (ending the era of local horse-drawn transport).

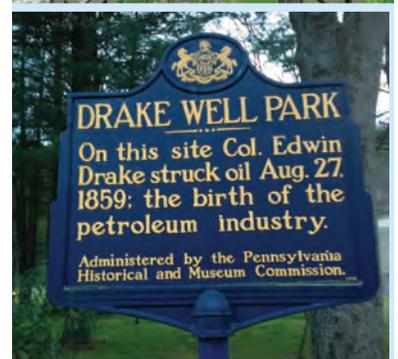
People poured into the area to buy oil leases and to work in oil-related businesses. Churches, schools, mansions, commercial buildings, and the first opera house were built, and banks were chartered. European factories began importing cheap American oil during the 1860s, and by 1866, petroleum jumped to the second most valuable US export. In the mid-1870s, the oil industry was well established. Over ten million barrels of crude oil were being produced in 1873, and at the peak of the oil boom, Pennsylvania wells were producing one third of the world’s oil. In 1881, the world’s first oil exchange was established in Titusville.

Larger producers, such as John D. Rockefeller’s Standard Oil, began to consolidate their holdings over wells and refineries, and the oil rush began to settle down. Oil production in Pennsylvania peaked in 1891, when the State produced 31 million barrels of oil, 58% of the nation’s oil that year. Ohio surpassed Pennsylvania as an oil producer in 1895, and by 1907, the decline of the Pennsylvania fields and the discoveries of oil in Texas, California, and Oklahoma left Pennsylvania with less than ten percent of the nation’s oil production. By 1901, the Pennsylvania oil boom was over.



Today, the Titusville area sits in the middle of another potential oil and gas boom-- the **Utica Shale** play-- and the community invites the oil industry to

“Come Back to Where it all Started. We’ve been drilling here since 1859— We Get It!!”





Come Back to Where It All Started...

Getting Started

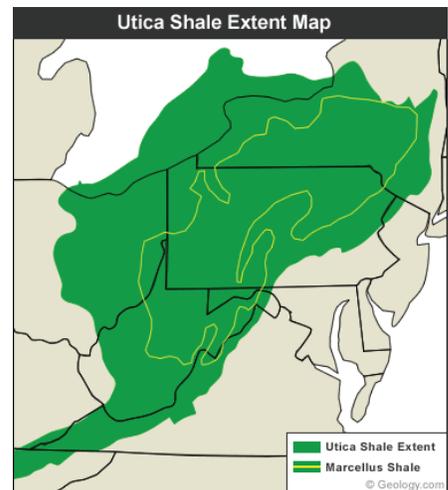
The Titusville Redevelopment Authority (TRA) entered into an agreement with CMK Planning, LLC on January 17, 2014 to prepare a Titusville Area Utica Shale Strategic Plan. A grant from the Pennsylvania Department of Community and Economic Development (DCED) through the “Discovered in PA, Developed in PA” (D2PA) Program was used to fund this study, the purpose of which was to prepare for the diverse changes to the Titusville area that could likely occur as a result of the exploration and production of the shale gas formations in this region.



Titusville is strategically located in the center of the Utica Shale formation (see **Map A**), and professionals in economic development and the shale gas industry believe that it is just a matter of time before gas-related companies flock into Titusville (again!) to begin exploring and drilling for gas and oil. To best prepare for that happening, this planning process was authorized to:

Processes Authorized

- *Identify potential impacts and verify them as factual*
- *Develop opportunities and strategies to address the identified impacts*
- *Communicate with and educate the public about the oil and gas industry*
- *Address ways to strengthen the industrial base of the area and create new jobs*
- *Develop key vacant or underutilized sites and buildings*
- *Create strong community relationships with operators*
- *Address lodging, housing, and retail/service needs*
- *Explore intermodal transportation opportunities and needs*
- *Explore workforce development and education issues*
- *Assure that community assets (environment, infrastructure, life styles, and quality of life) are protected*
- *Develop a “Best Practices” Manual to appropriately react to energy development*



Map A



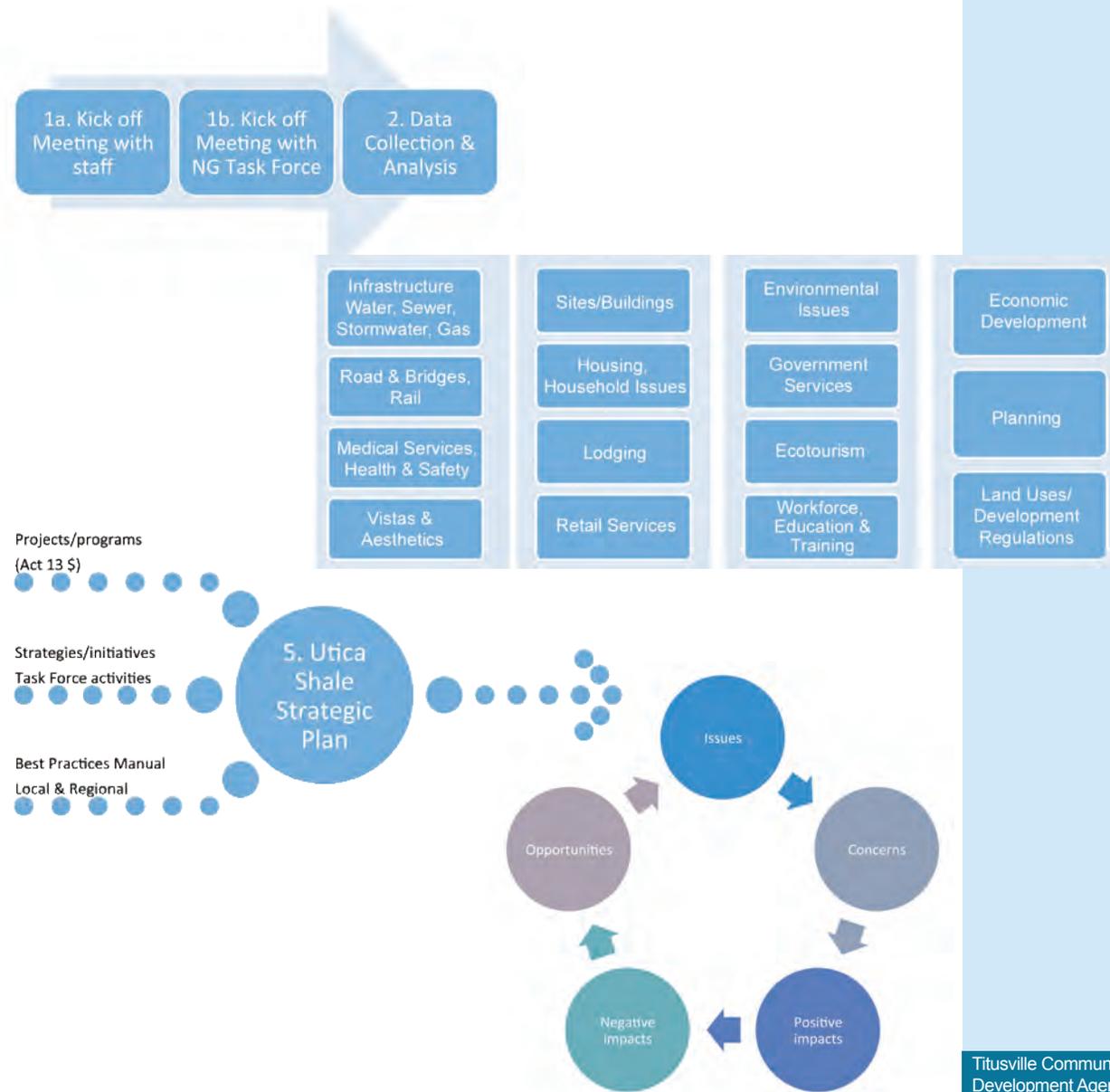
Come Back to Where It All Started...

As part of this planning process, the knowledge and experiences of communities, counties, and industry professionals currently involved in oil and gas exploration and production throughout Pennsylvania would be sought and incorporated. The intent was to benefit from what these entities have learned over the past decade, and adapt their successful best practices to specific conditions in the Titusville area.

CMK Planning, LLC utilized the services of Wunz Associates, LLC, for professional expertise related to the oil and gas industry and Pennsylvania regulations, specifically as they relate to environmental issues. The Titusville Community Development Agencies (TCDA) utilized their existing Titusville Professionals Shale Team as the Steering Committee to help guide the path of this planning effort, and to review progress, draft reports, and the final plan.

The Planning Process

The following planning process was utilized for this study, which lasted about seven months.





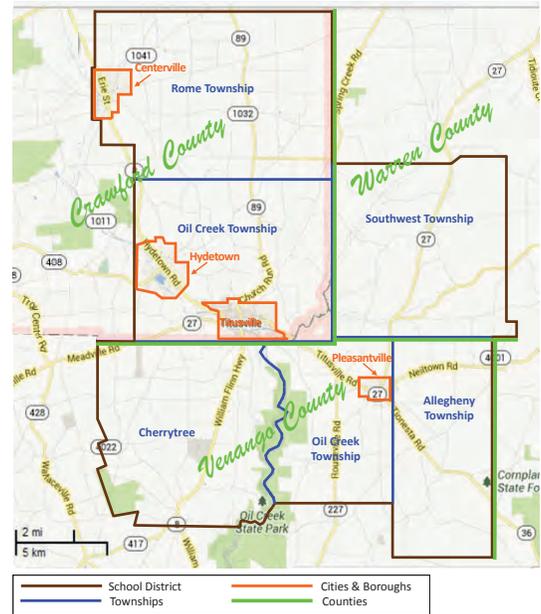
Come Back to Where It All Started...

Step 1: Kick-Off Meeting

An initial meeting was held with TCDA staff on January 17, 2014 to discuss the process, expected goals and outcomes, a timetable, stakeholder interviews, public meetings, media protocol, and other organizational items. It was decided that the study area would encompass the entire Titusville Area School District, which includes the City of Titusville, the Boroughs of Hydetown and Centerville, and the Townships of Rome and Oil Creek in Crawford County; the Borough of Pleasantville, and Cherrytree, Oil Creek and Allegheny Townships in Venango County; and Southwest Township in Warren County. (See **Map B.**)

An initial set of issues was developed, including the issues listed in the Request for Proposals, to use as a starting point for research. TCDA staff identified potential municipalities and contacts that should be interviewed to gain an understanding of their experiences and history with the oil and gas industry.

On March 5, 2014 a meeting was held with the Titusville Professionals Shale Team. The study was introduced to Shale Team members and they were encouraged to take the survey, which is discussed in Chapter 3.



Map B



Step 2: Data Collection and Analysis

Data collection began as soon as the consultant process was completed. Internet research was instrumental for collecting data on the municipalities and counties that are experiencing oil and gas exploration and production, industry statistics and issues, potential impacts, local regulations and existing plans, existing support services, educational and medical services, workforce programs and providers, oil and gas impact studies, housing supply and conditions, and just about anything else related to the and gas industry.





Come Back to Where It All Started...

Specific data were collected and analyzed related to:

- Area demographics
- Job market and economic conditions of the region
- Municipal infrastructure systems (water, wastewater, roadway, bridges)
- Municipal services (police, fire, EMS, parks, recreation)
- Zoning, SALDO, floodplain and other development regulations
- Vacant and underutilized buildings and sites
- Ecotourism and tourism activities and venues
- Environmentally sensitive areas and key vistas
- Support services such as housing, lodging, retail, restaurants, education, and health care
- Existing and future land uses

Interviews or phone calls were held with numerous county and municipal representatives, industry representatives, gas and oil associations, and various agencies exploring related areas of interest. This information is discussed in more detail in Chapter 3.

At the same time, a SWOT Analysis –an analysis of Strengths, Weaknesses, Opportunities and Threats (SWOT) within the Titusville area as they relate to the potential oil and gas industry - was completed.

Strengths	Weaknesses	Opportunities	Threats
ED Organizations	Gas infrastructure	County GIS system	Uncertainty re: NG
Partners—MSC, PIOGA	City Plan—update	'06 ICA	No regional effort
City Council—ready	Zoning—update	Past oil history	Retraining needed
Financing programs	Decreasing incomes	Current planning	Varying regulations
Oil History	Spending leakage	Cracker plant	Stealing workers
U Pitt-Titusville	No baseline data	Downtown Revit.	24/7 gas hours
Oil Heritage Region	No housing study	This building	Dev. Constraints
Hospital	Hsg. rehab needed	Opportunity Park	Regs -- address NG
'06 ICA w/3 muni's		Existing sites/bldgs.	U-Pitt's future
County Plan		Newfound wealth	Lease issues
Parks & Trails		Trail Town Plan	
Tourist Attractions		WWTP upgrades	

It became quite evident that the oil and gas industry of today is full of terms and acronyms that are not common to the average citizen. To assure that readers of this Strategic Plan understand the verbiage used, several Appendices of helpful documents are attached, including a list of all the resources that were referenced as part of this planning process. These Appendices include:

[Appendix A—Shale Gas Glossary](#)

[Appendix B—Acronyms and Abbreviations](#)

[Appendix C—Resources Referenced](#)





Come Back to Where It All Started...

Step 3: Stakeholder Interviews

Based on the information collected to date, a survey form was compiled to reflect key issues of concern and areas of potential impact. The Shale Team was asked to complete this survey on line. A copy of the survey is contained in [Appendix D](#) and the results are included in [Appendix E](#).

All of these efforts helped formulate an extensive list of potential impacts, issues, and opportunities, which were organized into the following categories.



A public session was held on May 14, 2014 to present preliminary information to the public and to seek input on issues and concerns that they may have. Members of the media were there to record and present to information to the non-attending public through TV and newspaper.

Step 4: Draft Strategic Plan

At this stage in the process, CMK Planning began drafting a summary of all the data collected to date into a format for review by the TCDA, the Shale Team, the City, and the public. The draft was placed on the TCDA's website for review.

A second public session was held on July 17th 2014 to discuss the recommendations of the draft plan and to address any comments or concerns from residents and businesses. Appropriate comments were incorporated into the draft Strategic Plan and final edits were made, prior to presentation to the TCDA and City for additional review.

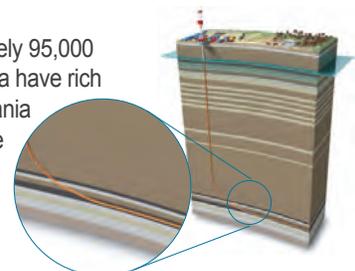
Media contacts were made aware of the availability of the draft Plan and were asked to let the public know that they could go to the website to review it.

Step 5: Final Titusville Utica Shale Strategic Plan

Once TCDA staff members were comfortable with the draft Plan as amended, and felt that the public had adequate time for review, the Plan was provided to the City and Titusville Redevelopment Authority Board for final review and approval. Presentations were made to both of these entities prior to their approval, and the Plan has been placed on the City of Titusville and the Redevelopment Authority websites.

Unconventional Drilling—What it Means

Marcellus Shale came into play in 2005 in the eastern United States. Approximately 95,000 square miles of upstate New York, Pennsylvania, West Virginia, Ohio, and Virginia have rich deposits of shale gas in the Marcellus and Utica plays. Almost 70% of Pennsylvania and much of West Virginia are the key locations for shale gas plays. These shale gas plays alone could yield as much as 489 trillion cubic feet of natural gas using horizontal drilling and hydraulic fracturing.





Come Back to Where It All Started...

The first horizontal (unconventional) well was drilled in 1929 and it became standard practice in the 1980s. Horizontal drilling reduces the number of drilling pads needed since gas can be extracted from areas that would otherwise be unfeasible. Hydraulic fracking uses water with proppants (commonly sand) and fluids to inject into a well under high pressure to open fractures and initiate new fractures. The fluids used are governed by the geologic characteristics of the site and the chemical characteristics of the water.

Since 2005, over 12,000 well permits have been granted in Pennsylvania. As of 2013, 6,489 unconventional wells were drilled and about 3,500 are already producing gas. The State received \$224.5 million in impact fees for CY 2013 and a total of \$630 million in the past three years from natural gas companies. In addition, the State has received \$2.1 billion in unconventional well tax revenues since 2008 and \$1 billion in transportation fees and improvement projects, as well as royalty payments.

Methane gas migration may result from geological disturbances during the fracking procedure. Gas may migrate through or around the cement sheath around the well or stray gas may escape outside the wellbore. There are many solutions to prevent these situations from happening and the industry, with safety as its highest priority, utilizes a variety of alternatives to prevent methane gas migration, as well as other potential accidents.



The shale gas industry can substantially impact a municipality in a number of ways. For example, the City of Williamsport in Lycoming County has experienced a substantial amount of natural gas exploration and production in the past decade. In 2011, *CQ Press* identified Williamsport as the 7th fastest growing city in the United States. Located just south of the most

Highly-productive dry gas region, Williamsport had a 7.8% growth rate that year--the highest growth rate in Pennsylvania. At about the same time, it was ranked in the "Top 200 Towns for Outdoorsmen" by *Outdoor Living Magazine*.

The balance of this study will explore the potential impacts of the natural gas industry on the Titusville area, based primarily on the experiences of other counties in Pennsylvania and current research, and how the area might best prepare itself for this second oil boom.





Come Back to Where It All Started...

Chapter 3

EXISTING CONDITIONS

History

There are numerous books and articles written about the history and development of Titusville and the oil boom. Wikipedia, in one article alone, identifies 15 references that discuss the growth and development of Titusville¹. The key element common to all of these resources is the historical importance of the oil industry to the Titusville area. It is very likely that, because of this rich oil legacy, the Titusville area is more amenable to the rebirth of oil and gas exploration and development than many other communities might be. The residents of the Oil Creek region “get it” –because they have lived it, either directly or through their parents and/or grandparents.



WIKIPEDIA
The Free Encyclopedia

Monuments to the past oil industry are everywhere—from the Drake Well and Museum, to the Oil Creek and Titusville Lines, to the mansions of oil barons, banks and manufacturing facilities formed or constructed during the oil boom, churches, the downtown, and other structures that were built to service the oil industry. Oil Creek State Park and Oil Creek itself are constant reminders of the rich oil history of the region.



¹ http://en.wikipedia.org/wiki/Pennsylvania_oil_rush



Come Back to Where It All Started...

Demographics

An understanding of some of the basic demographic conditions of the region is important to establish baseline data, so that future statistics can be measured against this data.

HISTORICAL POPULATION

Census	Pop.	%±
1850	243	—
1860	438	80.2%
1870	8,639	1,872.4%
1880	9,046	4.7%
1890	8,073	-10.8%
1900	8,244	2.1%
1910	8,533	3.5%
1920	8,432	-1.2%
1930	8,055	-4.5%
1940	8,126	0.9%
1950	8,923	9.8%
1960	8,356	-6.4%
1970	7,331	-12.3%
1980	6,884	-6.1%
1990	6,434	-6.5%
2000	6,146	-4.5%
2010	5,601	-8.9%
Est. 2012	5,501	-1.8%

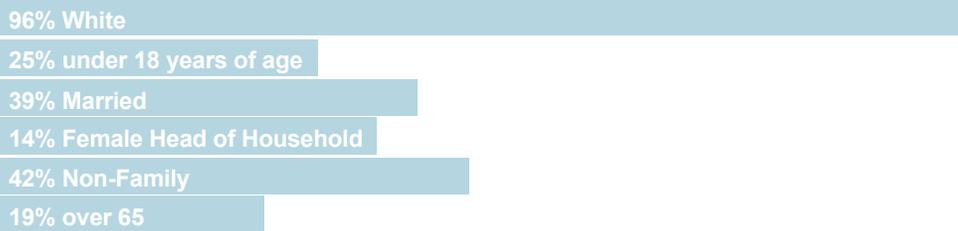
Source: US Census Bureau, 2013

Population

The Historical Population chart on this page shows the significant changes in the growth and decline of the City of Titusville. The 1860s, and especially the 1870s, experienced significant growth during the height of the historic oil boom. The 1890s were the beginning of a population loss, as the oil boom reached its peak, stabilized, and then slowed down. The population has remained stable or declined since that time to the present day. The 2010 population of the City was 5,601 according to the US Census Bureau. The population for the entire Titusville Zip code in 2011 was 6,195 urban residents and 5,127 rural residents.²

The 2010 racial makeup of the City was predominantly white (96%). Of the 2,322 households, over 25% had children under the age of 18 living with them, 39% were married couples, 14% had a female head of household with no husband present, and 42% were non-families. Just over 19% had someone living alone who was 65 years of age or older.

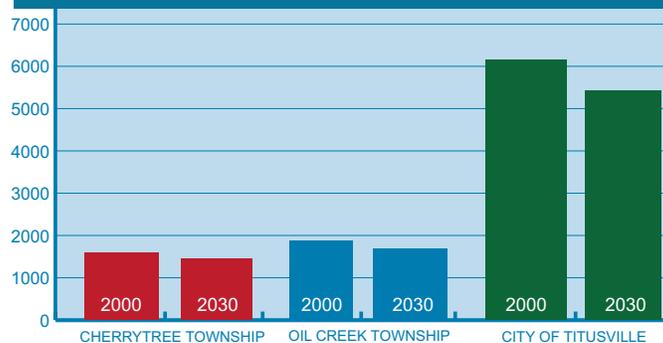
GENERAL POPULATION TITUSVILLE



It is interesting to note that 25% of the population in 2010 was between 45 and 64 years old and 20% were 65+ years old— i.e. 45% of the population was over 45, and the median age was 40. As is common in many rural communities, many young people are going away to college and not returning to their rural hometowns. Rather, they are flocking to larger metropolitan areas that offer good-paying jobs, a variety of entertainment and dining options, alternative housing choices, and amenities such as parks, modern recreation facilities, hiking and bike trails, cultural activities, theater and music venues, and technological innovations. The average age statistics also reflect the fact that we are living longer.

The Act 537 Plan Update (November 2010) by Gannett Fleming referenced the DEP Bureau of Watershed Management State Water Plan, which provided population projections for all municipalities in Pennsylvania for 2010, 2020, and 2030. Declining populations were projected for the City, Oil Creek Township (Crawford County) and Cherrytree Township (Venango County) for all three decades.

FUTURE POPULATION



The City was projected to go from a 2000 population of 6,145 to 5,765 in 2010, and 5,430 in 2030. Oil Creek Township (Crawford County) was projected to decrease from 1,880 in 2000 to 1,694 in 2030; while Cherrytree Township was projected to decrease from 1,543 in 2000 to 1,448 in 2030.

² www.usa.com

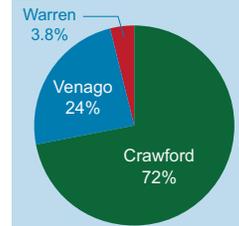


Come Back to Where It All Started...

The population of the school district, according to the school district's web site, is 14,426. Just over 72% of the population of the district is in Crawford County, with 24% in Venango County and 3.8% in Warren County. The median age of the district's population is 41 years and the average annual wage is \$33,700. About 47% of adults over the age of 25 have a high school diploma, while an additional 51% have an education beyond high school. Single-parent households make up 14.5% of the district's population.

School district enrollment is 2,020 students in K-12, which is a decrease of about 500 students since 2001. About 59% of the students are economically disadvantaged and 18% have an Individualized Education Program (IEP) to support disabilities. The graduation rate currently stands at 86%, and 63% of graduating seniors attend college, with 53% attending a four-year institution.

SCHOOL DISTRICT POPULATION



Employment

Pennsylvania's seasonally adjusted unemployment rate for February 2014 was 6.2%, which was lower than the unemployment rate of the US (6.7%). The State's seasonally adjusted total non-farm jobs for the same time period were 5,766,000, which is down about 46,900 jobs since the start of the recession in December 2007.

Pennsylvania's new hire activity increased by 497,679 across all industries in the 4th quarter of 2013, which is an increase of 1.7% from the 4th quarter of 2012. Still, there were 1.9 unemployed persons for every online job posting in February 2014.

New hires in Pennsylvania between the 4th quarter of 2010 and the 4th quarter of 2013 in core industries were 29% lower, but new hires were 3% higher in new hires in ancillary industries. From 4th quarter 2012 to 4th quarter 2013, new hires decreased in core industries by 17.7%, but increased in ancillary industries by 1.1%.³

Income

Household and family incomes in Titusville are consistently below the medians for the State of Pennsylvania, and generally by a considerable amount. The median household income for Titusville in 2009 was \$29,278, compared to \$49,520 for the State. The 2011 median income for Titusville was \$31,266, compared to \$50,228 for the State. The median per capita income in 2009 in Titusville was \$20,000, compared to the State at \$26,739. Both Titusville and the State had positive increases in per capita income between 2000 and 2009: +18.2% and +28.1%, respectively.

Median family income (MFI) in 2009 for Titusville was \$36,249, while the MFI for the State was \$62,185. MFI by number of persons per household were always lower in Titusville than then were in the State. Also, in 2011, there were more people living below the poverty level in the Titusville Zip Code (14.2%) than in the State of Pennsylvania (7.6%). The percentage for the City itself was 27.6%.



³ Marcellus Shale Fast Facts, Pennsylvania Department of Labor & Industry, March 2104



Come Back to Where It All Started...

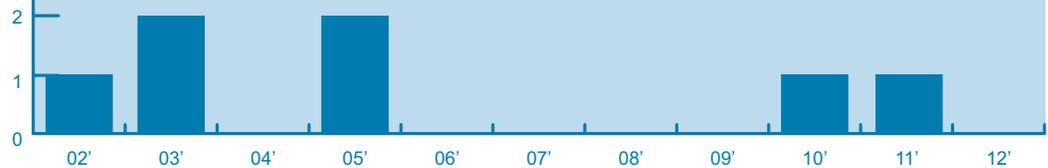
Incomes for mineral rights owners in the Titusville area will undoubtedly rise as a result of the shale gas industry in the region. The Economic Impact Study for Tioga County⁴ noted that owners of mineral rights spent over 55% of their leasing dollars (in both Bradford and Tioga Counties) on investments, savings, and finances, and over 17% on taxes.

Housing

In 2011, there were 5,315 housing units in the Titusville Zip Code plus 1,516 renter-occupied apartments. The median housing value was \$74,500, compared to a median value of \$164,800 statewide. The estimated value of houses and condos in Titusville in 2011 was \$31,266, up from \$25,945 in 2000. However, the median housing value of homes in Titusville remains significantly lower than the median housing values in Pennsylvania.

There has been little new housing construction in Titusville in the past decade. Only one new single-family building permit was issued in each of 2002, 2010 and 2011; two permits for single-family units were issued in 2003 and 2005. No permits were issued for single-family housing in 2004, 2006-2009 and 2012.

SINGLE-FAMILY BUILDING PERMITS



Recorded home sales for Titusville show that 2007 through 2009 were low, at less than five units per quarter. 2010 and 2011 saw significant increases in activity, with approximately 77 houses sold in 2010 and 123 in 2011. The mean price of all housing units in Titusville in 2011 was \$78,832.

The percentage of rental units in Titusville is higher than the percentage for the State. In addition, housing in Titusville is generally older than housing across the State.⁵

Lodging

There are three hotels/motels in the Titusville area: The Cross Creek Resort, which includes a 27-hole golf course, has 94 guest rooms, five meeting or social rooms with capacities from 30 to 300 people, and dining and banquet facilities. The Caboose Motel is opened seasonally from May through October and is located adjacent to the tracks near the Perry Street Station of the Oil City & Titusville Lines. Each of 21 caboose cars is a self-contained suite. The Comfort Inn is a traditional motel with 48 rooms, an indoor pool, free breakfast and free Wi-Fi. It is also located near the Oil City & Titusville Lines, and is close to many local attractions.

In addition to hotels and motels, the Hillhurst Bed & Breakfast offers traditional Bed & Breakfast suites, and a banquet room on the third floor that has been used for training schools. Many local companies use this B&B for long-term employee or customer stays, as well as training sessions and special events.



⁴ Economic Impacts of Marcellus Shale in Tioga County, Penn State Extension and Penn College, 2012 www.msetc.org
⁵ www.usa.com



Come Back to Where It All Started...

SWOT Analysis

The data collected throughout this planning process was analyzed and organized into strengths, weaknesses, opportunities, and threats (SWOT) for the Titusville area. Some elements may be considered both an opportunity and a threat, given different perspectives. So they may be listed under both categories.

Strengths

<i>Oil and drilling history, and a positive, proactive attitude toward oil and gas drilling</i>	<i>The local Titusville Airport</i>
<i>A welcoming community to the oil and gas industry</i>	<i>Many recent business expansions and new businesses</i>
<i>Titusville Community Development Agencies (TCDA) and Titusville Redevelopment Authority (TRA) and their proactive approach to exploration and drilling</i>	<i>Several gas industries with existing offices in Titusville</i>
<i>Titusville Industrial Fund</i>	<i>2006 Intergovernmental Cooperative Agreement (ICA) with Hydetown and Oil Creek Township (Crawford County) for Land Use Sharing –based on 2006 Comprehensive Plan Update</i>
<i>The TRA \$5 million Revolving Loan Fund (RLF) portfolio and US Department of Agriculture RLF</i>	<i>Crawford County Comprehensive Plan should be completed soon</i>
<i>The TRA is in the process of creating the Greater Titusville Development Foundation, a 501c3 corporation</i>	<i>Residents are acclimated to truck traffic because of their history of drilling and logging</i>
<i>Chamber of Commerce and Crawford County Convention & Visitors Bureau</i>	<i>Oil Creek State Park and Bike Trail</i>
<i>Existing relationships with the Marcellus Shale Coalition (MSC), Penn Tech College, the Department of Environmental Protection (DEP), and the Pennsylvania Independent Oil and Gas Association (PIOGA)</i>	<i>Two Mile Run County Park, French Creek Water Trail and other trails</i>
<i>Existing natural gas task force (Titusville Professionals Shale Team) and established subcommittees</i>	<i>Titusville Historic District and Walking Tour</i>
<i>Titusville City Council is prepared to address oil and gas needs</i>	<i>Fishing, hunting, camping, golfing, geocaching and boating opportunities</i>
<i>Existing Wellhead Protection Plan and Committee</i>	<i>Drake Well Museum and Park/ Caboose Motel / Tourism attractions/ other County museums and historic sites</i>
<i>Titusville Area Hospital has researched potential impacts and is already preparing for oil and gas industry needs</i>	<i>Oil City & Titusville Lines (tourism and freight)</i>
<i>Four Extended Care Facilities</i>	<i>Housing values have gone up in recent decades</i>
<i>University of Pittsburgh-Titusville</i>	<i>Many Agricultural Security Areas (ASAs) in Oil Creek Township (Crawford County)</i>
	<i>Route 6 Artisan Trail to the north</i>
	<i>Oil Heritage Region</i>
	<i>Proximity to Erie, Buffalo, Cleveland and Pittsburgh</i>



Come Back to Where It All Started...

Weaknesses

There is inadequate infrastructure in place to get produced gas to the market or to residents

The 2006 Comprehensive Plan needs to be updated to address oil and gas issues

Most zoning ordinances and subdivision regulations may need to be updated to include provisions for the locations of oil and gas industry facilities

The historic district needs an overlay zone for the general protection of historic assets

Incomes of households and families, and per capita incomes, are consistently lower than those of the State in general

Approximately \$1,250 of consumption dollars per person per year is spent outside the County⁶

No current housing study

The Landlord Association is not active

Building and site inventory is not yet completed

Some of the existing housing stock would benefit from additional modern amenities

Liens and regulations are issues when using federal and state housing programs (such as CDBG) to rehabilitate existing housing

There is no comprehensive baseline data for water quality and quantity throughout the region, including private wells

There is no available baseline roadway data, including conditions inventory, for local roads in the region

There is no baseline data for air quality or noise levels specific to this region

Opportunities

Titusville is equal distance from four county seats, which is critical to the oil and gas industry

The current planning process could expand into a regional approach--the Northwest Commission is an interested partner

TCDA is prepared to help local businesses expand to meet industry needs—retail, industrial, service and ancillary businesses

TCDA is prepared to recruit oil and gas ancillary businesses

Titusville Opportunity Park—200+ acre industrial park with available land and buildings

The proposed cracker plant (within 100 miles) will bring associated opportunities

Existing companies could expand to address oil and gas industry needs

Local economic development partners are already talking with the private sector regarding workforce needs

Local businesses could expand their services and products into new markets to service oil and gas industry workers

The 2006 Intergovernmental Cooperative Agreement based on the 2006 Comprehensive Plan for land use sharing

Existing data and experience from similar communities already experiencing oil and gas activity

The Towne Square Building and downtown revitalization process

The Towne Square Building has 25,000 SF of professional office space available for oil and gas industries, as well as professional incubator space, with conference center, elevator, restrooms, and common areas, as well as adjacent parking

Existing manufacturing areas

Upper stories of buildings in the downtown could be converted into business office space

Compressed Natural Gas filling stations are being planned throughout northwest PA

A large percentage of the land in the region is owned by the State

Incomes have been on the rise since 1990

The number of housing units has increased since 1980

Residents may have newfound wealth to spend/invest, so the services of CPAs and wealth managers will be needed



Come Back to Where It All Started...

The need for gas infrastructure would create jobs and opportunities

The City of Titusville has sufficient water supply and could sell water to the gas industry for additional revenue

The Titusville wastewater treatment plant is being upgraded

One company, Range Resources, owns most of the leases in the area

Crawford County Planning has an existing Geographic Information System (GIS) system

The City of Titusville is pursuing LERTA (Local Economic Revitalization Tax Assistance) and Enterprise Zone designation for economic development incentives

The University of Pittsburgh—Titusville could be a potential workforce training center

New jobs will require new skill sets

The Titusville Area School District is very active in energy education opportunities for students and is trying to excite children and young adults about oil and gas careers

Trail Town Master Plan recommendations

Threats

Uncertainty of University of Pittsburgh-Titusville future plans

Not knowing what type of drilling will occur here, or when

Local workforce not currently trained for oil and gas industry jobs

Legacy businesses could experience a loss of skilled workers to the oil and gas industry for higher wages

CDL certified drivers likely to be stolen by oil and gas companies for higher wages

Oil and gas industry work hours (24/7) are hard on workers and families

This study addresses only a small part of the region

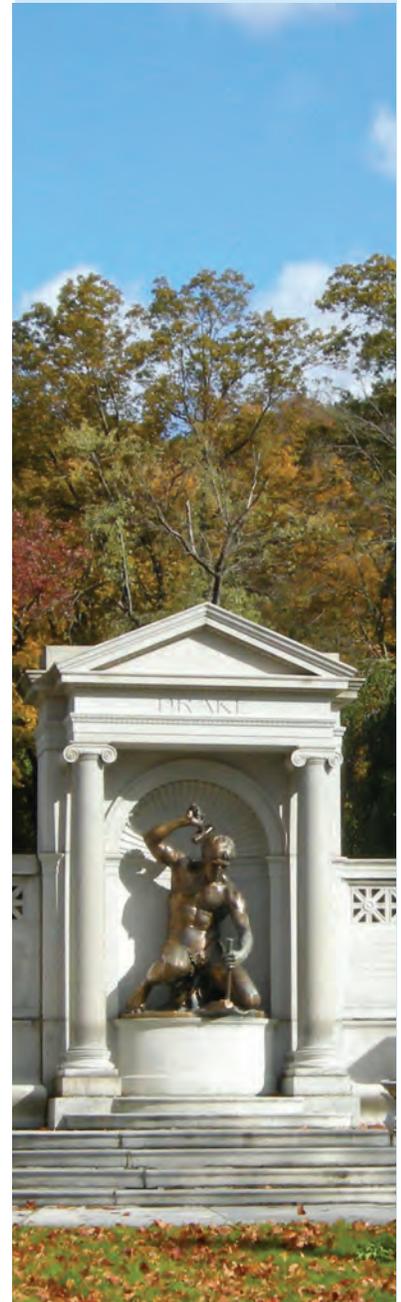
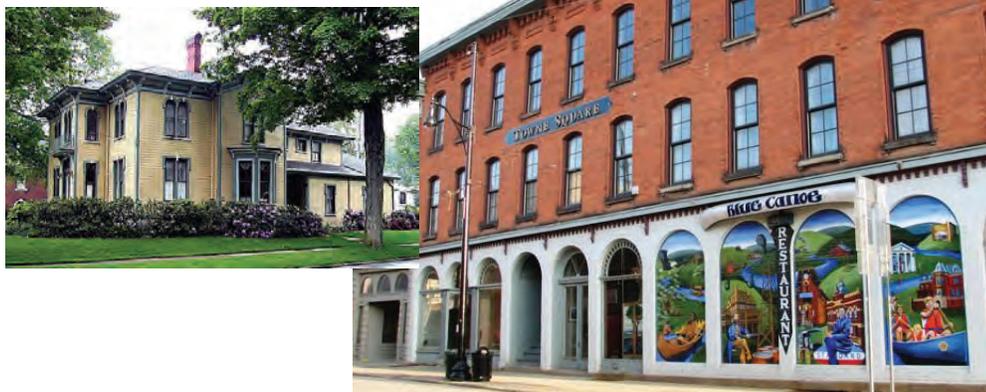
There are some constraints to development especially along rivers and creeks

Most municipal zoning and SALDOs need to be updated and do not address the oil and gas industry

No consistent set of rules and regulations exist among municipalities in the region and State

Leases for existing shallow wells are different than leases for Marcellus/Utica Shale wells

The possible inability of residents to best utilize/invest newfound wealth from royalties and leases—need CPAs and wealth managers





Come Back to Where It All Started...

Interviews with Municipalities

A goal of this planning process was to learn from our neighbors and other counties and municipalities in Pennsylvania that are already experiencing exploration and production by the oil and gas industry, and to incorporate their experiences and recommendations into this strategic initiative. In addition to extensive internet research, phone interviews were held or e-mails exchanged with a number of key individuals. These included:

Centre County	Sue Hannegan, Assistant Director, Planning and Community Development
Bradford County	Ray Stolinas, Director of the Department of Community Planning, and several staff members
Clearfield County	Rob Swales, Clearfield Economic Development Agency
Washington County	Mary Stollar, Washington County Chamber
Lycoming County	Kurt Hausammann, Director of Planning Department, Bill Kelly, Deputy Director, Kim Wheeler, Lead Planner, Megan Lehman and Jenny Picciano, Environmental Planners
Warren County	Dan Glotz, Director, Department of Planning and Zoning

Research also involved investigations into what other counties and municipalities were doing as well, including Clinton, Susquehanna, Tioga, Crawford, and Venango counties, as well as counties in other states.





Come Back to Where It All Started...

Interviews with Industry Professionals

Industry professionals were interviewed to gain insight into their perceptions of the oil and gas industry and potential impacts on the Titusville area. Individuals interviewed included:

<i>Marcellus Shale Coalition</i>	<i>Joy Ruff, AICP (former) Community Outreach Manager</i>
<i>Larson Design Group</i>	<i>Marty Muggleton and Robert Tellish, Engineers involved in Oil and Gas Projects</i>
<i>Ben Franklin Technology Partners, Shale Gas Innovation & Commercialization Center</i>	<i>William Hall, Executive Director</i>
<i>Seneca Resources</i>	<i>Jack Cochran, Engineer and Geologist</i>
<i>Entreworks</i>	<i>Erik Pages (Currently working on supply chain studies for SBA and the Northwest Commission)</i>
<i>Moody and Associates</i>	<i>Mark Miller, Project Manager</i>
<i>Titusville Area Hospital</i>	<i>Anthony Nasralla, President</i>
<i>Titusville Area School District</i>	<i>Karen Jez, Superintendent</i>
<i>Pennsylvania Department of Community & Economic Development</i>	<i>Denny Puko, Planning Program Manager</i>
<i>Northwest Commission</i>	<i>David Zellers, Jr., Economic Development Manager</i>
<i>Department of Environmental Protection, Northwest Regional Office, Meadville</i>	<i>Gary Clark and Rich Neville</i>

Public Input

Any planning process trying to determine future scenarios for an area should attempt to acquire input from the residents, businesses and other interested parties. In addition to the interviews mentioned above, this process utilized the media to relay information to public and to report on meetings and other items of interest. In addition, a survey was conducted of the Titusville Professional Shale Team members, and public hearings were held.





Come Back to Where It All Started...

Stakeholders Survey

In order to assure that each member of the Titusville Professionals Shale Team had the opportunity to express his or her specific concerns about the potential impacts of oil and gas exploration and drilling in the Titusville area, a survey was conducted. A survey form was compiled, and reviewed by TCDA staff. It is attached as [Appendix D](#). It was placed on-line using Survey Monkey, and Team members were asked at the Kick-off Meeting, and later in email reminders, to go to the website and complete the survey. Thirty two people started the survey and 29 completed it.

Results of the survey are included as [Appendix E](#). As a summary, the most highly ranked issues of importance were as follows: (Italicized issues were tied with others of same color. The numbers represent the average ranking on a scale of 1 to 5 with 5 being the highest.)

The most important issues were as follows:

Priority	Issue	Rank
1	Need for gas line infrastructure to get gas to the market	4.66
2	Current workforce training programs	4.47
3	<i>Converting vacant sites and buildings to oil-related offices or housing</i>	4.35
3	<i>A consistent set of rules & regulations for the region re: oil and gas drilling</i>	4.35
4	<i>A streamlined permitting process</i>	4.34
4	<i>Educating and informing the public</i>	4.34
5	Establishing baseline for surface water	4.34
6	<i>Lack of adequately trained local workforce</i>	4.31
6	<i>Active recruitment of oil & gas ancillary services</i>	4.31
6	<i>Helping local businesses expand to meet gas industry needs</i>	4.31
6	<i>Require Emergency Response Plans from companies</i>	4.31
7	<i>Enticing young adults into gas-related careers</i>	4.28
7	<i>Increased opportunities for service providers and retailers</i>	4.28
7	<i>Identifying areas of existing ground water contamination</i>	4.28
8	The need for service businesses to adapt to new markets	4.25



Come Back to Where It All Started...

The least important issues were as follows:

Priority	Issue	Rank
1	Increased light pollution, limiting celestial viewing	2.91
2	Increases in Sexually Transmitted Diseases	2.94
3	Increased traffic at night	3.03
3	Increased need for government services and workers	3.03
4	Forest fragmentation—cutting of trees for roads, pad sites, and pipelines	3.16
5	Traffic backups in some locations	3.19
5	The need for curricula changes for transient workers' children	3.19
6	Social and cultural impacts	3.22
6	Increased noise from trucks, pad site operation, and construction	3.22
7	Additional truck traffic	3.34
7	Living with temporary damage to roadways	3.34
7	Use of RV parks for industry workers	3.34
8	Updates to housing and building codes	3.38
9	Habitat fragmentation	3.42
10	Providing income and tax advisors and estate planners	3.44

Public Session #1

In order to inform the general public about this planning process and to provide an opportunity for residents to express their issues of concern or to ask questions, a public session was held in the conference room of the Towne Square Building on May 14, 2014. About 30 people attended the 5:00 PM meeting.

A presentation was made of the planning process and information collected to date. Results of the SWOT Analysis and Stakeholder Interviews were presented, and then the participants were provided with an opportunity to ask questions and provide additional input. Concerns were raised about why this planning process didn't address all issues generally included in a community comprehensive plan, rather than just those potentially impacted by shale exploration and production. This Shale Strategic Plan will touch on a variety of issues common to comprehensive plans, but not in a comprehensive manner, as that was not the scope—possibly, a conventional comprehensive plan will be needed in the near future.

Another critical issue raised was what impact orphan wells might have on future drilling activities. Additional



Come Back to Where It All Started...

research was done to address this issue, and is discussed later in this document. Workforce training was brought up as an important issue that needs to be addressed. Several efforts are currently underway, and more are recommended in this Plan.

After the public discussion, participants were asked to take the five stickers they were given when they signed in, and place them on the charts adjacent to the five issues that they felt were the most important ones to be addressed in the balance of this planning process. Results of that voting are indicated below. Numbers indicate the number of votes given to that issue. A number next to a category heading means that that many participants felt all issues under that subject were important. Participants could place all five of their stickers on one issue if they so desired. The #X indicates the overall ranking of the issue by the participants that night.

Transportation - 1

Roadways – Ranked #5
(Tied with Gas lines to market)
Bonding/ Use Agreements - 0
Weight Limits - 0
Truck Bypass - 1
Bridges - 1
Increased Traffic – 2
Rail/Intermodal – 2
Establishing Baseline Data – 1

Business Climate - 3

Expand Existing – 3
Encourage New – 3
Attract Ancillary – Ranked #3
Medical / Health – 2
School / Education – 2
Adapting to New Markets – 1

Housing - 4

Single Family – 1
Multi Family – 1
Upscale housing – 0
Rental Housing – 0
Housing Conditions – 0
Affordability – 0
Hotels – 1
Campgrounds – 0
Need Housing Study – 1

Infrastructure - 1

Gas Lines to Market – Ranked #5
(Tied with Roadway)
Gas Lines to Residents – 0
Water – 5
Water Quality - 1
Water Quantity - 0
Private Wells - 0
Frac Water Disposal – 4
Stormwater Management – 0
Establishing Existing
Baseline Data - 3

Government - 0

Streamlined approval
process – 11 Ranked #1
Common set of regulations – 3
Regional coordination – 3
Safety forces – 0
Updated Land Use Plan – 1
Updated zoning – 1
Title/records – 2
GIS mapping – 0

**PUBLIC
OPINION**
**May 14th 2014
Public Session**

Workforce - 0

Training/retraining – 10 Ranked #2
Attract young people
to oil & gas – 6 Ranked #4
(Tie with Hiring Local)
Hiring local 6 - Ranked #4
(Tie Attract young people
to oil & gas)
Local unions – 0
Rising wage rates – 2
Existing workforce programs – 1
Regional coordination – 4

Real Estate - 0

Existing industrial sites – 0
Existing industrial buildings – 0
Brownfield sites – 0
Vacant office space – 0
Flat sites – 0
Warehouse space – 0

Other

Community strategic plan
addressing all issues,
not just shale – 1
Code enforcement – 1



Come Back to Where It All Started...

Phases of Shale Gas Development

In order to understand the impacts of oil and gas exploration and development, it is necessary to understand the process or phases of development. Pennsylvania's experience associated with Marcellus Shale, from 2006 through today, demonstrates that the development of energy resources from shale gas occurs in a series of phases or waves, either separately, or concurrently. The phases of development vary from place to place depending on the existing circumstances that affect the duration of the phases, and upon the economics prevailing in the production of natural gas.

PHASE 1 The first phase is likely never seen by local residents. It involves the gas producers' corporate decision-making to select a geographic area and to begin exploration and development. In this phase, one or more gas producers will select an area for exploration. This decision is generally made based on economics of production that are measured in:

- *Likely gas yields,*
- *Forecasted price of gas,*
- *Ability to control significant gas production rights through leases,*
- *Distance to market, and*
- *Conveyance to market.*

The decision-making also involves the study of existing geologic information, including:

- *Past well history,*
- *Geologic setting, and*
- *Geophysical measurement-- both existing data and newly collected data.*

The impacts on the geographic area of interest during this initial phase are mostly negligible.

PHASE 2 After a decision to proceed further is made, the second phase begins and involves efforts to lease gas rights. In some areas, gas rights have been long separated from surface rights. In other areas, they have, and continue to, run together. For example, in the Marcellus Shale Play, many areas of Lycoming County had never been subject to gas, oil, or coal development, so the rights had never been separated. In Clearfield County, on the other hand, coal and gas rights were likely separated beginning around 1900-- first the coal, then the gas rights.

This gas-rights leasing phase involves a lot of courthouse time to determine, basically, who owns what. Two types of gas leases exist. In one case, the gas is leased to any depth. In other cases, the gas is leased to a certain depth or depths, and other depths may not be leased or may be subject to another lease. Given the history of oil and gas production in the Titusville study area, it is likely that there are extensive oil and gas lease filings in the county courthouses. Because leases frequently lapse when production either has not started within a stated time period or has ceased after a period of time, the matter of determining gas rights ownership is not always easy. Further, it is customary for surface rights to be conveyed with the gas rights sufficient to allow the gas to be drilled and produced.

The people who work on this second phase are commonly called "land men" and their duties extend to meeting with and negotiating gas rights with their present owners. Land men frequently work directly or indirectly for gas producers, but in a few cases may be employed by a speculator who is looking to amass a book of leases for later sale. Gas rights leases are secured through an initial upfront payment, a signing bonus, and a percentage of the net or gross sale of the gas as it is produced. Current leases are likely to define what the net value of the sale of gas is to be, and contain deductions for severance taxes paid, cost of gas cleaning, etc., that will be incurred before the gas is sold.

The impacts on the infrastructure during this phase are likely limited--increased motel room bookings, increased traffic at the county courthouse, and perhaps some office rental.





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PHASE 3 As lease holdings are perfected, a third phase of development begins. It is essentially a mobilization phase with some of it occurring in the background and some of it being more obvious. Engineers and surveyors are hired to begin permitting efforts, construction contracts are negotiated with local earthmoving and highway contractors, equipment lay down areas are leased, support and drilling equipment begins to arrive, and foremen and other needed early field personnel show up. This phase impacts local construction companies, engineers and surveyors, quarries, realtors, and a few local landowners. There may be some increase in motel bookings, restaurant sales may increase, and area residents may notice a slight increase in traffic measured in the number of white (or same color) pickup trucks, some with out of state licenses. Local regulatory agencies will begin to see applications for permits.

PHASE 4 As the second and third phases of development continue, the fourth phase begins. This is the exploration phase when the first drilling starts. During this phase, the resource is proven, and the decisions made in Phase One of development are revised. In fact, all efforts are subject to being revised. Wells may be drilled in selected locations across a leasehold.

Location selection can be based on many factors including readiness to proceed, ideal geologic setting, date of lease expiration (if not drilled), and well location in relation to transmission mains. Early results will guide later exploration efforts. This is the beginning of the time of greatest study area impacts, which will be noticed in:

- *Heavy construction and quarrying operations,*
- *Motel and restaurant bookings,*
- *Traffic increases, especially truck traffic,*
- *Secondary road damage,*
- *Utility water sales,*
- *Increases in landfill use, and*
- *Reduced unoccupied housing stock.*

PHASE 5 Following and likely overlapping with the exploration phase (Phase Four) is the production phase. This phase includes continued well drilling to maximize production; processing facility and transmission main construction; increased production water to haul and be treated; a level or diminishing impact on motels, restaurants and housing; and continued damage to secondary roads. This phase may last for 50 to 100 years depending on a number of factors.

Experience with Impacts on Infrastructure

Infrastructure is defined as the basic physical and organizational structures needed for the successful operation of a society. We can divide infrastructure into several categories:





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The impacts of shale gas development on the various infrastructure aspects of the area will vary. For example, experience in the Marcellus regions has shown that there will be little impact on the electrical infrastructure from shale gas development. However, there might be secondary impacts should an abundant supply of low cost natural gas resulting from shale gas development result in a new gas turbine electrical generation plant or a new chemical plant being built.

The biggest impact on the solid waste infrastructure will be increased tonnage at landfills, increased truck traffic hauling solid waste (and the related transportation infrastructure impact), a possible change in the characteristics of landfill leachate, and the need for continued vigilance in complying with the radioactivity regulations that are already in place.

Impacts on water infrastructure will include increased sales of bulk water for loading on tank trucks and possibly, in a few locations, waterline extensions for the same purpose. This statement assumes that watershed and wellhead protection zones are properly drawn and that there will be no direct impact on the potable water source due to drilling.

Impacts on existing wastewater infrastructure will be minimal. DEP regulations do not encourage discharge of frac or produced water to Publicly Owned Treatment Works (POTWs.) This makes the expense of pre-treatment prior to discharge to a POTW very high. Still, frac and produced water will need to be handled. The present preferred methods are (1) reuse after treatment and (2) disposal in Class II disposal wells, most of which are currently located in Ohio. It is likely that the private sector will construct new treatment for reuse facilities, which may also incorporate significant water storage. These are likely to be constructed in areas of good roads, railroad access, and close to concentrations of wells being drilled. Such treatment currently provides for reuse of the water and for disposal of the products of the treatment process as sludge hauled to a landfill. Numerous development efforts are underway to recover and/or produce salt, barite, chlorine bleach, hydrochloric acid, and sodium hydroxide from frac and produced water.

The impact of development on existing stormwater facilities is likely to be minimal except in equipment storage areas and where new construction occurs. New stormwater infrastructure will be built to serve access roads and pad sites. Storm drainage associated with roads will likely suffer and need to be maintained.

To the extent that new commercial (e.g. motels) and industrial (e.g. an electric power plant) development occurs, there could be a corresponding impact on water, wastewater, and stormwater infrastructure.

Contrasted with the discussion in the several previous paragraphs, the impact on transportation infrastructure will be significant. The local airport will likely see an uptick in private aircraft movement. Railroads will see a big increase in tonnage carried, and new sidings will need to be constructed. Existing sidings are likely to be occupied by cars carrying equipment, drilling and fracking supplies, water, and wastewater.

Highway infrastructure will see the greatest impact; conflicts with school bus traffic and with other traffic at times of peak highway use will occur. Slow traffic areas may become slower, greater backups at intersections are likely, and traffic signal timings may need to be adjusted. Noise from traffic will greatly increase, and there may be more mud and dirt on the roadways. Township roads, especially those with poor drainage, will be destroyed and will need to be repaved. Some township roads can actually be improved if the proper agreements with the gas companies are in place. Accelerated damage to State highways may occur in some areas.

Obviously, as a result of successful drilling, natural gas infrastructure will be impacted, most likely through the construction of new processing facilities (to insure "pipeline" quality gas is sold), and new gathering lines (from well to well to processing facility) and new transmission lines (from processing facility to market) will need to be constructed. This construction will also impact the transportation infrastructure.



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Undocumented, Abandoned and Orphan Oil and Gas Wells

It has been estimated by the DEP that over 300,000⁷ oil and gas wells have been drilled in Pennsylvania since the first well was drilled in Titusville in 1859. It has been reported that the DEP has records on only about 120,000 of these wells⁸. This means that around 180,000 wells are of unknown condition and location.

All wells can be thought of as being vertical conduits that allow the movement of oil, gas, and water from source geologic formations to other geologic formations and/or the surface. When the well conduit becomes compromised in any way, either through improper construction and immediate or later failure of casings or seals, or through disturbance from the surface and subsurface activities of man, undesired conveyance of oil, gas, and/or water can occur. This undesired conveyance could obviously compromise both safety and the environment.

It is appropriate to begin this section with some definitions. An undocumented well is an unknown well whose existence is not known. An orphan well is a well for which ownership⁹ cannot be established. An abandoned well¹⁰ is a well that is no longer in production but is not in an inactive status. Undocumented and orphan wells are always abandoned wells. Communication is the term used when one well, either new or existing, causes the movement of gas or liquid (water or petroleum products) into another well. A plugged well is an abandoned well that has been plugged in some way, whether consistent with current regulation or not.

Undocumented Wells

If an undocumented well's casing has not been removed, it is possible to locate it using metal detectors. Sometimes, observable residual earth disturbance (evidence of a pad or hole cave-in) and the presence of telltale equipment like a pump jack, can lead to the discovery of such a well. Unfortunately, searching for unknown wells is not easy, because frequently there is no observed surface evidence and the detection of abandoned equipment and gathering line piping will produce false well casing positives. Nonetheless, a few individuals pursue the search for undocumented wells as a hobby or for a sense of fulfillment in protecting the environment and insuring safety¹¹.

When an undocumented well is discovered, its safety and environmental risks are assessed, and a plan is developed for plugging the well through the DEP Orphan Well Program. The following is from the DEP website:

In 1992, the legislature amended the Oil and Gas Act of 1984 to allow certain oil and gas wells abandoned before April 1985 to be classified as orphan wells. This amendment gave the Department the authority to plug orphan wells if landowners, leaseholders and oil and gas operators have received no economic benefit from the well after April 18, 1979.

Surcharges were established by the Oil and Gas Act to fund the orphan and abandoned Well Plugging Program. The 2012 Oil and Gas Act, Section 3271, continued the provision for surcharges. Well plugging contracts are funded with permit surcharges, which are in addition to the permit application fee. The orphan surcharge is \$200 for a gas well or \$100 for an oil well. The abandoned well surcharge is \$50.¹²

New undocumented wells are found frequently, perhaps a few per month, in northwestern Pennsylvania

⁷ <http://files.dep.state.pa.us/OilGas/BOGM/BOGMPortalFiles/AbandonedOrphanWells/WellPluggingProgram.pdf> Other estimates are in the range of 325,000 to 350,000 wells. The actual number is unknown.

⁸ See article posted at: http://www.huffingtonpost.com/dimiter-kenarov/lost-hunting-for-pennsylvania-abandoned-wells_b_2438135.html

⁹ As defined by 25 PA Code Chapter 78.91 (a)3 related to deriving to economic benefit exclusive of royalty payments. An owner of surface or subsurface rights does not necessarily own an abandoned well unless he has derived economic benefit.

¹⁰ As defined by PA Code Chapter 78.101 as no longer in production and meeting or not meeting the requirements for registration as being in "Inactive Status".

¹¹ See article posted at: http://www.huffingtonpost.com/dimiter-kenarov/lost-hunting-for-pennsylvania-abandoned-wells_b_2438135.html

¹² <http://www.depweb.state.pa.us>



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including in the Study Area. Undocumented wells are likely to exist throughout the Study Area with some expectation that they will be clustered in valley areas. Most are likely to have tapped one of three Venango formations (up to 1,500 feet), but some are much deeper, tapping the Medina (5,500 feet).

Abandoned Wells

The production of oil and gas from a well is subject to a decline curve. At some time, the well operator decides that it is no longer economically worthwhile to operate the well because its production has declined so much. At that time, the well is put into inactive status, or it is abandoned.

Since the adoption of current regulations in 1989, well owners have been required to properly plug abandoned wells. Prior to 1989¹³, abandoned wells were frequently not correctly plugged. Since that time, they should have been properly plugged. A properly abandoned well is not considered a threat to safety or to the environment. An improperly abandoned well can be a threat to both.

This is an important issue to consider in the Titusville Study Area because of the past history of drilling here and the potential for future shale gas development. DEP sets forth procedures for well abandonment in 25 PA Code Chapter 78.92 through .95. Early well plugging practices varied from doing nothing and walking away; to removing any above ground evidence; to dropping a wooden pole down the casing as a plug then adding concrete; to dropping other available materials, sometimes waste materials, down the hole. Interestingly, in early oil fields and prior to DEP regulation, cannonballs were frequently dropped down wells as plugs. If used, their presence increase the cost of proper plugging because they need to be drilled out before the well can be plugged.¹⁴

Unfortunately, there was no requirement for registration, permitting, or design of oil and gas wells until 1956, and it was not until 1985 that oil and gas operators were required to register old wells. So, it has been logically concluded that many of the wells abandoned prior to the beginning of regulation were not properly plugged when abandoned.

Orphan and Abandoned Wells in Study Area

The DEP website contains a searchable database¹⁵ listing abandoned and orphan wells. The database reports that the following wells exist in the study area:

County	Municipality	Abandoned Wells	Orphan Wells	DEP Plugged Wells
Crawford	Rome Township	25	0	25
	Centerville Borough	0	0	0
	Hydetown Borough	0	0	0
	Oil Creek Township	54	25	7
	City of Titusville	0	0	0
Venango	Cherrytree Township	342	82	75
	Oil Creek Township	328	134	126
	Pleasantville Borough	1	0	0
	Allegheny Township	186	56	48
Warren	Southwest Township	246	180	11
Totals		1182	477	292

Table 3.1

¹³ When PA Code 78.91 through .95 was effective

¹⁴ DEP, NWRO, Rich Neville, July 1, 2014

¹⁵ http://www.depreportingservices.state.pa.us/ReportServer/Pages/ReportViewer.aspx?/Oil_Gas/Abandoned_Orphan_Web





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No assumption is made relative to the number of unknown wells in the Study Area. For example, there is no expectation that there are no wells in the municipalities where none are reported. Rather, they are unknown or undocumented. Also, no inference can be made that the difference in numbers between the abandoned wells and the DEP plugged wells represents unplugged abandoned wells.

Requirements for New Wells Relative to Abandoned Wells

A review of the current new well permit application¹⁶ and existing regulations pertaining to the drilling and operation of new wells¹⁷ fails to identify a requirement that existing abandoned, plugged, or orphan wells be surveyed, shown in mapping, or assessed in the location of new well sites. Similarly, there is no requirement for surveying or assessing the possible existence of undocumented wells within a radius of a proposed well.

However, under proposed regulations published in the PA Bulletin on December 14, 2013, the following would be required:

78.52a. Abandoned and orphaned well identification.

(a) Prior to hydraulically fracturing the well, the operator of a gas well or horizontal oil well shall identify the location of orphaned or abandoned wells within 1,000 feet measured horizontally from the vertical well bore and 1,000 feet measured from the surface above the entire length of a horizontal well bore in accordance with subsection (b). Prior to hydraulically fracturing the well, the operator of a vertical oil well shall identify the location of orphaned or abandoned wells within 500 feet of the well bore in accordance with subsection (b). For the purposes of this section, a gas well is a well which is producing or capable of producing marketable quantities of gas or of gas and oil with a gas-oil ratio of more than 100 MCF per bbl of oil.

(b) Identification shall be accomplished by conducting the following:

- (1) A review the Department's orphaned and abandoned well database.
- (2) A review of applicable farm line maps, where accessible.
- (3) Submitting a questionnaire on forms provided by the Department to landowners whose property is within the area identified in subsection (a) regarding the precise location of orphaned and abandoned wells on their property.

(c) Prior to hydraulically fracturing a well, the operator shall submit a plat to the Department showing the location and GPS coordinates of orphaned and abandoned wells identified under subsection (b) and proof of notification that the operators submitted questionnaires under subsection (b)(3).

For example, in the case of a horizontal Utica well with 5,000 foot long horizontal bore, the required area of investigation would be 7,000 feet long and 2,000 feet wide, or 321 acres.

Potential for Gas, Petroleum, and/or Water Migration from Existing Wells

When an unconventional well intended to tap Utica or other deep shale is drilled in the Titusville area, the bore will travel through geologic strata that have previously been tapped to yield oil and gas. It is assumed that most of the shallow oil and gas that can be produced by these shallow strata has already been produced in the last one hundred and fifty-five (155) years, so the oil and gas that remains in the shallow formations¹⁸ is unlikely to move unless disturbed, or more correctly, when pressure conditions change so that the forces causing movement exceed the forces causing the oil and gas to stay in place. The remaining gas in those formations can be termed "non-target" gas in that it is not being targeted by the new well.

¹⁶ DEP Form 8000-PM-OOGM0001a – Permit Application to Drill and Operate an Unconventional Well

¹⁷ Starting at 25 PA Code Chapter 78.71

¹⁸ Those formations are less than 1,500 feet deep.



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All wells produce oil and gas as a result of naturally occurring or induced pressure differential. Gas and oil wells often flow freely, but for many oil wells, it is pumping that provides the pressure differential for oil production. When a well is new, the pressure differential is greatest, and wells achieve their highest production in their first few days and weeks. In the absence of a pressure differential, the oil and gas is likely to remain in the formation.

The drilling of a deep Utica well (about 6,500 feet deep) will ultimately tap Utica shale pressures of thousands of pounds per square inch. These wells will be deeply cased and carefully grouted and then tested, so that the likelihood of a leak of high pressure Utica gas into adjacent shallow low residual pressure strata is very unlikely. However, as has rarely been seen in other areas in Pennsylvania and neighboring states, it is possible that a casing or grouting leak can occur and a localized area of shallow strata can become pressurized by the leak. This may cause residual non-target oil and gas in the shallow strata to migrate. This phenomenon has likely occurred many times in the past.

In the absence of a casing leak, another area of concern would be associated with the energy expended in drilling and fracking of a new Utica well. The mechanical forces imposed during these operations may, theoretically, disturb shallow strata to the extent that residual oil and gas in those strata might migrate through new migration paths.

In both cases an existing, improperly plugged, shallow oil or gas wells could serve as the conduit to permit migration of the residual oil and gas. One of the saving aspects for consideration is that the previously tapped Venango formation is more than a mile shallower than the target Utica formation. The Medina formation is about 2,000 feet vertically separated.

So, the answer to the question of whether Utica drilling will have the potential to cause shallow oil and gas migration, is yes. This has happened for years as other formations were drilled and is likely to occur again when other formations are drilled in the future. The most obvious impacts will be at drinking water wells which may have bubbles of methane in them. Under existing regulation, contamination of an existing water supply well is assumed to be from the new drilling unless the driller has preserved a defense pursuant to 25 PA Code 78.52 by the pre-drilling identification and testing of existing wells.

Safety can also be compromised if gas leaks occur into a closed space like a basement. The natural gas will not be odorized, so it may not be detected by the homeowner. Natural gas detectors can be purchased at hardware stores.

While recognizing that each new well presents some risks, given the huge number of oil and gas wells drilled in Pennsylvania and the continued drilling of new wells that has occurred since 1859, it is not possible to identify a measurably greater risk of oil and gas migration than already exists. It should be noted that oil and gas companies have safety as their #1 concern and are taking appropriate measures to prevent leaks and other accidents from occurring.



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Chapter 4

POTENTIAL IMPACTS AND OPPORTUNITIES

The intensive amount of research conducted for this project, including interviews with counties and municipalities that have experienced, or are currently experiencing, oil and gas exploration and production, resulted in an extensive list of potential impacts and opportunities for the Titusville area. This research could continue for years, as there is new information available almost every day, as more and more communities experience this second oil boom. Plus, every person interviewed had a wealth of information to share about their experiences and recommendations they would make for Titusville.

In order to compile as much of this information as possible in an orderly manner, the issues were divided into categories, as indicated below. Each of these categories has a chapter dedicated to discussing the issues and impacts experienced by other municipalities, how these issues and impacts might affect the Titusville area, potential opportunities and initiatives that could be pursued, and other critical issues.

Categories of data, and subsequent chapters, are as follows:

Chapter 5: Infrastructure

- Wastewater
 - Impacts on Wastewater Treatment
 - Water and Sewer Service in Rural Areas
- Water
 - Surface Water
 - Ground Water
 - Oil and Gas Contamination of Ground Water
 - Water Supply
 - Potential for Water Supply Contamination
 - Impacts of Utica Shale Development
- Stormwater
- Natural Gas
- Compressed Natural Gas

Chapter 6: Transportation

- Roadways and Bridges
- Railroads





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Chapter 7: Housing and Lodging

- Housing
 - Supply
 - Condition
 - Affordability
 - Displacement
 - RV Parks and Campgrounds
 - Planning
 - Codes and Regulations
- Lodging

Chapter 8: Local Government Services

- Emergency Services
- Geographic Information Systems (GIS)
- Other County Services
- Financing

Chapter 9: The Business Community

- Agriculture and Tourism
- Personnel and Wages
- Sites, Buildings, and Brownfields
- CNG Fueling Stations
- New/Different Services and Products

Chapter 10: The Environment

Chapter 11: Health and Safety

- Public Education and Awareness
- Social and Recreational Services
- Safety
- Undocumented Wells
- Medical Services

Chapter 12: Education and Workforce

- The Local School District
- Workforce
- Workforce Training Programs
- Workforce Investment Boards





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Chapter 13: Household Issues

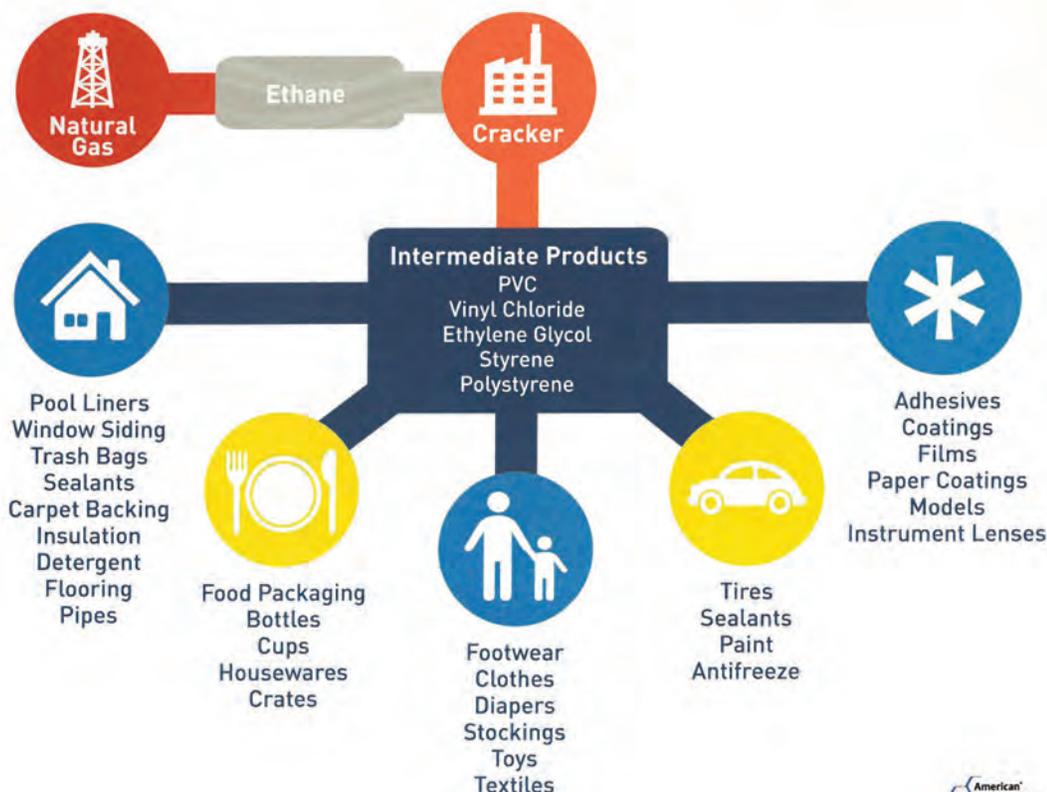
- Access to More Affordable Energy
- Leasing Issues
- New-found Wealth
- Job Transitions

Chapter 14: Planning and Development Regulations

- Economic Development
- Data Compilation and Dissemination
- Regional Coordination
- Planning and Development Regulations
- Zoning
- Guideline Documents

Of special note is the potential for a cracker plant in Beaver County, PA, 35 miles northwest of Pittsburgh. The \$3.2 billion petrochemical plant would chemically crack ethane (wet gas) into ethylene, which is the raw material used to make plastics. The major oil company considering this project anticipates that 10,000 construction jobs will be created plus about 300 permanent jobs. This facility will attract other plants that use ethylene to the area. It could be several years before a final decision is made to construct this facility, but indications are positive that it will happen.

ETHYLENE CHAIN



American



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This facility will have impacts on municipalities within a 100 mile radius, not only creating jobs in the shale business, but creating opportunities for existing or new businesses to meet their demands for new or increased services and products.



The shale gas industry has already had significant impacts on local companies. The Erie Times-News on May 28, 2014 reported that Universal Well Services, Inc., a Meadville company, grew from a small company of 200 employees with offices in Meadville, as well as in Wooster and Zanesville, Ohio, to a company that today

employs over 1,000 employees in twelve locations, in four states. Universal Well Services pumps more than \$50 million annually into Pennsylvania's economy, almost exclusively from its work in the Marcellus. The company specializes in pressure pumping wells, cementing casings, and other well services.

The company has five locations in Meadville, including its downtown headquarters, and newly remodeled offices and training center in the Crawford Business Park. It outgrew its first facility before it ever moved in. Its facilities include sophisticated garages and paint shops to service its fleet of over 1,000 trucks, ranging from cement carriers to tractor trailers filled with satellite dishes on top and computer stations inside. Facilities also include state-of-the-art labs for testing sand and cement blends, as well as a training facility that provides training for all employees to prepare those heading out to work on locations, and in awareness, safety, CPR, first aid, health and environmental issues. Universal has also put on some basic Hydraulic Fracturing and Oil & Gas Industry "101" courses for OSHA, DEP, and EPA inspectors to help them gain better insight into what goes on during drilling & completion operations on a gas well location. The company positively impacts the railroad industry, regularly moving large numbers of rail cars loaded with frac sand throughout the Appalachian Basin area.

Universal has a policy to buy local whenever it can, housing its people at the Meadville Holiday Inn Express, catering food from Meadville's Downtown Mall Bistro, purchasing fleet vehicles from Humes Chrysler Jeep Dodge and RAM in Waterford, and purchasing everything from masking tape to welding rods to huge trucks, from local vendors. Universal is excited about the Utica Shale and the Upper Devonian Shale, which are coming into play, especially since they can work in all three zones from one well pad.

Many other companies in the area have similar positive growth experiences with the natural gas industry. There are currently job openings for 150 people in the oil and gas industry in the region, and companies are having a hard time filling the positions. Natural gas companies spent \$11.48 billion in Pennsylvania in 2012; about \$6.23 million per well. About thirteen jobs are created per well during the drilling phase.

Ben Franklin Technology Partners has assisted individuals and small businesses with creating or commercializing new products to service the natural gas industry. One company developed a vibration sensor to tell when a piece of equipment will break down. Another developed a boot cleaning device and received a patent for it. These are simple ideas that individuals and small businesses can profit from as a result of the natural gas industry and help from partners such as the Ben Franklin Technology Partners and similar organizations.



Municipalities and local governments benefit as well. Studies by the Penn State University Extension (PSUE) for Tioga County¹ revealed that State sales tax, motor vehicle tax, and personal income tax all increased over the periods of time that were studied (2006 to 2011). In addition, total compensation increased, the number of tax returns filed increased, and royalty income increased by over 400% between 2007 and 2009. A similar study in Susquehanna County² by PSUE revealed similar increases, with royalty increases of over 800%.

The impacts are many and the opportunities are endless.

¹ *Economic Impacts of Marcellus Shale in Tioga County, MSETC and Penn State Extension, 2012*

² *Economic Impacts of Marcellus Shale in Susquehanna County, MSETC and Penn State Extension, 2012*





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Chapter 5

INFRASTRUCTURE

This Chapter addresses a variety of issues related to existing infrastructure systems within the Titusville area and specific municipalities, and how potential oil and gas exploration and production could affect them. Discussed are: wastewater, water, stormwater, and gas. Electricity and solid waste are not discussed, as no critical impacts were reported or anticipated during the course of this planning process.

Wastewater

Issues identified during the planning process related to potential wastewater impacts from the oil and gas industry activities include:

- *Capacities of local wastewater systems to handle additional flows from oil and gas activity*
- *Effects on municipal NPDES permits*
- *Disposal of flowback water (frac water or produced water or brine from older wells)*
- *Effects on the area's waters and water sources*

Sanitary sewer (wastewater) capacity is an issue for some municipalities that experience oil and gas production, not necessarily because of the oil and gas industry itself, but because of the increase in commercial, residential and industrial activity that the oil and gas industry brings with it. Additional housing, hotels, RV parks and campgrounds, restaurants, and commercial enterprises, as well as increases in manufacturing activity at existing or new businesses, may result in significant amounts of additional wastewater being produced and discharged into the municipal systems. Municipal systems may or may not be able to handle the additional capacity for treatment and the first corrective step, should overloads occur, would be a ban or prohibition on new development.



The City of Titusville's wastewater treatment plant (WWTP) and sewer system services the City and portions of Oil Creek Township in Crawford County. The WWTP was constructed in 1958, and was upgraded in 1988, 2004, and 2008. It has been claimed that the City's plant was the first sequential batch reactor (SBR) plant constructed east of the Mississippi River, and was state-of-the-art when it was upgraded in 1988. The plant has a continuous flow rating of 4 million gallons per day, with a peak rating of 9.8 MGD.¹

¹ From City of Titusville website www.cityoftitusvillepa.gov



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The sewer system dates back to the 1860s and is comprised of approximately 33 miles of pipe ranging from 6" to 48" in diameter. A portion of the sewer system is separate from storm sewers and a portion is combined, carrying both storm water and sanitary sewage. There are four permitted combined sewer overflows (CSOs), one at the treatment plant, one at Brown Street, one at Bank and Allen Streets, and one at Bank and Roberts Streets.

The 2011 Act 537 Plan concludes that the plant may be hydraulically overloaded because past operation provided less than total flow measurement, and that the plant is also projected to be organically overloaded. Based on existing and projected flow data, design flows were determined to be 4 MGD average daily flow, 12 MGD peak daily flow, and 16 MGD peak hourly flow. In order to provide this capacity, an \$8 million project is underway to add another process tank and make other improvements.

The Titusville system serves about 8,200 equivalent population—or about 3,600 equivalent dwelling units (EDU's), including a small portion of Oil Creek Township. Cherrytree Township is said to be considering connecting about 150 EDUs to the Titusville system.

The current phase of the WWTP expansion and upgrading plan will increase the capacity of the WWTP to a peak hourly flow of 16 million gallons per day, at a cost of about \$8 million, \$4.6 million of which is coming from grants, and the balance from the City of Titusville. The upgraded facility will be adequate to service the City, Oil Creek Township (Crawford County) and Cherrytree Township (Venango County) for the foreseeable future, including general needs of businesses servicing the oil and gas industry. It will be completed by the end of 2014 and will meet current NPDES requirements. The City also has an Industrial Pretreatment Program, which requires industries to pretreat wastewater prior to it entering the City's wastewater treatment system.

The other public sewerage system in the Study Area is the system that serves Pleasantville Borough. The remainder of the Study Area is served by on-lot disposal systems.

Impacts on Wastewater Treatment

Utica Shale development will likely have little impact on wastewater treatment in the study area. Effluent re-use, once thought to be an important opportunity for gas companies and for municipal sewer systems to cooperate in providing water for fracking, has really not come to be. Such effluent re-use is regulated by DEP as a residual waste and allowed pursuant to a general permit first issued to the Hughesville, PA sewer system, but there has been no demand for effluent by the gas companies.

While Marcellus development initially resulted in the delivery of frac water to publically owned treatment works (POTWs) for disposal, this practice effectively ended with the adoption of regulations under 25 PA Code Chapter 95.10. These regulations required, among several things, that frac water be treated so that total dissolved solids did not exceed 500 mg/l prior to discharge to surface water or prior to discharge to a municipal sewage treatment plant. Meeting this requirement is very expensive², and so expensive that only one plant is currently discharging to a municipal sewer system, and one direct discharge to the Susquehanna River is planned, both in north central Pennsylvania.

Used or frac water, or brine (the byproduct of the fracking process), is generally stored in lined, on-site holding ponds or tanks until it is hauled by truck or rail for disposal in DEP permitted facilities, or in approved facilities outside the State, or until it is recycled. Pennsylvania has five deep underground disposal wells. Most of the frac and produced water generated in western Pennsylvania is transported to disposal wells in Ohio while the same type of water in central and northeastern Pennsylvania is mostly recycled.



² Treatment steps would likely include equalization, chemical dosing, flocculation, coagulation, clarification, filtration, evaporation, distillation, crystallization, and/or reverse osmosis, before discharge. The resultant treatment by-products, the sludges, will also require disposal.



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Recycling of brine water is becoming more popular with the industry, with 90-100% of the used water currently being recycled. Disposal of any used water into surface water is regulated by the NPDES permit system. Each municipality with a wastewater treatment system must have a current NPDES permit issued by the Environmental Protection Agency (EPA) through the Pennsylvania Department of Environmental Protection (DEP). DEP monitors these NPDES permits on a regular basis.

The impact of oil and gas activity on regional waters is addressed by the DEP, and is discussed below. A WMGR123 permit is required for processing and beneficial use of oil and gas liquid waste, including flowback and produced water. A WMGR128 permit is required to make salt from flowback and produced water. Salt (sodium chloride or NaCl) is the highest concentration solid in flowback and produced water.

Water and Sewer Service in Rural Areas

Except for the very limited areas of public water and sewer service described in this Chapter, most of the Study Area is served by very small or individual water and sewer systems. The water systems that qualify as meeting a community or public water use definition threshold are required to have permits from DEP. DEP regulates all new and modified sewer systems through Act 537 and the sewage enforcement officer program. Old sewer systems, unmodified since the early 1970's, have not been permitted.

Utica Shale development should have little impact on individual sewer systems in rural areas. The question of impact on individual water supply systems in rural areas is more complicated for the many reasons stated.

RECOMMENDATIONS:

- *The region should work with DEP to fully understand all the standards for disposal of wastewater and other by-products of oil and gas from extraction activities.*
- *The region should coordinate with private frac water treatment companies and industry professionals to stay abreast of the most accurate industry needs, and ensure that industry demands can be properly managed by private and public treatment infrastructure.*
- *The region should work with the industry to continue to promote recycling of frac water.*

Water

Issues identified during this planning process relating to water supply and quality include:

- *Are local water supplies adequate to meet frac water needs?*
- *The potential for ground and/or surface water contamination*
- *The potential for natural gas migration*
- *Destruction or contamination of drinking water supply wells*

Surface Water

The Study Area lies within the Ohio River Basin. Surface waters reach the Ohio River in Pittsburgh via the Allegheny River, which drains eastern portions of the Study Area, Cherrytree Creek, Sugar Creek, and Prather Creek, which drain southwestern portions, and Oil Creek, which drains central and northeastern portions. The latter are all tributaries to the Allegheny River.

Most of the Study Area, particularly the most developed areas, are drained by Oil Creek and its tributaries. Oil Creek begins its journey at Canadohta Lake, and flows in a generally southerly direction nearly 30 miles through undeveloped woodlands (including Oil Creek State Park) and developed areas like Titusville before emptying into the Allegheny River near Oil City. The Allegheny and the Monongahela Rivers join at Pittsburgh to form the Ohio River.



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Oil Creek and its tributaries, including Church Run, which drains much of Titusville proper and enters Oil Creek near the Middle School, are classified by Pennsylvania³ as cold water fisheries (CWF) upstream of Cherrytree Run, which enters Oil Creek at Rouseville, near the south boundary of the Study Area. A significant trout population is supported, and fly fishing in the area is popular. The Allegheny River is classified as a warm water fishery, but its unnamed tributaries are classified as cold water fisheries. Similarly, Cherrytree Run, Prather Creek, and Sugar Creek are classified as cold water fisheries over most of their extent.

The quantity of water flowing in Oil Creek is measured continuously at a monitoring station in Rouseville. Median flow over 80 years of record is 496 CFS or 222,600 GPM. The watershed is mostly wooded with some agricultural cropland and some more heavily developed areas, specifically, Titusville and its suburbs. Because it is a largely rural area, human development impacts on water quality and water flow rates are minimal, but should not be entirely dismissed. For example, trees have been cut that formerly shaded surface waters; Titusville discharges combined sewage from four combined sewer overflows (CSOs) and treated sewage from its treatment plant; some individual on-lot disposal systems likely malfunction and cause localized and limited ground and surface water contamination; and stormwater discharges from developed areas and paved roads contribute heat in the summer, salt in the winter, and petroleum products from cars and trucks year-round, which would not otherwise exist in surface waters.

The area would be generally described as water rich in water quantity and quality. The CWF and HQ (High Quality) designations applied to the surface waters are reassuring given the many years in the 19th and early 20th century of unregulated oil and gas development in the area. A review of DEP's TMDL listings indicates that there are no impaired streams in the Study Area. One would conclude that the long term impacts of oil and gas drilling on surface waters will be much less than that of surface and deep mining which has impacted thousands of miles of streams in Pennsylvania.

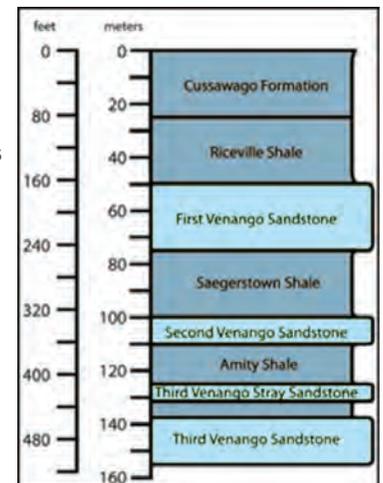
Ground Water

A brief description of the underlying geology of the area is required to understand ground water issues. The flat valley areas, closer to Oil Creek, consist of unconsolidated glacial and glacial outflow erosion products which are classified as being of Pennsylvanian⁴ and Mississippian⁵ age. The ground water is shallow, about 15 to 20 feet below the surface, and in some areas is unprotected from surface contamination sources by intervening impervious layers. The higher upland areas reflect non-glacier eroded Devonian age shales and sandstones, which have produced oil and gas since the middle of the 19th century. Shallow upland geology can be depicted as:

Shallow Geology at the Drake Well Site

The Drake Well was only 69 feet deep and penetrated the First Venango Sandstone. The other Venango Sandstones were also drilled in the following years in response to the chase for petroleum, and as technology improved to allow drilling to greater depths. The Utica and Marcellus formations are at a depth of about 6,500 and 4,000 feet, respectively, in the Study Area. Other Upper Devonian gas producing formations are of similar depth to that of the Marcellus.

Groundwater generally flows, but at a much slower rate than surface water, toward stream channels making them "gaining" streams.



³ PA Code Title 25 Chapter 93, Drainage Basin Q

⁴ Wellhead Protection Plan, City of Titusville, November 2001.

⁵ Site Characterization Report for Kwik Fill S-58 by American Environmental Associates, June 2000



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Oil and Gas Contamination of Ground Water

It has been long documented that the Study Area's shallow ground waters in the upland areas may already contain significant amounts of hydrocarbons. For hundreds of years⁶, people had known about petroleum seeps in western Pennsylvania. In fact, there is strong evidence that Native Americans, at least as far back as 1410 AD, had been harvesting the oil for medicinal purposes by digging small pits around active seeps and lining them with wood. European settlers had for years been skimming the oil from the seeps and using the petroleum as a source of lamp fuel and machinery lubrication. Drake Well only tapped the oil nearer its source. He did not discover oil, he only achieved its production more efficiently in that the ratio of oil to water essentially reversed itself from, say, 90 percent water and 10 percent oil to 10 percent water and 90 percent oil, and in much greater quantity.

The movement of liquid hydrocarbons and natural gas in aquifers is an extremely complex phenomenon, which is complicated by many factors such as heat, pressure, and size of the petroleum or natural gas molecule. It is not always predictable. Methane will be soluble in water at high pressure and lower water temperature and will only "outgas" when the pressure is reduced or the water warms. Longer chain petroleum hydrocarbons will float on the aquifer and some, like the longest chain paraffin's, will condense and clog aquifer pores at lower temperatures. Generally, however, for surface spills of liquid hydrocarbons, movement is likely to be restricted vertically to its first encounter with groundwater where it will float on and move with the groundwater. Natural gas will flow in the direction of lower aquifer pressure.

Given that petroleum hydrocarbons and ground water have long been co-produced at seeps and then naturally discharged into surface waters (hence the name Oil Creek), the question of whether new gas production, (that is, the impacts of drilling, fracking, pipeline construction, and traffic) has caused ground water to be newly contaminated with hydrocarbons and natural gas, is much more difficult to answer. Perhaps the question is really whether more or fewer hydrocarbons would now be co-mingled with ground waters.

Consideration of this concept, that the presence of liquid hydrocarbons and natural gas in ground water may not necessarily be caused by Utica Shale development, is an important one that may be known only after Utica drilling has started. This calls for extensive Study Area surface and ground water quality sampling over a number of years from existing wells, seeps, and surface waters, to establish baselines. If baselines for surface and ground waters are established, then there can be a clear understanding as to whether new drilling activities have or have not impacted those waters.

One additional comment-- It is appropriate to suggest that the City's Wellhead Protection Plan might be updated to consider shale gas development impacts from drilling, fracking, pipeline construction, and produced and frac water transportation by truck. These were not considered in the 2001 document.

Water Supply

Water used for human consumption in Pennsylvania requires a permit by DEP if the use is considered to be public or community based; no permits are required if the use is for individuals. Public water systems in the Study Area range in size from those serving an individual country restaurant to the Titusville water system, which provides water to both Titusville and Pleasantville.



The Titusville water system is sourced from ten shallow (60-80 feet deep) interconnected wells located near Oil Creek in Oil Creek Township on the northwest side of the City, south of Route 8. A 2001 Well Protection Plan⁷ states that the wells produce about 1.6 MGD on average and have a total peak pumping capacity of 5 MGD. This is discussed in greater detail below.

⁶ Sourced from and credit given to: http://www.museumoftheearth.org/outreach.php?page=s_oil_home/s_oil_s6_history/s_oil_s6_titus_1

⁷ Wellhead Protection Plan, Hatch Mott MacDonald, November 2001.



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Water supply that is not connected to the Titusville and Pleasantville water systems is sourced from springs and individual or public water supply wells on or near the development served. For example, Hydetown Park East and Hydetown Park each have a permitted public water supply system capable of serving a total of about 45 lots in the two Parks. Hydetown Elementary School also has a permitted public water supply system as does Titusville Estates. There are numerous small permitted water supply systems in the Study Area.

No attempt was made to catalog all of the permitted public water supply systems in the Study Area, but information on each is available at the DEP website⁸. All water served by permitted public water supply systems (ranging from mobile home parks to community associations to restaurants to schools) use groundwater as a source and have monitoring, reporting, and compliance responsibilities imposed by a DEP- issued permit. Many will provide water treatment in the form of UV light disinfection and little more. Sampling requirements may be limited to a single annual sample.

Individual water supply systems serving homes and non-public water use are likely unmonitored and untested. It should be noted that there is no permitting system for individual water supply wells in Pennsylvania. Some of this water may be treated, but much of it is most likely not. Surface water is used rarely, if at all, as a drinking water supply source in the Study Area.

Potential for Water Supply Contamination

As is true in all areas, surface and ground waters can be subject to potential contamination.

Surface spills can contaminate both. Malfunctioning on-lot sewage disposal systems (OLDS) can negatively impact surface and ground water through fecal contamination and nitrate migration, as can the spreading of excessive amounts of animal manure from agricultural sources. Leaks into improperly constructed water supply wells can allow surface or shallow contaminated waters into such wells. Similarly, leaks from improperly cemented oil and gas well casings (existing and new) can lead to methane gas migration into aquifers and into water supply wells.

Drilling and fracking may liberate non-target natural gas and oil in shallower formations causing it to migrate. If frac and produced water (both of which are heavier than ground water) were spilled by a truck or pipeline, it could migrate down to groundwater where they may continue to diffuse or where they might appear at a well or a spring. These risks of contamination exist throughout Pennsylvania where energy resources are being tapped and will be discussed in additional detail in the Abandoned and Orphan Well section of this study.

Impacts of Utica Shale Development

The potential impacts of ground water contamination have been discussed in the previous sections. Other impacts might include the potential for the sale of fresh water by Titusville for fracking. Such sales by municipalities have been common throughout the Marcellus Shale areas.

Research indicates that each shale well may require several million gallons of water for fracking over a several day period. Recently, a well that consumed 18 million gallons of water was reported. In eastern and central Pennsylvania, water withdrawals require permits from the, as applicable, Susquehanna or Delaware River Basin Commissions. DEP also requires a Water Management Plan from oil and gas companies during the well drilling permitting process to assure that water supplies and drinking water wells are protected from contamination and that frac and produced water are properly managed. Central clean water impoundments with pipelines to individual well sites have been increasingly used to reduce the number of truck trips carrying water to such sites.

⁸ <http://www.drinkingwater.state.pa.us/dwrs/HTM/SelectionCriteria.html>



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The City of Titusville has a Wellhead Protection Plan, which was completed in November 2001 by Hatch Mott MacDonald. The well field discussed in that plan is located in Oil Creek Township. According to the Plan:

Section 1428 of the Federal Safe Drinking Water Act (SDWA) requires each State to submit a plan to the U.S. Environmental Protection Agency (USEPA) that describe how they will protect ground water sources used by public water systems from contamination. The Wellhead Protection Program (WHPP) is a proactive effort designed to apply proper management techniques and various preventive measures to protect ground water supplies, thereby ensuring public health and preventing the need for expensive treatment of wells to comply with drinking water standards. The underlying principle of the program is that it is much less expensive to protect ground water than it is to try to restore it once it becomes contaminated. Pennsylvania's WHPP was approved by EPA in March 1999 and it is the cornerstone of the Source Water Assessment Program, which is also required under the SDWA. The Department of Environmental Protection (DEP) is the primacy agency for the Safe Drinking Water Act and the Division of Drinking Water Management in the Bureau of Water Supply Management is responsible for administering the WHPP and other drinking water source protection efforts in the Commonwealth of Pennsylvania.

The Well Head Protection Plan for Titusville⁹ identifies the three zones comprising the well field, as well as potential contaminants to the water supply. Zone 1 included area within 100-400 feet from the wellhead, Zone 2 was a half mile radius, and Zone 3 was the area contributing surface and ground water to Zone 2. (See Exhibit 5-1)

Both regulatory and non-regulatory management techniques were provided. Regulatory techniques included recommendations regarding zoning, SALDO, and other use ordinances, while non-regulatory techniques included water quality monitoring, land acquisition, easements, education, a hazardous waste collection program, signage, and school programs. A Contingency Plan for the Water Treatment Plant and an Emergency Action Plan for any contamination to the water supply were also provided in this document.

In addition, DEP has some surface water baseline data for the entire State of Pennsylvania. This information, when supplemented by additional locally-focused baseline information can help identify the migration of methane or other pollutants into the water supply system, provided that monitoring of existing systems is undertaken on a regular basis. The USEPA is in the process of doing case studies of Bradford, Susquehanna and Washington Counties regarding potential impacts of hydraulic fracking on drinking water resources. The studies are looking at stress on surface and ground waters as well as contaminants in discharges and potential air pollution.

Some counties have developed manuals to assist with testing and monitoring of water resources. Centre County has a document entitled Water Resources — Predrilling Testing and Monitoring, which is available on the County website¹⁰, then clicking on planning and community development, natural gas industry, then guidelines documents.

⁹ Wellhead Protection Plan, Hatch Mott MacDonald, November 2001

¹⁰ www.centrecounty.pa.gov/services

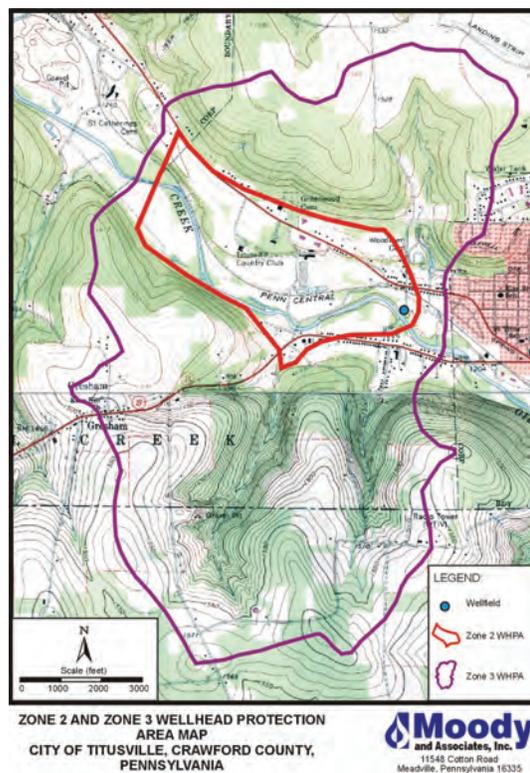


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RECOMMENDATIONS:

- Establish and map baseline data for water quality (including all streams in the area and ground water) and monitor the data regularly.
- A local watershed association, the counties, or other interest group may be willing to assume this responsibility. Reference the Beech Creek Watershed Association (Centre County) for a model program. Possible organizations include: Titusville Wellhead Protection Committee, PA Lake Erie Watershed Association, University of Pittsburgh—Titusville, DEP, and/or Crawford County Conservation District.
- Initiate coordinated planning with gas companies to discuss water system infrastructure improvements to more effectively deliver water to gas operations.
- If water systems within the study area other than Titusville do not have current Well Head Protection Plans or Source Water Protection Plans, contact DEP and work with DEP to develop the appropriate plans.
- Consider using Act 13 funds for water and sewer infrastructure improvement projects responding to gas industry needs.
- Coordinate and leverage water and sewer infrastructure projects and strategic planning efforts to leverage and support the gas industry.
- Implement or require testing measures to identify stray gas.
- Encourage municipalities to work with gas companies to understand and continue to employ Best Management Practices that help reduce undesirable impacts to public water supplies; and assign a municipal entity as the primary contact to work with the oil and gas industry.
- At a regional level, facilitate the obtaining and maintenance of baseline water quality data on private wells, and institute private well water testing standards and procedures.
- Encourage the City of Titusville to sell available water to the gas companies for fracking.
- The City should update its Well Head Protection Plan to reflect potential new impacts from drilling.

Exhibit 5-1 Wellhead Protection Area Map



Stormwater

Stormwater (an infrastructure issue and a surface and groundwater quality issue that has become more critical in recent years) is rain water and melted snow from streets, lawns, roofs, and other surfaces that generally enters the ground, is filtered, and then replenishes aquifers or flows into streams and rivers. Impervious surfaces such as roofs and pavement prevent water from naturally soaking into the ground. Instead the water runs rapidly into storm drains, sanitary or storm sewers or drainage ditches, sometimes causing flooding, erosion, increased turbidity, temperature and pH changes, and habitat impacts.

The only issue identified during the planning process regarding stormwater was that new stormwater regulations are detrimental to development. Requirements are very extensive and expensive, and discourage, rather than encourage, development that could be beneficial to the community.



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The Energy Independence and Security Act (EISA) passed by Congress in 2007 requires site planning strategies for any earth disturbance project over 5,000 square feet. State agencies of the USEPA enforce EISA in their respective states. The USEPA Office of Water has produced Technical Guidance to assist developers and property owners with site planning efforts. Strategies are suggested such as use of bioretention areas or rain gardens, storm water swales instead of pipes, use of permeable pavement in parking lots, use of cisterns for recycling of stormwater, installation of green roofs on buildings, and creation of pocket wetlands to name a few. Other low impact development and green infrastructure ideas can be found on EPA and similar websites. The focus has been to deal with stormwater where it is created.

Although these low impact development strategies may be great for the environment, they place additional expenses on developers or property owners, and add time and approval proceedings to the development process. In some cases, this is a detriment to development in general. This is especially a concern in the three-county area around Titusville, as this area contains 80% of all the wetlands in the State of Pennsylvania, according to the TCDA.

Crawford County's Act 167 Countywide Watershed Stormwater Management Plan was completed in June 2010 by HRG, Inc. It addressed all issues required by Act 167, identified the problem areas within the County (mostly flooding and erosion), and provided recommendations for future development.¹¹

Venango County also has an Act 167 Countywide Watershed Management Plan. Phase I of the Plan was completed in May 2007, also by HRG, Inc.¹² and it can be accessed on the Venango County website. Warren County also has an Act 167 County-Wide Stormwater Management Plan. Phase II was completed in June 2010 by HRG, Inc.¹³ and it can be accessed on the County's website, along with the adopting ordinance, which was adopted by the County Commissioners on July 14, 2010 and approved by DEP on September 10, 2010.

HRG also completed a Stormwater Management Implementation Guide for Municipal Officials in Crawford, Erie, Venango and Warren Counties. It explains that Act 167 requires that within six months after the adoption of a Stormwater Management Plan, "each municipality shall adopt ordinances and regulations" to regulate development consistent with the watershed Stormwater Management Plan and Act 167. The Plan provides structural and non-structural Best Management Practices and guidance for projects based on square footage. It contains application forms, sample calculations, information on credits, and sample ordinances for use by the municipalities.

As of December 2013, most of the Crawford County municipalities in the study area had adopted regulations, with the exception of Rome and Oil Creek Townships. At the time of the completion of the Venango Countywide Watershed Management Plan in 2007, none of the Venango County municipalities in the study area had local ordinances, although stormwater management was partially covered in the County SALDO. Southwest Township in Warren County passed its ordinance on March 7, 2011.

RECOMMENDATIONS:

- *Counties and municipalities should work with DEP to review the requirements of stormwater plans, and how they negatively affect development.*
- *Each County in the study area should work with its municipalities to assure that the appropriate regulations and ordinances are adopted to meet Act 167 requirements, while trying to make the compliance process less onerous.*
- *The community should be prepared to work with oil and gas companies to define, fund, design, and construct appropriate stormwater infrastructure projects to meet current requirements and facilitate oil and gas exploration and production.*

¹¹ www.crawfordcountypa.net

¹² www.co.venago.pa.us

¹³ www.warrencountypa.net



Come Back to Where It All Started...

Natural Gas

The primary issue identified during the planning process regarding natural gas as a local energy source was the need for pipeline extensions to provide service to more local customers and to get the remaining gas to the market.

The shale industry is all about producing natural gas as an alternative energy source, in an attempt to someday become energy independent from foreign oil. As businesses and residents in Pennsylvania watch and participate in the local energy boom, they would also like to benefit from its exploration and production, by having easy access to it for their homes and businesses.

The *Marcellus Shale Freight Transportation Study* explained that natural gas is carried by gathering pipelines from wells to processing and compressor stations that assist in moving the gas to larger pipelines regulated by the Federal Energy Regulatory Commission. There is the need for coordination among gas producers to collaborate and consolidate pipelines from various wells, and use common rights-of-way for major collection lines, creating redundant pipelines and multiple applications that require review by municipalities. Most of the pipelines carry the gas to distribution points, but the neighbors across the street may not have access to the gas.

Centre County believes strongly that “Rural Gasification” (similar to “Rural Electrification” decades ago) is needed including pipeline extensions to provide service to more local customers. This could go a long way as positive public relations and having the gas companies better accepted by residents. Local gas, electric, and fuel oil companies should get involved in promoting new gas systems in rural areas, working with the municipalities and economic development organizations.

Recommendations:

- A regional organization should start an initiative with local gas companies and municipalities to start a Rural Gasification program, including initial discussions with legislators.
- Priority locations for gas pipeline extensions should be planned, and funding should be sought, including the potential use of Act 13 funds for this purpose.
- Whenever pipelines are constructed, the Marcellus Shale Commission’s “Recommended Practices for Pipeline Boring” should be promoted.

Compressed Natural Gas

Natural gas as a transportation fuel has become increasingly popular over the last decade. It is not necessarily a new concept—the first CNG-fueled vehicles and early filling stations date back to the early 1900s. In 2012, there were more than 16.7 million natural gas vehicles (NGVs) in use in the world; however, only 130-142,000 of those were in the US. In addition, there were about 21,292 CNG fueling stations in the world, with less than 1,000 of them in the US.¹⁴

Less than 3% of the transportation industry in the US currently uses natural gas to fuel vehicles.¹⁵ The US lags behind the rest of the world in using natural gas to fuel vehicles, due primarily to geopolitical trade relations and a lack of investment in infrastructure. **The conditions for change, however, are very advantageous in the US at this time, and especially in Pennsylvania.**¹⁶



¹⁴ *Compressed Natural Gas in the Transportation Sector*, Heather L. Beatty, 2013

¹⁵ *US Energy Information Administration*, May 2013 (As referenced in the Heather Beatty’s article)

¹⁶ *Compressed Natural Gas in the Transportation Sector*, Heather L. Beatty, 2013



Come Back to Where It All Started...

Reasons for this include:

- World energy demands and the diminishing supply of crude oil necessitate other options to meet energy needs.
- The single fuel supply for CNG stations is domestic natural gas, which will lessen the demand for foreign oil, moving the US closer to energy independence.
- Pennsylvania is sitting on the second largest natural gas reserve in the United States—the Marcellus Shale Play, which is also the second largest in the world¹⁷ and is thus positioned to lead the nation in both natural gas reserves and CNG production. Approximately 75% of all projected Marcellus production is located in Pennsylvania. Pennsylvania also has the Utica Shale Play and other plays to provide even more natural gas.
- Diversifying vehicular fuel types will help stabilize the cost of oil and reduce dependence on it, providing greater energy security for the US.
- The US has only .05% of its vehicle inventory in Natural Gas Vehicles (NGVs), leaving ample room for growth in both CNG station production and NGV use.
- The technology is readily available and has been proven successful in various economic environments worldwide and in limited regions in the US.
- Numerous vehicle manufacturing companies already offer NGV options in the US.
- Secondary benefits from CNG usage include additional jobs and an influx of capital into the auto industry.
- Current leaders in using CNG vehicles in the US are transit companies, refuse companies, and airports. The fastest growing segment is refuse collection and transfer vehicles, while more than 35 airports in the US have NGV fleets or policies in place to encourage more use of NGVs on airport premises.¹⁸
- Growth in the CNG business has widespread trickle down effects on the local economy. Consumers are able to save 30-60% in fuel costs at the pump; increased usage will increase the demand, leading to more drilling, creating more jobs for Pennsylvanians and increased business for vendors that support the drilling industry, creating increased disposable income for vendors and consumers alike in the US and in the State.¹⁹
- The new jobs and new investment created by shale drilling and CNG production primarily impact the areas of Pennsylvania that need them the most—the economically depressed rural regions.²⁰
- NVG users will save an average of \$1.20 to \$1.30 per gallon for gasoline equivalents and even more for diesel.²¹
- Natural gas is a much cleaner burning fuel.
- NVGs have longer life spans with less maintenance.
- The commodity price for natural gas is a smaller portion of the price at the pump, creating more stabilized pricing for CNG over peaks and valleys in the commodity market.²²
- Much of the costly infrastructure for moving natural gas is already in place across the US. The CNG industry can build on that infrastructure by adding CNG stations at locations where sufficient natural gas already exists.
- Pennsylvania now has enough natural gas to become energy independent by 2035, according to BP projections.²³
- Natural gas is very efficient as an energy source, delivering about 90% of source energy to the end user, as compared to less than 30% for electricity.

17 "Ten Facts About the Marcellus Shale", October 2011, Library, Fact Sheets. May 2014 Marcellus Shale Coalition (As referenced in the Heather Beatty article)

18 About NVGs, NVG America, 2013, May 2013 <http://ngvamerica.org/about/ngv/index.html> (As referenced in the Heather Beatty's article)

19 Compressed Natural Gas in the Transportation Sector, Heather L. Beatty, 2013

20 Marcellus Shale Facts, Gregory Wrightstone, February 22, 2011, Energy Tribune May 2014 (As referenced in Heather Beatty's article)

21 Petroleum Reduction Technologies: Natural Gas Workshop, Rick Price, Pittsburgh Region Clean cities Petroleum Reduction Workshop, February 2014 (As referenced in Heather Beatty's article)

22 For Fleets, NVG America, May 2013 (As referenced in Heather Beatty's article)

23 Compressed Natural Gas in the Transportation Sector, Heather L. Beatty, 2013



Come Back to Where It All Started...

Reasons Continued:

- CNG uses considerably less water per gallon than alternative fuels, making it the least water-intensive alternative fuel.²⁴
- CNG is more environmentally-friendly than alternative fuels. According to the US Department of Energy, CNG vehicles result in the following reductions in vehicular emissions:
 - 30% in greenhouse gases
 - 30% in carbon dioxide (contributor to global warming)
 - 75% in carbon monoxide
 - 55% in nitrogen oxide (which forms smog)
 - 95% in particulate matter
 - 55% in volatile organic compounds
 - NG produces NO sulfur dioxide (which forms acid rain)
- NG produces virtually no solid waste and has much less impact on both water quality and water consumption than competing energy sources.
- CNG fuel stations are more environmentally-friendly than their liquid fuel counterparts. Storage tanks are above ground, posing no risk to ground water. If a leak occurs, the gas simply vents off harmlessly into the atmosphere.
- CNG is a renewable resource. It can be produced by using waste from landfills or farms. The methane from these sources can be converted to fuel, rather than being released into the atmosphere. Renewable Natural Gas (RNG) can be produced from landfills, agricultural waste, or other organic material that produces methane gas during decomposition. RNG addresses the expensive solid waste disposal challenge.²⁵ Several Pennsylvania landfills are already capturing methane from operations and compressing it into CNG.

There are three different types of CNG station designs²⁶:

Mother-Daughter stations, which use trailer mounted, mobile packages at several fueling sites called daughter stations. The daughter stations have smaller compressor systems and dispensing equipment. The mother station is located at a site with significant gas supply and larger compressor packages, and compresses CNG into tube trailers to be hauled to daughter stations. The capital expenditures for this system are similar to those of a large-scale fuel station.

Time-fill stations clean, dry, and compress natural gas, and distribute it directly to vehicles' onboard storage cylinders through individual fuel posts. Fueling can take up to eight hours and is often completed overnight while vehicles are non-operational. Time-fill stations are less expensive to construct than fast-fill stations because there is no on-site storage, but they have limited capacity for wide-scale use.

Fast-fill stations use high-pressure storage cylinders to hold large amounts of CNG on-site. The CNG can be quickly transferred to vehicles in a matter of minutes. This fueling experience most resembles current gas stations, and is the only model designed to handle the uncertainty of fuel demand at retail locations where vehicles arrive randomly. They are developed for use by the public and fleet vehicles that need to refuel mid-shift.

²⁴ Natural Gas in Transportation: Fueling the Future, William Freeman, Chesapeake Energy, Natural Gas Seminar, November 2012 (As referenced in Heather Beatty's article)

²⁵ Renewable Natural Gas (RNG): The Solution to a Major Transportation Challenge, Energy vision Facts and Case Studies, May 2014 (As referenced in Heather Beatty's article)

²⁶ Compressed Natural Gas in the Transportation Sector, Heather L. Beatty, 2013



Come Back to Where It All Started...

All three designs of CNG fueling stations will be needed throughout northwestern Pennsylvania and the Study Area. The ideal size for a CNG station is 4-5 acres, but stations could fit on lots as small as 2.5 acres. Site selection criteria include availability of natural gas supply, proximity to major thoroughfares, and the existence and number of fleets located in the area.

Pennsylvania has a critical need to develop a sound network of reliable, redundant, accessible, strategically-located, user-friendly CNG stations across the State. And, the US needs to build between 16,000 and 32,000 CNG stations to capture 10-20% of the market.²⁷

One of the first leaders in CNG was the Centre Area Transportation Authority (CATA), which installed its first CNG station in 1995. CATA provides over seven million bus rides each year to Penn State students and staff, commuters, and Centre County residents. In 2005, CATA completed its fleet of 64 dedicated CNG vehicles, saving \$1 million per year in fuel, after a \$2 million initial investment in CNG conversions. In addition, the University of Pittsburgh Medical Center (UPMC) replaced 20 diesel buses with 100% CNG buses in 2011 and plans to continue to purchase more CNG vehicles to upgrade its fleet.²⁸

Recommendations:

- *The TCDA should continue to work with CNG fueling station providers to construct CNG stations in the Titusville Study Area.*
- *Partners in the northwest PA region should identify sites for CNG fueling stations, and work with property owners to acquire site control. Vehicle fleets that would benefit from conversion to CNG should be identified and company owners educated about the CNG conversion process. This activity should be coordinated through a regional commission or agency.*
- *The TCDA should work with partners in the Titusville Study Area regarding conversion of vehicle fleets to CNG once the infrastructure is constructed.*



²⁷ US and Canadian Natural Gas Vehicle Market Analysis: Compressed Natural Gas Infrastructure, America's Natural Gas Alliance Report, TIAX, , May 2014 (As referenced in Heather Beatty's article)

²⁸ Compressed Natural Gas in the Transportation Sector, Heather L. Beatty, 2013



Come Back to Where It All Started...

Chapter 6

TRANSPORTATION

This Chapter addresses a multitude of potential transportation issues resulting from the oil and gas industry, and how the industry could affect local roadways, bridges and rail transportation, as well as daily traffic conditions.

Roadways and Bridges

Issues that arose regarding roadways and bridges during the planning process included:

- The destruction of roadways and bridges caused by gas-related trucks and equipment, and the costs to repair them.
- Increased traffic and congestion at key locations caused or exasperated by gas truck traffic or other gas-related traffic.
- Conflicts between gas trucks/heavy equipment and school buses.
- Danger caused by large equipment vehicles on narrow and/or winding roadways.

The *Marcellus Shale Freight Transportation Study*¹ provided a considerable amount of data regarding transportation needs and the gas industry. Although the study was written for the Northern Tier area of Pennsylvania (Bradford, Sullivan, Susquehanna, Tioga and Wyoming Counties), much of the general information is believed to be relevant to this Study Area as well.

The Study states that each new well requires water for drilling and, over a five-day period, could generate about 400 truck trips per well (at 5,500 gallons per truck). Sand for gas production is delivered by rail and then trucked to the well site, and each well may require up to 25 rail cars of sand, or 100 to 125 trucks. As the horizontal well legs grow, so too will the need for water and proppant for each well.

Obviously, so many additional heavy equipment trucks on local roadways and bridges is going to cause more damage than normal wear and tear. According to their Study, PennDOT and counties and municipalities in the Northern Tier found that roads requiring resurfacing every 15 years prior to fracking, now must be resurfaced every seven to eight years. It also stated that PennDOT Districts 3-0 and 4-0 have established checks and safeguards to ensure that roadways are safe and passable for all traffic. Centre County noted that roadway maintenance is now required more frequently than once per year until gas operations are completed, especially so that emergency vehicles and school buses are able to utilize the roads safely. After the spring thaw, Centre County stated that road maintenance was critical.

A unique problem associated with gas development and roadways was recently observed in western North Dakota (Watford and Williston) and Sydney, MT² (the Bakken Formation). In any area, roads are constructed consistent with a required level of service. In this Study Area, there are paved State highways and paved local roads maintained by the city, borough, or township government. In the townships, there are unpaved roads of differing quality of construction. Some of those roads are significantly improved over what we often call dirt roads, and some are not. The point is that they are currently suitable for the existing required level of service, and people using those roads put up with the mud and dust. Industry trucks in the Bakken Formation created significant mud everywhere when it rained and dust everywhere when it didn't.



¹ *Marcellus Shale Freight Transportation Study*, Gannett Fleming in association with Navarro & Wright Consulting Engineers, November 2011
² *Wunz Associates*, June 2014



Come Back to Where It All Started...

When the Utica gas development occurs, it is likely that pad and support sites will be accessed by travel on unpaved roads. Traffic counts will increase accordingly. Mud and dust problems may increase as a result.

Interestingly, the liability of the gas companies relative to dust and mud on trucks is limited to the condition of the trucks when the truck leaves a permitted site, either a pad or a support site. They are not responsible for mud picked up by travel on unimproved roads, and then shed on a paved road, or for the dust they kick up when on those paved roads.

Discussions with engineers experienced in permitted pad sites in WV, OH and PA confirm that the best way to address the mud and dust concern is during the permitting process. Some townships have negotiated agreements in early discussions with gas companies to heavily stone an unpaved road before pad development starts. Some roads have been tarred and chipped and a few have been paved. Local governments will need to be proactive in anticipating the mud and dust problem, just as they need to be with issues of road construction and weight limit posting. A potential solution is the use of pads made right here in Titusville³ that lay on the ground and remove dirt and mud from trucks as they drive over them prior to leaving the well site.

Traffic counts are critical to identifying problem areas and to accessing grant programs. PennDOT requires accurate and current traffic counts to improve its Systematic Technique to Analyze and Manage PA's Pavements (STAMPP) program and to update traffic projections.

There are several recommendations for assuring that roadways and bridges are safe and traffic is manageable for municipalities. Some municipalities in the Study Area have already taken some steps, including Oil Creek Township in Crawford County, which has started bonding its roadways. Under PennDOT's posted and bonded road program, heavy truck carriers are financially responsible for excess maintenance on the highways they use. PennDOT conducts a study of road capacity, and sets weight limits on those roads. Anyone who exceeds the limit must reach agreement with PennDOT to make any necessary repairs. According to the Gannett Fleming Study, the first bond in the Northern Tier had set limits (\$6,000 per mile for unpaved roads and \$12,000 per mile for paved roads). Once that bond was used, a subsequent bond could be set at any limit. Municipalities must monitor conditions of the roads and collect the bonds when damage occurs.

PennDOT has a "Road Bonding Formula" to help municipalities determine how much bonds should be for, according to Larson Design Group representatives, who also noted that from their experience, the industry generally leaves the roads in better condition than before they started work.

Weight limits have been posted on some roadways, and municipalities can work with PennDOT to do this; however, determining weight limits requires an engineering and traffic study, which costs money. After the study is completed, the municipalities must adopt an ordinance, notify heavy road users, and install weight limit signs. Arrangements are then made with heavy road users so that they can post bonds.

Road Use Agreements or Road Maintenance Agreements are being used in many of the counties in Pennsylvania. These agreements, entered into at the time of permitting, require operators to offset the predicted loss of life of roadway infrastructure. Many municipalities are using agreements in lieu of bonding, and some are using both. It was noted that some municipalities are entering into excessive road use agreements, and enacting road protection ordinances because they are less complicated than posting weight limits. Those agreements state that heavy users will repair any damage that occurs because of their use. Excessive, one-sided agreements can be detrimental to gas companies; however well-written and fair agreements are welcomed by gas companies and help companies avoid public relations issues.





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Residents in the Titusville area are used to large trucks and the delays and issues they present, due to the area's past oil history and the current logging industry. Titusville has one-way streets in the downtown and an alternate truck route, both of which help alleviate traffic and congestion problems throughout the City; however, related problems could still arise in the future.

In order to be best prepared for the potential roadway and traffic impacts related to the gas industry, the following recommendations are made:

RECOMMENDATIONS

- *A regional organization, such as the Northwest Commission, should facilitate and coordinate roadway and traffic studies in the region. Each county and municipality should work with the regional organization to develop a regional transportation plan to address oil and gas related issues. As part of these studies:*
 - Baseline roadway conditions should be documented before gas activity starts, including the monetary value of, and the estimated remaining, roadway life.
 - Baseline traffic counts should be compiled and maintained on a frequent basis to determine conflict areas, including secondary routes, and this data should be consolidated on a regional basis.
 - A Model Road Use Agreement should be drafted for use by all counties and municipalities within the region. Centre County and Bradford County both have models available on their websites.
 - Official, on-going roadway damage assessments should be planned and conducted to produce the appropriate documentation for costs.
 - Additional designated truck routes in key areas should be investigated.
 - Regional construction standards for roadways should be established.
 - Potential bottlenecks should be identified and traffic improvements to address those locations should be investigated—improvements could include traffic signal modifications and/or upgrades, the addition of turn lanes, turning radii improvements, and/or additional study.
 - The Transportation Improvement Plan (TIP) and the Long Range Transportation Plan (LRTP) for the region should be reviewed to identify opportunities to address long-term impacts from the gas industry. For example, pipeline construction could reduce heavy truck traffic significantly.
 - Projects for potential funding should be identified, and funding opportunities pursued.
 - Preventive measures regarding dust and mud should be agreed upon.
- *A proactive regional approach should be taken with PennDOT, municipalities and the gas companies to develop key corridor plans and to propose upgrades to roads that the industry will be using for years, and plan for funding, designing, and constructing improvements.*
- *Better traffic signage should be designed and installed, designating truck routes if they are determined to be needed, and the system must be enforced.*
- *As the key contact entity, the TCDA should facilitate discussions with the school district to identify bus routes, times of travel, and school calendars, and with gas companies to see if they would schedule truck trips around school schedules and/or reduce operations during school bus hours. Some gas companies have voluntarily established "black out" periods during bus hours. Vegetative or landscaped traffic buffers may also be considered for high pedestrian areas and routes to schools.*
- *The same discussions should be facilitated by the TCDA and held with the gas companies to reduce operations during peak hunting and fishing seasons in key areas.*
- *Well permits (listed on the DEP website) should be monitored by municipalities to determine where truck activity is likely going to occur; noting that truck patterns may change due to gas companies pursuing opportunities in different areas at different times, and to discuss the potential need for stoning or paving roads that they will be utilizing.*
- *Lower speed limits should be considered at major traffic conflict areas.*
- *If weight limits are placed on roadways, ensure that they are enforced and that punitive ordinances are in place to enforce them.*
- *Specific bridges and/or culverts that are critical to the shale activity should be identified and evaluated to determine if upgrades are needed or if detours should be identified.*



Come Back to Where It All Started...

Railroads

Railroads are definitely on a rebound due to the natural gas industry⁴. *The Freight Study*⁵ stated that sand for shale production is almost exclusively delivered by rail from the Midwest and is then trucked to the well site. Each rail car carries 100 tons of sand, and a single well may use up to 25 rail cars of sand. Each rail car requires four to five trucks to carry the sand to the well site. Other commodities handled by rail include pipe, cement and related materials for pad development and casing, hydrochloric acid, brine water, and miscellaneous equipment and supplies. Gas companies definitely want rail—and the closer to the well site, the better.

In the Northern Tier, railroads were expected to continue to experience about a 7% growth. The Study noted that transload facilities along rail lines are critical, so that the sand can easily be loaded into trucks. The locations of these transload facilities could significantly impact traffic flows and volumes, so locations should be well planned. In Centre County, a local business expanded its services to provide transloading services to natural gas companies, transporting sand from the railroad to the job site.

Gas activity presents many opportunities for short-line railroads, such as the Oil City and Titusville (OC&T) Lines, as well as commercial railroads. The Titusville Redevelopment Authority currently owns land along the OC&T Lines short-line railroad that could be used for sidings if/when they are needed.

The TRA should maintain a good working relationship with the Oil City & Titusville Lines, as well as commercial railroads that provide services to the area.



RECOMMENDATIONS

- The TRA property along the OC&T Lines should be reserved for potential rail sidings for the gas and/or other industries.
- The region should look at all other potential locations for rail sidings and acquire site control.
- Identify additional transload and trackage needs to serve increased natural gas activity at a regional level, and support application for funding thorough PennDOT's Rail Freight Assistance program.⁵
- Facilitate when possible transporting of pipe for pipeline construction via rail.

⁴ Bradford County Planning Officials

⁵ Marcellus Shale Freight Transportation Study, Gannett Fleming with Navarro & Wright Consulting Engineers, November 2011

⁶ Marcellus Shale Freight Transportation Study



Come Back to Where It All Started...

Chapter 7

HOUSING AND LODGING

Areas experiencing Marcellus and Utica Shale exploration and production have also experienced a myriad of housing and lodging impacts, which vary significantly from region to region, depending upon such things as: the locations of the well pads, the types of gas industry offices that are opened in the area, the phase of the drilling operation that is underway, the quantity and condition of existing housing stock, as well as many other issues.

This Chapter attempts to identify the issues and impacts experienced by other regions in Pennsylvania and then recommend strategies specific to the Titusville area based on that information.

Housing

Issues that arose regarding housing during this planning process include:

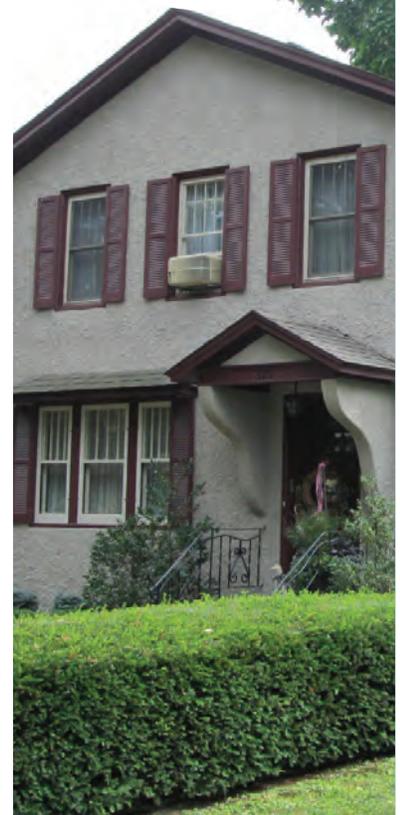
- *Lack of adequate housing, including rental units*
- *Subsidized housing converting back to market rate housing*
- *Lack of homes for emergency relocations*
- *Condition of existing housing, especially related to what industry workers expect*
- *Lack of apartment complexes with amenities such as pools and fitness centers*
- *Affordability of existing housing after gas industry workers start buying or renting homes*
- *Many young workers have no funds for down payments, no credit history, and/or cannot sell their existing homes*
- *Landlords renting to gas workers for higher rents, displacing existing renters – typically families with low- and moderate-incomes*
- *Increases in the homeless population*
- *Campgrounds and RV Parks are filling up and new ones are starting up*
- *Existing building codes and/or funding source regulations discourage rehabilitation of existing housing stock*

Supply

Many areas in Pennsylvania, especially rural areas, do not have an abundance of vacant or available housing units. Given the influx of workers with the gas industry, lack of available housing becomes a major problem. This is true for both owner-occupied housing and rental units, and for all levels of housing prices including executive homes. Existing vacant homes will be quickly gobbled up by gas industry workers, or the companies themselves to reserve housing for their workers. Most of the vacant housing units in Bradford County, as an example, are now occupied as a result of the gas industry.

The PA Housing Study¹ noted that the effects of increased housing demand are broad-based, but the negative impacts are felt the most by those living at the economic margins. The impacts are felt at all price points, but the housing shortage falls heaviest on those whose housing situation were most at risk prior to the shale industry growth, namely the non-working poor, seniors, the disabled, and the working poor. Never having extensive housing choices to start with, these groups are faced with fewer choices in most communities affected by the gas industry, often leaving them in substandard housing, couch surfing, or homelessness.

¹ *Marcellus Natural Gas Developments Effects on Housing in Pennsylvania, Pennsylvania Housing Finance Agency (PHFA) and Center for the Study of Community and the Economy, Lycoming College, October 31, 2011*





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Housing Phases related to Shale Gas Development

1st Wave - Transitory

- Hotels
- Short-term housing
- 1 Bedroom apartments
- Man camps
- Campgrounds
- Rental housing

Drillers with families

- Multi-bedroom housing- longer-term

2nd Wave - More permanent

- Longer-term rentals with option to purchase
- Newer 3-4 bedroom homes
- Upscale apartments
- Executive housing
- Amenities could include housekeeping, utilities, and on-site parking

The gas industry workers come in waves, which impacts local housing. The first wave of workers is transitory in nature. They set up the infrastructure and then move on, so they will need hotels or short-term housing, which could be one-bedroom apartments with housekeeping. Often, gas-company sponsored temporary residential facilities (“man camps”), campgrounds, and rental housing meet these needs. When the drillers arrive, they generally bring their families and will need multi-bedroom housing units for longer terms.



The second wave is more permanent in nature and includes support personnel, who may also move on, but need more diverse housing choices—longer-term rentals that they could purchase, newer three- or four-bedroom homes, or upscale apartments. If the regional offices of a gas company locate in the area, long-term housing will be needed, as well as executive housing. It was frequently noted that housing must be “move-in ready” with housekeeping, utilities, and on-site parking included.

In many instances, landlords who were currently receiving federal or state assistance to rent to lower-income families opted out of those programs for higher rents from gas industry workers, leaving lower-income families without adequate housing choices or no choice at all. The lack of adequate housing also means that housing is not available for families or individuals experiencing a housing emergency. In addition, sales of vacation homes and cabins have increased significantly in many of the tourist areas of the State, causing additional problems that will be discussed later.

The Williamsport community, which has experienced a tremendous amount of gas production, responded to the demand of the gas industry and current residents by building several hundred market-rate housing units and some low- and moderate-income housing units. Seneca Resources financed several small trailer parks for employees until they got settled and built homes. The company also contracted with local businesses to finance hotel construction.²

It was interesting to note that Washington County, which experienced a great demand for housing in 2008 and 2009, had out-of-state contractors come into town to construct both residential and industrial facilities, even some speculative buildings, and there are very few vacancies now.³

² Jack Cochran, Seneca Resources, May 9, 2014

³ Washington County Chamber of Commerce, Mary Stollar, May 6, 2014



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The Titusville Redevelopment Authority owns a site of 50+ acres with all infrastructure, except a roadway, that has been planned for 12 to 15 executive homes. There have been developers who have expressed potential interest in constructing these homes. In addition, the TCDA has potential plans for apartments and condos in the City, as well as developers who have expressed potential interest in those projects.

It was interesting to note that some counties offered incentives to developers to construct new housing or rehabilitate existing, while others felt that the demand pre-empted the need for the county to offer any incentives. No incentives were provided by Washington County to the developers that came from out of state to construct housing and industrial facilities.⁴ Depending on the goals of the municipality and the phase of gas development, incentives may or may not be needed.

Condition

The majority of the housing in the rural parts of the State (most of which are older homes) have not been updated with modern conveniences such as: open kitchen plans and modern appliances, media rooms, spacious bathrooms, pools or spas, fitness rooms, internet, or even simple upgrades; making the available supply of homes unacceptable to many gas industry workers. Lycoming County specifically experienced that gas companies and their employees, especially those coming from the south or the west, were not satisfied with the current housing stock in the County and would prefer newer housing units in move-in condition with all the modern conveniences.⁵

Affordability

Most reports indicate a substantial increase in home prices and rents when the gas industry comes to town, mostly as a result of low supply and high demand. In some instances, excessively high rents were noted. Bradford County, at the height of the gas boom, experienced rents that tripled and did not come back down, although they have since stabilized. With that upswing in rent prices, property values also increased. And even though more apartments are now available in Bradford County since the industry has stabilized, rents have not gone back down.

Williamsport reported that the gas boom created a shortage of affordable housing and that the shortage directly affected shelter programs that were offered by the YWCA.⁶ The YWCA hoped to expand by adding 30 rooms to the existing basement area.

Many of the young families in the regions experiencing drilling, as well as many of the young families coming to the area for work in the gas industry, do not have adequate funds for down payments to purchase homes; often do not have a credit history; or if moving into the area, may not be able to sell the homes from which they are moving. These issues are then made worse by the lack of housing supply, the poor condition of existing housing, and the high housing and rental prices.

Displacement

Most counties, including those in the Northern Tier, experienced some displacement of people from rental units so that landlords could rent to gas workers for higher rents. \$1700 per month for a two-bedroom, two-bath home is common. This issue was mentioned by many municipalities and was documented in much of the research. Families have resorted to couch-surfing (consistently moving from one home to another), living in their cars, camping, or living with many families in one housing unit. Increased homelessness was mentioned, but not frequently.

Centre County, on the other hand, felt no significant housing impacts, primarily because most well pads were located on the boundaries of the County, so housing was likely accessed in neighboring counties. In addition, some counties reported that lack of housing increased commute times for gas workers who found housing further from the well sites.

⁴ Washington County Chamber of Commerce, Mary Stollar, May 6, 2014

⁵ Marcellus Natural Gas Developments Effects on Housing in Pennsylvania, Pennsylvania Housing Finance Agency (PHFA) and Center for the Study of Community and the Economy, Lycoming College, October 31, 2011

⁶ <http://lycomingcounty.wnep.com/news/news/107451-county-studies-look-marcellus-shale-impacts>





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RV Parks and Campgrounds



Another phenomenon experienced by some areas with natural gas production is families or workers moving into RV parks or campgrounds for more permanent housing. In some places, RV owners are getting \$1,000/month for an RV rental, and some areas are allowing four RVs per property without a septic tank.

Bradford County experienced an influx of families and gas workers to the point that all their RV parks were filled and new ones were being developed. Although this has been a moneymaker for property owners, it has created issues with septic tanks, and most municipal zoning ordinances or SALDOs do not even address this situation. Currently, four lots are permitted on one septic tank in Bradford County, but that assumed that the homes were being used sporadically, not on a regular basis. Bradford County planners are currently making changes to the County ordinances to address this issue.

Planning

The Pennsylvania Housing Finance Agency (PHFA) has completed several studies on the impacts of the oil and gas industry on housing.⁷ Its 2011 Study with Lycoming College evaluated housing impacts in Bradford, Greene, Lycoming, Sullivan, Washington, and Westmoreland counties, which have experienced a substantial amount of natural gas exploration and production.

Many municipalities across Pennsylvania have completed housing studies for a number of different reasons, and to be eligible for a variety of funding programs. In order to access housing funds through the PA Housing Affordability and Rehabilitation Enhancement (PHARE) program⁸, some of which is designated for the needs of the gas industry, a PHARE Plan must be completed. Act 13 “specifically allocates certain amounts from the impact fee into the PHARE Fund to address the following needs:

- “Support for projects that increase the availability of affordable housing for low and moderate income persons and families, persons with disabilities and elderly persons in counties where unconventional gas wells have been drilled (regardless of production levels),
- “Provide rental assistance, in counties where unconventional gas wells have been drilled, for persons or families whose household income does not exceed the area median income,
- “Specifies that no less than 50% of the funds are to be used in fifth, sixth, seventh, and eight class counties.”⁹

Lycoming County completed a housing impact study, which included many recommendations to resolve housing issues in the County. As a result, a developer is constructing 72 units (40 affordable and 32 town homes) on a former brownfield site. In addition, 150 houses are being upgraded with PHARE funds, and 32 units of senior housing are being developed using Low Income Housing Tax Credits (LIHTC) through the PHFA. Bradford County currently has a housing study underway.

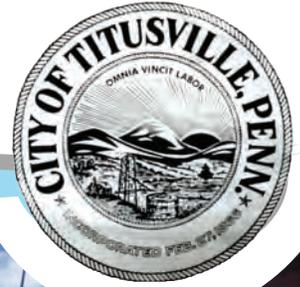
Research did not find any current housing studies for Crawford County or for municipalities within Crawford County.



⁷ Marcellus Natural Gas Developments Effects on Housing in Pennsylvania, Pennsylvania Housing Finance Agency (PHFA) and Center for the Study of Community and the Economy, Lycoming College, October 31, 2011

⁸ www.phfa.org

⁹ Pennsylvania Housing Affordability and Rehabilitation Enhancement Fund (PHARE) 2014 Plan, <http://www.phfa.org/forms/phare-plan/2014>



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Codes and Regulations

Much of the research for this project indicated that existing building codes and government regulations regarding housing grant programs make rehabilitating existing housing stock very difficult, and often unattractive to developers. Rehabilitation costs to meet these codes and regulations often exceed the market value of the housing unit, making it cheaper to build new. Although building new is one solution, leaving homes in poor condition is not always the best alternative for the municipality.

Lodging

Hotel and motels, vacation homes and cabins, and other rental facilities have become issues once the gas industry commits to locating in a region. The lack of adequate housing, and/or the need for temporary housing quickly, has placed strains on the existing lodging industry. The use of these facilities for gas industry workers often pre-empts their use by tourists, which is negatively affecting the tourism business. Furthermore, if visitors cannot find accommodations, event organizers are likely to relocate events to other locations.

Bradford County added new hotels and had one of its hotels filled to capacity for months until Chesapeake built a man camp for its workers. Lycoming County has added five new hotels. There has also been some spillover into New York State by the gas industry in the Northern Tier for temporary lodging facilities. ("Temporary" for the gas industry could be many months or years, depending on the worker's job and the phase of the drilling operation.) The Freight Study noted that lodging for tourists has been reduced because of the gas industry in the Northern Tier.

Many new hotels have been constructed to meet the needs of the gas industry; some by gas companies themselves and others by private developers. Some existing hotels have developed more extended stay facilities to address the needs of the gas industry. But there are many questions about whether counties have the resources to support the added development of hotels from an infrastructure and services perspective, as well as what happens to the hotel after the gas boom stabilizes.

As mentioned in Chapter 3, the Titusville area has three hotel/motel facilities—Cross Creek Resort, the Caboose Motel, and the Comfort Inn, as well as the Hillhurst Bed & Breakfast. It is not known if these facilities could handle the potential need for lodging facilities if/when the gas industry commits to this region, but the question needs to be pursued.

The Titusville Redevelopment Authority is currently working with private developers and hotel chains that may build new hotels in the Study Area. They could be prepared to address lodging shortages for the gas industry, as well as any current lodging shortages, in a timely manner since planning is already underway.

There are many steps that the Titusville region could take to be prepared to address potential housing and lodging impacts in the future.





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RECOMMENDATIONS

Municipalities and/or the region should prepare a PA Housing Affordability and Rehabilitation Enhancement (PHARE) Plan, which would establish a housing inventory and baseline, and identify housing needs. Specific needs for the gas industry should be addressed in the Plan.

PHARE funds, some of which are targeted to housing in drilling areas, should be pursued for critical housing projects identified in the PHARE Plan.

The TRA should continue to work with existing developers who are interested in constructing apartments, condos and executive housing within the City. Plans should be ready to go when the industry announces a commitment to the area, or sooner if the current demand requires them.

Municipalities, possibly working through a regional organization, should develop a toolbox of incentives, along with parameters for their use, to be available if/when the housing market needs to be incentivized. For example, housing grants may be needed to encourage developers, or owners of non-traditional buildings, vacant or underutilized properties, or buildings with vacant upper floors, to convert and rehabilitate the structures for housing.

Developers should be recruited to undertake housing projects such as those mentioned above or multi-use buildings that include housing, and/or convert vacant student housing to gas worker housing.

Municipalities, possibly under the overall direction of a regional organization, should work with their local banks to provide incentives for home ownership (with or without the influx of potential homeowners from the gas industry), and affordable financing for new housing construction.

A regional organization should work to match CDBG and HOME funds, as well as Act 13 Impact Fees to augment income-qualified homebuyers.

Municipalities should encourage gas companies to build company-owned housing, which often includes transportation and meals.

The TRA should continue to pursue the construction of new lodging facilities in the Study Area.

Agreements with lodging facilities should be secured to reserves blocks of rooms for non-gas-related customers during annual festivals and large tourism events.

The region should consider a land bank to purchase, rehab, and resell housing and building sites, assuming that the land bank legislation allows for the removal of liens.

A regional organization or county planning offices should work with municipalities to review and amend building and housing codes to assure that they are workable to meet the municipality's housing goals.

If additional housing is determined to be needed in the PHARE plan, subdivision(s) should be planned and engineering plans prepared for utilities and roadways so that the sites are ready for sale and new housing construction when the workers arrive.

Local housing authorities should be encouraged to explore the potential for using PA Housing Finance Agency (PHFA) funding enhanced with Act 13 Impact Fees to meet low- and moderate-housing needs.

Competitive grants for affordable housing programs should be provided to mitigate the impacts of the shale industry on affordable housing.

Public-private partnerships should always be explored to increase the housing supply.



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Chapter 8

LOCAL GOVERNMENT SERVICES

Chapter 8 addresses the impacts that could be felt by local governments when the natural gas industry begins its exploration and production activities within or near their municipalities. Municipalities in Pennsylvania have experienced different impacts on the services that they provide for a variety of reasons. Recommendations will suggest ways for local municipalities in the Study Area to best prepare for the gas industry. Issues that arose during this planning process regarding local government services included:

LOCAL GOVERNMENT ISSUES

- Increased demand and stress on emergency service providers (police, fire and EMS), who will need special training for unique kinds of potential emergencies
- Loss of personnel to the gas industry for higher paying jobs
- 911 addressing—each well pad requires a 911 address
- Additional demands on county departments providing deed and title research, GIS mapping, planning and zoning, and record storage
- Damage to local roadways, bonding of roadways, and Roadway Use Agreements
- Unplanned growth
- Increased rental housing inspections
- Hotel tax and other revenues and needed incentives

General consensus is that there will be little to no drilling within the Titusville corporate limits as there is little open space available for production activities. There may be potential for drilling near the airport, which is located in Venango County. The areas around Titusville, however, have great potential for locations of well pads and drilling activities.

Many local governments have experienced personnel transitioning to the gas industry, which paid higher wages and possibly better benefits than government. Bradford County noted that CDL drivers were the largest segment of workers leaving government for gas industry work, especially in road maintenance, forcing governments to higher younger people and raise their salaries. The Freight Study noted the same issues for the Northern Tier counties, and Bradford County mentioned that PennDOT had placed signs around the County advertising openings for CDL drivers with the department.

Emergency Services

Many of the counties and municipalities experiencing gas exploration in Pennsylvania reported that the most significant impacts on government services were on local emergency service providers. There are also general perceptions that police, fire and EMS services are busier after the industry comes to town than before, and that municipalities without police forces may need to create one. Clinton County experienced a 30% increase in the demand for emergency services. Lycoming County noted that emergency services were the most negatively impacted government service, with new challenges, new training needed, and being excluded, in large part, from receipt of Act 13 Impact Fee funds. Bradford County mentioned that more training was needed for their emergency responders.

Training is needed to learn how to deal with unique and different emergency situations, such as gas site incidents and fires, chemical releases, hazardous materials, accidental spills from surface impoundments or trucks, safety violations with trucks, and well pad responses. Larson Design Group noted that, generally, gas company operators are responsible for well pads plus 200 feet around the well pads,





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and that local jurisdictions are responsible for the areas outside the 200 foot circle. It is important that local municipalities clarify this arrangement with gas companies before they commence operations.

The Freight Study¹ noted that police and emergency responders are stretched to capacity in the Northern Tier area, and that volunteer emergency responders are responding to more incidences that require specialized training.

Act 9 requires that all well locations be numbered with a 911 address so that emergency service providers can locate the site in a timely manner. Bradford County created a special GIS layer of 911 addresses and requires that address signs be placed at each site. In the case of emergencies, gas workers can snap a photo of the sign and email it to the emergency services. Most companies in Bradford County are now asking for a 911 address when they apply for their permits. Lycoming County's Emergency Management Task Force assisted in the 911 numbering process by placing 911 addresses at well pads. All well pads now have a 911 address.

Clearfield County noted that most oil and gas companies will help train EMS providers. Clearfield has a unit at its airport—Wild Well Services. They are a military type operation, and send people and equipment to emergency sites from one of their locations in Pennsylvania or West Virginia. Then they send cargo planes from Texas to replenish anything used from the local facility. With a great communication system, they are able to know everything that is going on in the area and help instruct local fire departments. They can land at any local airport.²

Washington County noted that the industry has done a good job with emergency services and training, and that they conduct mock drills and tours of facilities on a regular basis to familiarize emergency responders with sites and situations.³

Crawford County Emergency Management Agency already has a system in place to prepare for emergencies. The Office of Emergency Services reviews emergency plans from well sites, conducts training, reviews on-site equipment, and will be undertaking exercises to prepare for oil and gas emergencies. In emergency situation, the Office of Emergency Services acts as liaison among emergency service providers, provides logistics assistance, and determines what is needed to resolve the problem situation. To date, most of their emergencies have been motor vehicles accidents involving oil and gas trucks and oil spills. Their goal is to ensure public safety, and they have been doing this for years.⁴

Geographical Information Services (GIS)

The GIS departments in most of the counties researched as part of this study generally experienced the most noted increase in workload as a result of drilling. Most counties reported that they have started to collect data and record it in their GIS systems.

Since 2008, Bradford County has been collecting a large database on natural gas information, including locations of pipelines, compressor stations, well pads, and impoundments; withdrawal permits and DEP information; locations of water lines; well production statistics; and roads that have been repaired by gas companies. Each has been added as a new layer to the GIS system. County GIS staff in Bradford County began contacting companies and started a process of communicating with company representatives on assigning addresses and street names for new gas facilities, placing signs on the sites, and providing other information to the gas companies.

Centre County also noted extra demands on its GIS and mapping department, which tracks active wells on a GIS mapping layer. They use information from the DEP website to keep their County maps current. Lycoming County Planning Department includes individuals proficient in GIS, and they have computerized land records (a process paid for with Act 13 funds).

¹ Marcellus Shale Freight Transportation Study, Gannett Fleming, November 2011

² Clearfield Economic Development Agency, Rob Swales, May 2014 www.clearlyahead.com

³ Washington County Chamber of Commerce, Mary Stollar, May 2014

⁴ Allen W. Clark, EMA Director, Crawford County Office of Emergency Services, June 30, 2014





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Clearfield County mentioned that its GIS department has the most communication with oil and gas companies, primarily regarding the 911 addressing system.⁵ Clearly, GIS is a critical element of the natural gas industry for local governments.

Other County Services

In addition to GIS services, Centre County also noted increases in deed and title office work, as well as in County administration, planning, and record storage for land warrants. Lycoming County hired a person for public safety training and an additional zoning officer as a result of increased activity from drilling. Municipalities in Lycoming County took advantage of Act 13 funds to construct needed new township facilities.

Impacts on planning and zoning were frequently mentioned and are discussed in Chapter 14. Centre County noted that there was very little impact on the County Court system as a result of the gas industry, although trained security guards often left the County to work at the gas companies for more money. Bradford County also made a point of explaining County services, departments, etc. to gas companies to ensure greater coordination and compliance.

It was noted in the Freight Study that most increases in county services resulting from natural gas activity were not supported by existing revenues, causing additional problems for those counties in the Northern Tier.⁶ Other sources mentioned the higher costs to government to provide the additional services required by natural gas activity.

Clearfield Economic Development Agency mentioned the importance of having a designated point of contact in the municipality for oil and gas companies; and the DEP has e-notices on its website that track all permits, and that this is an opportunity for municipalities to get a heads up on the designated people at the oil and gas companies. It was suggested that this website be checked daily and that outreach to the companies be done as soon as possible.⁷ It was also mentioned that there should be roundtable discussions with the oil and gas industry, municipalities, chambers of commerce, key civic organizations, and the public, on a regular basis.

Damage to local roadways owned by local governments was discussed in Chapter 6. A concern to local governments is who pays for damage to roadways and bridges, as well as any clean-up costs resulting from gas industry accidents on local roadways. The Roadway Use Agreements and bonding programs discussed in Chapter 6 address those issues.

Many municipalities and counties have experienced growth that was not planned, but resulted from the natural gas activity in the area. Of special importance are locations of well pads and rail sidings, as well as impacts on traffic, and locations of new hotels and other housing. The Freight Study mentioned that many small municipalities in the Northern Tier did not have staff to devote to develop and maintain planning and zoning documents, and that they had to rely on county or regional organizations to assist them with these types of activities. These issues are discussed in more detail in Chapter 14.

Although not mentioned frequently, increased inspections of housing has created additional burden on local governments in some areas. Those municipalities without rental inspections may determine it necessary to start a rental inspection program to assure that rental units are safe for their occupants. This may be a good area for intergovernmental cooperation.



Financing

⁵ Clearfield Economic Development Agency, Rob Swales, May 2014

⁶ Marcellus Shale Freight Transportation Study, Gannett Fleming, November 2011

⁷ Clearfield Economic Development Agency, Rob Swales, May 8, 2014



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The Economic Impacts of Marcellus Shale in Pennsylvania⁸ noted that most municipalities in the survey (74%) felt no change in tax revenues received by the municipality as a result of shale drilling. However, 23 municipalities (19%) saw an increase in revenues, especially if they had over 51 wells in their municipality. The study pointed out several issues that could have caused local wage tax revenues to not be paid to the correct municipality and recommended that more study be done.

There were initially some concerns that hotel taxes were not being collected because of the 30-day exclusion regulation on payment of bed tax. However, it appears that workers generally do not stay in the same room for a long enough uninterrupted period of time to trigger the 30-day exclusion regulation.⁹ There were also questions about which municipality receives the income tax revenue from gas workers if they are not PA residents. This issue should be discussed on regional and State levels to assure that appropriate taxes are collected.

The City of Titusville and the TRA already have incentives in place to assist businesses with expansions, or help new businesses get started. This is especially important as new businesses or expansions may be needed to meet the needs of the gas industry. The TRA has a Revolving Loan Program (RLF) in place to provide low-interest loans to commercial and manufacturing projects that create jobs in the area. The TRA is also pursuing designation of an Enterprise Zone and Local Economic Revitalization Tax Assistance Act (LERTA) to provide additional incentives.

Act 13 Impact Fee funds have been substantial for some municipalities and counties. Lycoming County created a grant program with Act 13 funds to disburse money to municipalities within the County. The County distributed \$4.7 million, leveraging \$64 million and providing money to 30 municipalities and public safety organizations. They also used Act 13 funds to computerize land records.

RECOMMENDATIONS

There are several steps that local governments can take to start to prepare for the influx of gas companies and the potential impacts that might result. These include:

Coordinate with gas companies regarding safety parameters around well pads and who is responsible for what.

Assure that cell phone service exists throughout the Study Area and require satellite phone or land line phone coverage at the site if no cell coverage exists.

As a region, work to develop training programs for emergency responders (see Chapter 12).

Develop guidelines and training manuals with and for emergency responders.

Develop requirements for emergency response plan submission by gas companies for their impact area for sheltering in place, evacuations, road closings, first response, etc. Setback or buffer requirements could be reduced if the company agrees to mitigate risk in an acceptable manner.

Assure that the 911 address system is current and mapped as a GIS layer.

Enhance existing, or add new, GIS systems to track data regarding the natural gas industry, including rig and well counts, and ownership of mineral rights.

Collect fees for data and maps required of gas companies and related parties to help cover costs.

Establish upfront communication with gas companies regarding local government services.

Refer to Chapter 6 for Roadway Use Agreements and bonding programs.

Assure that municipal plans and zoning are current (Refer to Chapter 14).

Consider a county-wide approach to rental inspection programs.

Municipalities should develop meaningful relationships with gas companies and pursue philanthropic activity and volunteer support, as there are reports of substantial charitable giving efforts by gas companies.

⁸ *Economic Impacts of Marcellus Shale in Pennsylvania*, Penn State Extension and Penn College, 2011 www.msetc.org

⁹ Clearfield Economic Development Agency, Rob Swales, May 8, 2014



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Counties and municipalities should plan for Act 13 Impact Fee usage via a capital improvements plan or comprehensive plan that identifies and prioritizes needed public improvement projects.

Municipalities should consider decreasing property taxes if/when gas revenues can compensate for lower property tax rates.

Municipalities should assure that appropriate tax and financial incentives are in place to assist new companies, or the expansions of existing companies, responding to the needs of the gas industry.

Clarify the distribution of wage taxes in regards to oil and gas industry workers.





Come Back to Where It All Started...

Chapter 9

THE BUSINESS COMMUNITY

Chapter 9 addresses those issues that could impact the business community, based on what has impacted businesses in other counties experiencing oil and gas production in Pennsylvania. The lodging industry was discussed separately in Chapter 7 because of the significant impact that oil and gas industries have on that sector of the economy. This Chapter looks at other business sectors.

Issues identified during the planning process include:

- Economic consequences on agriculture and tourism; impacting the visitor experience
- Change from amenity development to industrial development; creating an industrial landscape
- Loss of workers to oil and gas businesses for higher wages
- Available, vacant and/or underutilized sites and buildings, and brownfield sites
- Need for Compressed Natural Gas (CNG) fueling stations
- Demand for new/different and/or expanded commercial services and products; and the desire to provide services and products to oil and gas companies

Many of the counties in Pennsylvania experienced an influx of gas workers and their families from other places, often the south or west. Very few mentioned major problems with these families adapting to their new surroundings in Pennsylvania, although there were some issues.

A study done by Penn State Extension regarding economic impacts of Marcellus Shale in Pennsylvania included a poll of businesses in Bradford and Washington Counties regarding whether their sales increased or decreased due to natural gas drilling. In Bradford County 32% had annual sales increase due to natural gas drilling and 3% had a decrease. In Washington County, 23% responded that their sales increased, and only 2% said that their sales decreased.

Of those businesses responding that their sales increased, 80% were hotel and campground owners, 35% were in construction, and 30% were in transportation, communications and utilities.¹

Clearfield County's experience notes that local businesses and the workforce need to understand work ethics and hours of operation for the gas industry—they are not the standard. Businesses need to be customer friendly and provide 24/7 service. For example, it costs \$300,000-\$500,000 to operate a rig for one day. If a part breaks, they need to have it fixed quickly. Local businesses need to be responsive to this need or they will be blacklisted by oil companies. There is a "green list" of companies that provide excellent customer service within the gas industry. Companies should understand that they will be well compensated for providing excellent services to gas companies.²



¹ *Economic Impacts of Marcellus Shale in Pennsylvania, Penn State Extension and Penn College, 2011*
² *Clearfield County Economic Development Agency, Rob Swales, may 8, 2014*



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Agriculture and Tourism

One report indicated that gas extraction will create a “boom-bust” economic development pattern as seen in many resource rich regions and countries. This report states that shale gas drilling in states like Wyoming, Texas, and Pennsylvania have had serious economic consequences for adjacent industries like agriculture and tourism, because of the widespread industrial activity that accompanies drilling.³

That report also discussed the potential impacts of gas drilling on tourism in the three-county region serviced by the Southern Tier Central Regional Planning and Development Board (STC). The tourism brand for this area is intertwined with agriculture, rolling hills, scenic farms, rural vistas, and viticulture. The Finger Lakes wine industry is becoming one of the most popular wine destinations in the eastern US by capitalizing on similar amenities. Growing the tourism industry should be a key development strategy for the STC region for future decades. However, some of the concerns regarding the impacts on tourism include:

CONCERNS REGARDING TOURISM

The strain on the available supply of hotel/motel rooms, RV parks, campgrounds, and other short-term accommodations—making it difficult for tourists to find accommodations

If additional facilities are built, will there be a glut of corporately-owned hotels when the boom is over

The permanent resident exclusion in the state and county room tax legislation

Negative visual impacts

Truck traffic

Degradation of the visitor experience

Impacts on native habitats and ecosystems, streams, lakes and water resources—negative impacts on outdoor amenities

Impacts on the labor supply

These concerns are being addressed within this report, based on experiences from counties who are already in the midst of oil and gas production.

In order to evaluate the impact on agriculture or tourism, baseline data is needed for an accurate analysis. Various efforts have been undertaken or enhanced to preserve the agricultural areas and tourist attractions, and to preserve the natural assets that have attracted visitors to the area. It should be noted, however, that many farmers are interested in locating wells on their property to enhance their farm income.

One negative impact of the oil and gas industry on tourism that was mentioned was the decrease in the number of hotel rooms typically available when tourism or special events were underway. This was discussed in Chapter 7. Washington County experienced problems with the August Pony League playoffs, when lodging became a critical issue; and, of course, everyone is familiar with the similar problems that Williamsport experienced with the Little League National Championship games.

There was also concern that the rural, forested landscape would be transformed into an industrial landscape with oil rigs scattered through formerly pristine vistas. Several measures have been taken by counties to assure that this impact is limited, including adopting specific setbacks, requirements to plant trees around well pads, special considerations in locating well sites, and other steps negotiated with the drilling companies.



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Personnel and Wages

Some of the businesses in the counties experiencing oil and gas production mention that their workers had been recruited for oil and gas industry jobs due to higher wages and better benefits. Lycoming County officials noted, however, that awhile after this happened in their county, many workers went back to their former jobs (even for less money) because the 24/7 work schedule of the gas industry was too taxing for them, with 12-14 hour days being very common. Gas employment in that county has now stabilized.

Clinton County experienced a 48% increase in employment as a result of the oil and gas industry. In other counties, only minimum wage jobs were increasing in service businesses. Core industry jobs in the oil and gas industry average \$90,000/year, more than \$40,000/year higher than the PA average; and ancillary or supply chain jobs average \$65,000/year, more than \$17,000 higher than the State average, obviously the major factor in the loss of jobs to gas companies.⁴



Sites, Buildings, and Brownfields

Bradford County noted that existing, vacant buildings were rented very quickly and that land within development corridors with existing water and sewer were/are the most desirable sites. In addition, an old rail yard was converted and reused for new enterprises. Centre County mentioned several potential gas-related businesses that could locate on brownfield sites, which are often difficult to convert to alternative uses, including sand depots, gravel yards, pipe coating companies, railroad depots/yards, mud plants, frac water recycling facilities, engineering firms, seismic testing surveyors, water and air quality testing firms, gas field service companies, and other businesses.

Generally, oil and gas companies are interested in flat sites with easy access to highways to store equipment and materials. In some areas, the private sector built industrial and business parks to meet oil and gas industry needs and most are now built out, according to Larson Design Group. Having a current inventory of available sites and buildings was often mentioned as being critical, although Centre County was not sure if its inventory was used in any instance for a property sale to a gas company, although the usefulness of the inventory for other purposes was noted. Other counties found the having such inventories readily available was extremely useful. The Titusville area is linked to the State's website, which has an inventory of available sites and buildings, and a City inventory is kept current.

Retrofitting of vacant buildings to meet the needs of the gas industry, ancillary services, or expansions of local businesses to meet the needs of the gas industry was often noted as being extremely beneficial. Companies are looking for "move-in" office space, generally on the outskirts of town for yards where they will not disrupt others with their 24-hour operation.⁵ The Titusville Community Development Agencies' Towne Square Building has office space available in an incubator format. Office spaces from 1100 square feet to 2700 square feet are available, and several ancillary gas businesses have already located in Towne Square. Additional improvements to the facility are planned, including a courtyard and direct access to a parking area behind the building.



⁴ MSC Fact Sheet

⁵ Seneca Resources, Jack Cochran, May 2014



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The Titusville Redevelopment Authority owns the Titusville Opportunity Park and has been retrofitting old industrial buildings for current uses. A recent grant will enable that activity to continue, providing available space for oil and gas industries, ancillary companies and related businesses.



CNG Fueling Stations

As the natural gas industry continues to thrive in Pennsylvania, it becomes more and more important to provide the infrastructure to allow residents to utilize this asset. One critical element of that infrastructure is Compressed Natural Gas (CNG) fueling stations. The CNG Focus Group is promoting CNG as vehicle fuel and the trend has been catching on, especially in the past two years.

Range Resources, as an example, recently purchased a fleet of CNG pickups (180 trucks) from Chevrolet and Chrysler. They are expecting a two-year payback. CNG is \$2.00 per gallon. Italy's FIAT is the largest producer of NG vehicles, and they own Chrysler's Group Fleet.⁶

The TRA is working with CNG fueling station providers and has identified sites in the community for fueling stations. It is imperative that other counties and the State promote CNG as vehicle fuel as well. School districts, State government agencies, local governments, hospitals and large companies could convert their fleets to CNG, saving money while promoting the local economy.

A more detailed discussion of the potential for CNG fueling stations is included in Chapter 5.





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New/Different Services and Products

New businesses, services, and/or products that were noted as being needed, in addition to housing and lodging (discussed in Chapter 7), include:

NEW BUSINESSES, SERVICES OR PRODUCTS

Medical services (discussed in chapter 11)

Education and training (discussed in chapter 12)

Financial and legal services

Retail

Recreation and entertainment

Spousal employment

Equipment storage

Staff recruitment and training

Engineering and surveying

Transportation and logistics

Provision of frac sand, cranes, and rigging

Roads and earthwork

Wastewater processing and water resources

Pipeline connections

Permitting and regulatory compliance

Equipment maintenance

Drilling/fracking

Land leasing

Seed and fertilizer sales for site reclamation

Geologic data

Companies that use natural gas as feedstock—chemicals, life sciences, and pharmaceuticals

Obviously, a wealth of opportunities exist for local Titusville Study Area businesses and residents.

It was often noted that more upscale stores, home décor and furniture stores, Mexican food, pre-packaged sandwiches, barbeque and varied food and beverage menus were needed. Expanded clothing lines to include fire retardant and other safety clothing, as well as Red Wind shoes, that are required of oil and gas workers. Extended restaurant and store hours, expanded menus in restaurants, food wagons, and limited machine usage at laundromats were all mentioned as being issues of concern. Also, encouraging gas companies to buy supplies and products from other local companies is critical to increasing revenues and enhancing the local economy.



The Lycoming Chamber of Commerce was very proactive in dealing with the new and different needs of the oil and gas industry. Eighty (80) businesses either started up or expanded in the county, and downtown Williamsport experienced extensive revitalization. New high-end housing was developed on the second floors of buildings in Williamsport's downtown, providing much-needed housing and aiding in downtown revitalization. Bradford County noted that more new cars were being purchased and driven, and more improvement work was being done on homes in the area.





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There are numerous examples of companies that started up to provide a service or product to the oil and gas industry, or that expanded their current operations to meet a new or different need. One Centre County company expanded to manufacture rental housing units for gas companies to house their workers. Another local wood furniture company started making modular bunks and desks for the rental housing units. A company in Bradford County started to manufacture and repair drill bits, a critical element of the drilling process.

In Clinton County, commercial construction other than hotels rose 30%. Financial businesses, retailers, restaurants and bars, wholesale trade, business services, and tourism businesses all saw increases in sales in Clinton County.

Bradford County suggested that continued growth in ancillary activity should be anticipated, including power and alternative fuel (Compressed Natural Gas [CNG] and Liquefied Natural Gas [LNG]), and extension of utility grade service to communities that do not have natural gas at this time. Smaller power plants may also be developed to provide power to municipalities—this should be a discussion point with the gas companies.

Titusville has two local companies, Oil Creek Plastics and Charter Plastics, Inc., that have grown substantially over the years providing polyethylene pipe to a variety of users. Charter Plastics is a manufacturer of high density polyethylene (HDPE) pipe for potable water, reclaimed water, wastewater, geothermal, irrigation, and a variety of industrial applications, including the natural gas industry.⁷ Oil Creek Plastics is a leader in the industry of polyethylene piping systems, producing pipes used in a number of industries. Their product lines include water, radiant heat (HEATFLEX), gas, geothermal, irrigation/swing, and LPG service.

The Ben Franklin Technology Partners and the Shale Gas Innovation and Commercialization Center (SGICC) have worked with numerous individuals and small companies to commercialize ideas and obtain patents for new products that service the oil and gas industry, and they encourage more of this type of activity.

Ben Franklin Technology partners/CNP is an initiative of the Pennsylvania Department of Community and Economic Development (DCED), and is funded by Ben Franklin Technology Development Authority. It provides investment capital, operational assistance, and entrepreneurial support to emerging tech-based companies and small, existing manufacturers to retain or create jobs in the State.⁸

The SGICC was awarded a grant by DCED through the Discovered in PA, developed in PA (D2PA) program to provide seed grants to stakeholders to advance the commercialization of shale energy focused technology, product, or service; and to identify bottlenecks slowing the growth and economic impacts of the shale energy play within the State.

Ben Franklin and SGICC identify innovations primarily through an annual innovation contest, which is in its third year. This year there were 80 submittals competing for four awards. Submittals are from small companies and individuals who are persistent in bringing their product to market. At times, the sponsors, who are also judges, may take on some of the projects, or form direct relationships with the winners.

A good example of a local company that has expanded to meet the needs of the oil and gas industry is AlturnaMats. AlturnaMats is the world's largest manufacturer of ground protection mats, which protect the turf from heavy vehicular traffic. Use of these mats eliminates damage to lawns, landscaped areas, or natural ground areas such as the forests or agricultural lands that are being traversed for construction of oil and gas wells. The mats are easy to

use and lock into place to create a continuous path or a base for drilling rigs, as examples. Made of recycled polyethylene, they are virtually indestructible under vehicle weights up to 120 tons. They can bend without breaking and have been tested under record heat and cold conditions. Plus, they are ideal for removing dirt and gravel, which is important when trucks leave gas well sites and drive through communities, and for temporary roads, allowing trucks and equipment to access areas that might otherwise be difficult due to wet and/or muddy terrain.⁹

PREP (Partnerships for Regional Economic Performance) is a statewide network of partners designed to work in concert to deliver vital business assistance services across ten regions of the commonwealth. Local and regional PREP partners have the experience and know-how to assist individuals who have an



⁷ <http://charterplastics.com>

⁸ <http://www.sgicc.org>

⁹ <http://www.alturnamats.com>



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idea and need help with the basics of starting a new venture. PREP also meets the demands of existing companies that seek assistance in all aspects of successful business development and growth.

The PREP network¹⁰ consists of hundreds of trained and experienced experts who can offer assistance and resources. PREP partners provide one-on-one counseling, specialized workshops, online training and financial incentives making it one of the most coordinated and respected networks in the nation designed specifically to meet the needs of our job creators — the men and women who start and grow our businesses. PREP makes it easier to learn what public and private sector resources can be quickly harnessed to meet individual and company needs. Their coordinated network can quickly analyze needs, formulate a plan and assemble a team to put that plan into action.¹¹

Through funding from the Small Business Administration (SBA) and coordination with the Northwest Commission, a company called Entworks is completing a study on the gas industry supply chain to identify potential companies, products and services that will likely be needed as a result of the oil and gas industry in this region. A report is being prepared in mid-2014.

RECOMMENDATIONS

Establish baseline data for agricultural and tourism assets, including revenues generated and jobs created, as well as non-monetary assets, and develop strategies to protect them.

Work with local planning groups to assure that measures are in place to protect natural assets, agricultural land and tourism venues.

Develop innovative local programs to incentivize local businesses to pay higher wages and/or offer better benefits to retain workers.

Encourage local property owners to retrofit and rehabilitate vacant and/or underutilized buildings to prepare for new tenants.

Identify brownfield sites and advocate redevelopment by assuring that zoning is proper for redevelopment, infrastructure is in place, environmental due diligence has been completed, the sites are prepared for re-use, and the owners are willing participants.

Maintain a current inventory of sites and buildings, including brownfield sites.

Continue to work toward developing a public/private partnership to build and foster large, multiple vehicle CNG fueling stations.

Start a “Buy Local” campaign with gas companies, and educate them about what is available locally; this could include bulk purchasing incentives.

Working with the Titusville Area Chamber and successful businesses in other counties, organize workshops to educate local businesses on how to prepare for the influx of gas industry workers and their families, and train them to take advantage of the industry—in terms of extended store hours, expanded menus and product lines, recruiting new businesses or expanding existing businesses to sell new products or services, changing their business models to reflect new markets, etc.

Sponsor economic development workshops with Ben Franklin Technology Partners and SGICC to encourage entrepreneurship and new product development related to the gas industry, and participate in the Business Energy Roundtable, which connects businesses with opportunities.

Continue to pursue ancillary gas businesses, support companies, and businesses that use gas as feedstock for the community, and continue to participate in gas trade shows.

¹⁰ Northwest PA PREP Partners include: The Northwest Commission, Clarion County Economic Development Corporation, Economic Progress Alliance of Crawford County, Develop Erie, Erie Regional Chamber and Growth Partnership, Forest County, Lawrence County Economic Development Corporation, Penn-Northwest Development Corporation, Oil Region Alliance of Business, Industry and Tourism, Warren County Chamber of Business and Industry, Catalyst Connection, NR IRC, Clarion University SBDC, Duquesne University SBDC, Gannon University SBDC, NWPA Workforce Investment Board/Partners for Performance, West Central Job Partnership, Ben Franklin Technology Partners, Governor's Actions Team and Northwest Pennsylvania Incubator Association.

¹¹ www.newpa.com/business-assistance/prep-regions



Come Back to Where It All Started...

Chapter 10

THE ENVIRONMENT

This Chapter deals with various issues that could affect the environment if the oil and gas industry does not undertake proper procedures and precautions. The counties in Pennsylvania that have experienced oil and gas exploration and production have not experienced critical environmental problems. There have been some problems in the past, of course, but most have been adequately resolved and steps have been taken to prevent similar situations from occurring in the future. Issues that were mentioned during the planning process include:

Environmental Issues

- Forest fragmentation, habitat disturbance, and ecosystem diversity
- Damage to historic or scenic sites, fisheries, rail trails, state forests, aesthetics, view sheds, rural landscape, night skies, etc.
- Abandoned, undocumented, or orphan wells
- Air quality
- Noise and light pollution
- Impacts on floodplains and wetlands

Since 2008, natural gas production in Pennsylvania has increased exponentially as a result of unconventional drilling techniques such as hydraulic fracturing and horizontal drilling. In addition to energy security, this industry is providing national security, less dependence on fossil fuels from other parts of the world, less expensive energy costs, and improvements to air quality as a result of increased use of cleaner burning natural gas.

The key agency in Pennsylvania regarding environmental issues is the Department of Environmental Protection or DEP. DEP's mission is "to protect Pennsylvania's air, land and water from pollution, and to provide for the health and safety of its citizens through a cleaner environment. (We) will work as partners with individuals, organizations, governments and businesses to prevent pollution and restore our natural resources." As the general protector of our environment, DEP plays a critical role in identifying and addressing impacts from oil and gas exploration and production activity.

DEP is responsible for ensuring that well sites are operated in a manner that is safe for citizens and protective of the environment. As such, DEP plays a critical role in the oversight and regulation of the oil and gas industry across the State. DEP issues the permits that are required for the construction and operation of oil and gas wells, and is the primary agency responsible for inspections at well sites.

The Public Utilities Commission (PUC) and the Federal Energy Regulatory Commission (FERC) also have specific roles regarding inspections of natural gas activities in Pennsylvania. While DEP is responsible for inspecting the construction of natural gas "gathering" lines, PUC is responsible for safety inspections of **intrastate** natural gas transmission lines that carry natural gas to local markets, and FERC is responsible for inspections on **interstate** natural gas transmission lines that move natural gas to regional and national markets.¹



¹ 2013 Oil and Gas Annual Report, PA DEP, Office of Oil and Gas Management, 2014 <http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-100389/2013%20Oil%20and%20Gas%20Annual%20Report%20with%20cover.pdf>



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It is interesting to note that Pennsylvania is recognized nationally and internationally for developing and implementing a successful regulatory approach to the oil and gas industry that protects the environment and citizens, while providing a climate for optimal development of oil and gas resources. DEP's Office of Oil and Gas Management has met with representatives from countries around the world who are interested in learning more about DEP's programs and practices, so that they might implement similar measures.²

Forest fragmentation, etc.

Even with DEP's monitoring and regulation, the environment can still be impacted to some degree. Forest fragmentation was discussed at length in Centre County, where an entire chapter of its Comprehensive Plan was dedicated to forests, addressing potential fragmentation and a variety of solutions and steps to control problem areas. The Plan includes alternative solutions such as forest zoning, ridge top protection overlay zones for slope management, scenic view overlays for view shed preservation, open space/cluster development, riparian buffers, lot averaging, vegetation management and conservation, conservation easements, woodland legacy planning, greenway planning, and the Clean and Green program.³ These alternatives can be viewed in the



Some counties have actively involved their Conservation Districts, and/or other groups to analyze issues and develop strategies to prevent potential negative impacts. Lycoming County's Conservation District is very active and successful in funding projects with gas companies and watershed groups to preserve or protect certain areas or assets.⁴ Larson Design Group mentioned that some areas are working with the National Wild Turkey Federation and Trout Unlimited to protect habitats and fisheries. They also mentioned that the Marcellus Shale Coalition is actively involved with these groups, as well as local groups to protect natural assets.⁵

DEP's Office of Oil and Gas Management's 2013 Annual Report on the oil and gas industry presents statistics on environmental issues related to unconventional drilling. In that report, Secretary Abruzzo notes the "steady transformation of this State into the second largest natural gas producing state in the nation," and mentions the new jobs, and new economic development and growth resulting from the oil and gas industry, and that this industry is providing energy security to our nation.

Undocumented, abandoned, and/or orphan wells/Stray gas migration

Chapter 3 discusses this subject in detail, and includes information obtained from DEP officials in Meadville⁶ and in the 2013 Annual Report.⁷ Undocumented, abandoned and/or orphan wells are critical issues with the oil and gas industry, as they can negatively affect the environment. DEP has a specific division for "Well Plugging and Sub-Surface Activities", which is responsible for the management of subsurface oil and gas related services and activities. This division maintains and implements the Orphan and Abandoned Well Plugging Program. The Northwest Regional Office in Meadville is knowledgeable about this subject and is involved in documenting and



² 2013 Oil and Gas Annual Report, PA DEP, Office of Oil and Gas Management, 2014

³ Centre County Comprehensive Plan <http://centrecountypa.gov>

⁴ Lycoming County Planning and Community Development Department, February 2014

⁵ Larson Design Group, Marty Muggleton and Robert Tellish, March 2014

⁶ Gary Clark and Rich Neville, NW District Office of DEP, Meadville, July 1, 2014

⁷ 2013 Oil and Gas Annual Report, PA DEP, Office of Oil and Gas Management, 2014





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plugging wells in the Study Area.

Undocumented or orphan wells that are not properly plugged could “communicate” with new unconventional wells being drilled, causing the migration of gas or acid water discharge into ground water, surface water, or water wells. This migration often results from poorly constructed casings.

Wells drilled before 1985 are likely not properly plugged. Often, the locations of wells are not known. As abandoned wells are discovered and reported, they are documented by DEP and placed on a list and prioritized for plugging. The cost of plugging wells is significant, varying from \$7,000 to \$100,000 in rare instances. Costs are very site specific. DEP generally walks the sites to determine potential costs and issues prior to prioritizing them.⁸ In a good year, DEP manages to plug about 200 wells, while most years that number is fewer than 100. Most of the wells being plugged are in Venango, Warren, Forrest and McKean Counties.

When an owner of an undocumented well is known to exist and is identified, he or she is legally responsible to plug a well if it is no longer producing oil or gas effectively or as intended, or if it has been abandoned. If no known owner exists, those wells are placed on DEP’s list of orphaned and abandoned wells, inspected, and prioritized for plugging. After plugging, DEP routinely follows up to ensure that the wells are plugged according to regulatory requirements.

If oil and gas wells are not constructed or operated properly, there is a potential risk for natural gas to migrate into the well bore or into geologic strata or groundwater. The operator is required by law to correct or mitigate any “stray gas” migration situations. There are several cases of gas migration each year, mostly from shallow wells, although there have been none in the Titusville area. The number of stray gas case investigations by DEP has decreased significantly since 2010, from over 40 in 2010 to only 10 across the State in 2013.⁹

Natural gas is colorless and odorless. Common indicators suggesting potential gas migration include tiny bubbles or effervescence in tap water, or the sound of knocking in a water well that results when infiltrating gas disturbs the well pump.

Pennsylvania Oil and Gas Regulations¹⁰ provide specific requirements for oil and gas well construction, including what operators must do if a gas migration incident occurs. DEP strengthened these regulations, and placed many of the responsibilities of investigating stray gas incidents on the oil and gas companies. DEP intends to further strengthen these regulations in 2014.

The Oil and Gas Act of 2012 holds the unconventional well operator responsible for water supply pollution if the source is within 2,500 feet of the unconventional well, and when the pollution occurs within 12 months of the unconventional well being drilled, stimulated, or completed. The operator must restore or replace the affected water supply with an alternative source of water, unless he or she can prove that the pollution was not caused by their actions.¹¹

Air, noise and light pollution

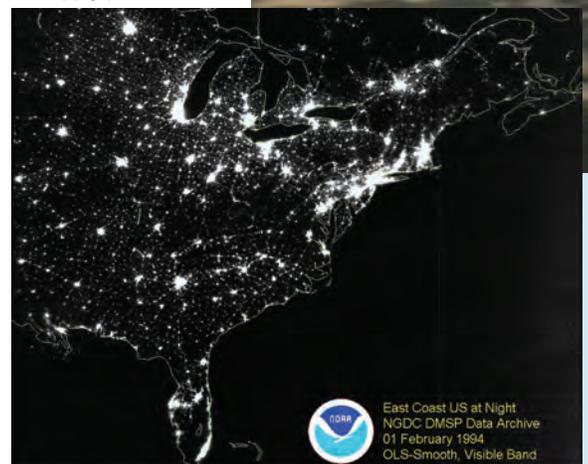
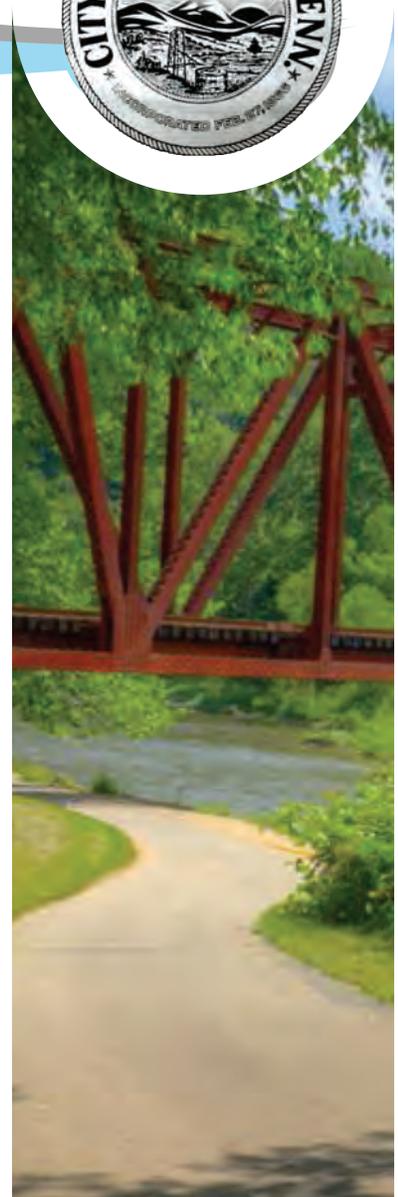
Fort Worth, Texas has established setbacks to regulate the drilling industry within the City, and requires a noise management plan for each well. Nighttime activities are limited and activities on Sundays are prohibited, except for mobilization, demobilization or advancing the bore hole. The City also requires that landscaping along public-rights-of-way be installed within 180 days of the first well and around all fracture ponds. If planting of trees is impractical, companies may make payment into a tree fund.¹²

⁸ Gary Clark and Rich Neville, NW District Office of DEP, Meadville, July 1, 2014

⁹ 2013 Oil and Gas Annual Report, PA DEP, Office of Oil and Gas Management, 2014 10 25 PA. Code, Chapter 78, Subchapter D

¹¹ 2013 Oil and Gas Annual Report, PA DEP, Office of Oil and Gas Management, 2014

¹² <http://fortworthtexas.gov/gaswells>





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In Lycoming County, the Responsible Drilling Alliance has partnered with the county to establish a balance between the two sides of the drilling issue. Some local governments have required gas companies to enclose compressor stations in structures to reduce noise and visual pollution, and others have required noise management plans with locally-established noise levels. Still others have suggested limiting night time activities and hours of operation to prevent noise and light pollution and disruption of night skies.

Floodplains and Wetlands

The research conducted as part of this study and the many interviews with counties and other experts in Pennsylvania did not reveal significant concerns regarding impacts on fishing and boating, parks and recreation facilities, or floodplains and wetlands. Most county Stormwater Management Plans, which were discussed in Chapter 5, address the potential impacts of industrial uses, such as the oil and gas industry, on existing floodplains and wetland. In the Titusville area and other areas of northwestern Pennsylvania, Stormwater Management Plans are known to be so stringent as to substantially increase the cost of development, which can be a deterrent to economic development and new job creation.

RECOMMENDATIONS:

Inventory community environmental assets and establish baseline data.

Work with planning organizations, local governments, and gas companies to establish parameters for the gas industry (as permitted by law), such as:

- *Payments into a tree fund when planting of trees is not practical.*
- *Camouflaging of well sites and quick restoration when completed.*
- *Enclosing compressors in structures to reduce noise and light pollution.*
- *Requiring noise management plans and establishing noise levels.*
- *Limiting night time activities and hours of operations.*
- *Adopting setback standards.*
- *Requiring buffering, fencing, landscaping, screening, and/or sound barriers.*

Continue to follow DEP guidance regarding air quality testing for baseline and regular monitoring; and continue to work with DEP on air quality issues.

Pursue relationships with national organizations and local environmental groups to prepare strategies to preserve and enhance environmental assets.

Encourage oil and gas companies to address new regulations regarding identifying and locating abandoned, undocumented or orphan wells and work with DEP and the county GIS departments to record them on their GIS systems.

Facilitate educational sessions with DEP and property owners regarding undocumented wells in the Study Area. Encourage private property owners with undocumented wells on their properties to identify them and report them to DEP and the County GIS departments.





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Chapter 11

HEALTH AND SAFETY

Public health and safety issues were identified in most of the counties that were interviewed for this study, and were abundant in the extensive amount of research undertaken to identify potential impacts for the Titusville area. Issues ranged from public education and awareness to social services, crime and other safety concerns, medical services and facilities, and orphan wells, to name a few. Specifically, the following issues were presented during the planning process:

HEALTH AND SAFETY ISSUES

Assuring that the public is aware of what was happening with the gas industry, and that facts are presented to counteract possible false information

Assuring that social and recreational services are available to new workers and families

The likelihood of increases in crime, substance abuse, vehicular accidents especially with gas industry trucks

The need for documentation and closing of abandoned wells

Capacities of local hospitals, especially emergency rooms (ERs), and the availability of family physicians

Dealing with potential well-site accidents

Public Education and Awareness

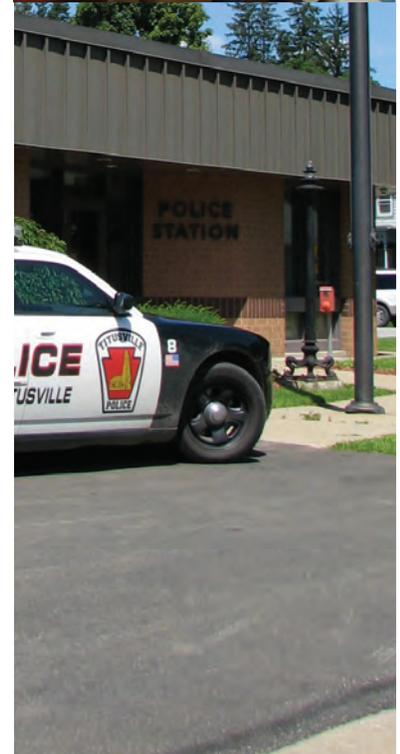
The research convincingly proves how critical it is to keep the public aware of what is happening related to gas exploration and production, and to assure that the CORRECT information is dispersed to the community. Misinformation and bad or inaccurate information creates unnecessary problems for the gas companies, local governments, economic development groups and the general public, and it was generally agreed that there is a lot of misinformation out there.

Lycoming County has taken several steps to educate the public and keep them aware of what is happening locally with the gas industry. A Neighborhood Improvement Program Task Force completed a tremendous outreach effort as part of a 12-month housing study that reached a large percentage of residents and resulted in several housing projects being undertaken. In addition, the County submits completed and noteworthy projects for awards, and uses the awards as opportunities to tell the gas industry story in a positive manner.

Lycoming County brought in Thomas Committo Associates to hold workshops on what needs to be done to prepare for the gas industry, and LCAT TV regularly presents information related to drilling. County officials make a point of having the Planning Commission at all public meetings and staff members listen to and communicate with the public at these meetings. All County Commissioner meetings are well covered by the local newspaper, and Planning Commission staff members are there to discuss the status of current projects. Planning staff spend a lot of time in the field working on projects and educating people and municipalities about what is happening.

Bradford County published a Data Resource Book in 2008 that showcases community assets and is geared toward gas company officials, workers and families. The County also publishes a Natural Gas Primer and a Community Guidebook for Natural Gas Development, and maintains a Natural Gas Production Map identifying gas-related activities in the County. This information and more is available on the Bradford County website.¹

¹ www.bradfordcountypa.org/natural-gas.asp





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Centre County has also prepared numerous documents to assist property owners and municipalities with gas-related issues. Examples include: NG Lease Considerations, NG Seismic Considerations, NG Pipeline Considerations, Alternative Fuel Considerations for Fleet Applications, Predrilling Testing, and Monitoring of Water Resources. These documents and more are available on Centre County's website.²

Bradford County officials noted that the *Marcellus Observer* series contains a one-page description of the permitting process within the County, and that the Penn State Cooperative Extension has published numerous brochures on gas-related issues, and they are all on the Extension's website.³

Larson Design Group professionals⁴ mentioned that task forces can be used to "calm the waters" by educating stakeholders about the true facts related to the natural gas industry. Many gas companies do promotional and marketing ads to try to educate the public about the industry. Tours and presentations have been offered by Larson Design Group and many other professional organizations involved in the exploration and production of natural gas to continue the educational process.

Recognizing the impacts on the economy in Washington County, a bank, the County commissioners and local businesses formed the O&G Expo to educate residents regarding oil and gas exploration, regulating leases, royalty payments, etc. They then began having the Expo with oil and gas companies and vendors to help educate the community. Although this effort was very valuable in the beginning of the oil boom in the County, it is less valuable now that the community is much more knowledgeable and experienced.⁵



Social and Recreational Services

Most of the counties interviewed for this planning process did not mention major issues related to recreational and social services when the gas industries came into their communities. Sometimes mentioned in the research were culture clashes with workers from other areas of the country, but those did not appear to be very significant. Park facilities and recreational services were never mentioned as having negative impacts resulting from the gas industry locating in a community; although that does not mean that there cannot be issues at times.

Safety

Safety concerns were identified throughout the research for this project, and they were varied and numerous. The Freight Study stated that dealing with heavy trucks, transient employees, a potentially dangerous industry product, steep grades, and sub-par roadways require specialized responders and equipment, and knowing where the trucks are or will be is critical.

The perception is that most communities experienced an increase in crime, specifically assaults, speeding, theft, DUIs, irresponsible behavior, public intoxication, substance abuse, vehicular accidents, truck-related crashes, and overweight vehicle violations. However, these increases are consistent with population increases in almost all circumstances, and cannot be specifically attributed to the oil and gas industry.⁶

² www.co.centre.pa.us.

³ www.extension.psu.edu/natural-resources/natural-gas

⁴ Larson Design Group, Marty Muggleton and Robert Tellish, March 7, 2014

⁵ Washington County Chamber of Commerce, Mary Stollar, May 6, 2014

⁶ APA/AICP Webinar Fracking and Resource Extraction and Community Planning, February 13, 2013



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Ridgway Volunteer Fire Department Chief John Wygant noted that drilling companies have good safety records. While there are not many incidents, he mentioned that they still need to be prepared for anything.⁷ Clearfield County emphasized that safety is the #1 concern for the oil and gas industry and service providers. They have safety plans for drilling sites and rental office space. They will send their corporate safety people in to study buildings in which they have offices, to determine what types of safety improvements are needed, and then upgrade the buildings to meet their required standards. They have been known to add concrete barriers, safety markings, and other improvements that are long-term assets to the buildings, at their cost, even though they are merely renting space.



Safety matters

The industry and the communities have taken several steps to curtail crime from occurring. The bigger gas companies self-regulate, as safety is their #1 concern. They require drug tests, do not allow cell phone usage while driving, and have initiated more safety and environmental compliance measures. The Freight Study⁸ reported that the State Police have teamed up with some municipalities in the Northern Tier to set up weigh stations to enforce weight limits and vehicle safety, and have ramped up patrols to enforce speeding and overweight vehicle violations.

Most gas companies take extreme measures to assure safety at work sites. Workers receive training from the companies in work site safety, equipment operations, truck driving, etc. to help prevent accidents from occurring. Well pads must have 911 addresses; most companies are now requesting these at the same time their permits are requested. Accidents will happen, but it is the best interests of the gas companies to minimize the number of accidents and the amount of damage that they might cause. The oil and gas industry has a Zero Tolerance policy. Safety is their #1 priority.⁹

Some municipalities are now requiring training for truck drivers. Many issues related to transportation systems, roadways, and traffic problems were discussed in Chapter 6.

It should be noted that many of the safety issues addressed during this study are common to any increase in population, whether it be gas-related or not. The substance abuse issue, as an example, is a concern in all municipalities across the country and cannot be tied directly to the gas industry. For example, the President of the Titusville Area Hospital noted an increase in substance abuse problems being experienced in the community at this time, and the gas industry has not yet arrived.



Undocumented Wells

The subject of orphan, abandoned or undocumented wells is a statewide problem. As stated in Chapter 3, it is estimated that there are about 180,000 wells in Pennsylvania that are unknown and undocumented. Many people are already very concerned about the potential impact of those unknown wells on the drilling of new wells. Refer to Chapter 3 and Chapter 10 for information on undocumented wells.

Medical Services

Some of the key concerns related to medical services and the gas industry that were noted during this project involve capacities at local hospitals, inadequate medical care being available to gas industry workers, occurrence of infectious diseases, diagnosing diseases rarely seen in Pennsylvania, waterborne illnesses, and increased use of the emergency room by the uninsured. The Center for Healthy Environments and Communities (CHEC) of the University of Pittsburgh, Graduate School of Public Health has received funds to study the potential environmental and public health impacts of gas extraction activities.¹⁰

⁷ www.meadvilletribune.com/local/x601183137/Crawford-Venango-fire-School-is-in-Session

⁸ Marcellus Shale Freight Transportation Study, Gannett Fleming, November 2011

⁹ Clearfield Economic Development Agency, Rob Swales, May 8, 2014

¹⁰ www.sgicc.org



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Titusville is fortunate that the President of the Hospital is actively involved with the Redevelopment Authority and sits on the Health/Safety Committee of Professionals Shale Team. Hospital President, Tony Nasralla has been actively pursuing information and experiences from other hospitals. Mr. Nasralla stated that he has had conversations with the manager of the Wellsboro Hospital, which shares a similar geographic service area and a similar scope of services.¹¹

Wellsboro did not notice a big influx of people with the oil and gas industry. Although housing was a temporary problem for them, a bigger issue was the lack of primary care physicians in the community, which resulted in greater use of the emergency room. Plus, Wellsboro hospital started seeing more of what larger cities see in the ER—gun shots, stabbings, results of bar room fights, and sexually-transmitted diseases. People with minor illnesses, such as the flu, ended up in the ER because the patients did not have primary care physicians. Elective services at the hospital, however, did not see a major increase in Wellsboro.

The Titusville Area Hospital will be limited by its current ER capacity, which is already about a third of what it needs to be. This is a result of the nature of medical care, not because of the number of people needing the ER, according to Mr. Nasralla. The Titusville Area Hospital is currently looking at fast tracking patients through the ER process, to eliminate long waits.

The Titusville Hospital already have decontamination systems in place, and practice the process twice a year, so they feel that they are ready to address those types of issues. The Susquehanna Health System developed a mobile decontamination system to address issues there. Wellsboro did not mention any increase in water-borne illnesses and Titusville does not expect any either. It is important to note that uninsured people using the ER is not an issue with oil and gas workers, as they have good medical benefits. Uninsured workers and people with substantial bad debts are generally problems associated with existing residents trying to utilize hospital services.

Mr. Nasralla also noted that drug abuse has been a big issue for Wellsboro, and Titusville should expect the same, but once again, this is not directly related to the oil and gas industry.

The Titusville hospital can accommodate a 20-30% increase in services in the hospital, excluding the ER. The City has two new primary care physicians in town who were recruited by the hospital and arrived in fall 2013 and March 2014. One of these new doctors replaced one who left the area, but both are taking new patients at this time.

RECOMMENDATIONS:

Continue efforts regarding public education and awareness, provide information on community websites to help educate the public, and continue to be open and upfront about natural gas activity.

Facilitate coordination between law enforcement/ safety forces and gas companies to develop an amicable professional relationship, and to develop strategies to identify potential detrimental situations and to minimize or deter crimes from occurring.

Work with DEP and local groups to identify and document orphan wells and to properly close them.

Continue to work with the Titusville Area Hospital to stay abreast of gas-related issues that may arise in the future, expand the ER capacity, and assure that adequate primary care physicians are available in the community.

Work with gas companies to understand and promote safety measures at well sites.



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Chapter 12

EDUCATION AND WORKFORCE

This Chapter analyzes a myriad of concerns regarding two primary potential impacts:

- 1) The potential impact that an influx of gas industry workers and their families might have on the public educational system.
- 2) Workforce issues—the existing local workforce, existing training programs for people interested in working in the gas industry, and other issues related to workforce development in the oil and gas industry.

Issues that were identified during the planning process related to these subjects include:

EDUCATION AND WORKFORCE ISSUES

The capacity of the local school district to handle a potential influx of students
Changes to the public educational system that may be required
Number and quality of existing workforce training programs
Types of jobs needed by the industry
Agencies or entities that are best suited to provide workforce training programs

The Local School District

According to the Freight Study,¹ the Pennsylvania Department of Labor and Industry estimated that the Marcellus Shale-related employment in the Northern Tier increased over 1,500% between 2007 and 2010, and that ancillary employment rose about 54% during the same time. These numbers are not necessarily all new people to the area, although some portion of them certainly is, and that is the concern when it comes to the local public educational system.



Lycoming County is completing a study on the impacts of the oil and gas industry on social justice and education, which will be completed by the end of 2014. County officials mentioned that some student body adjustments were needed in their schools, but nothing significant. Lycoming County also noted that school enrollments have been off from their peak in the 1970s, with a steady decline since then, so plenty of classroom space is available to address any increases in enrollment. There are also some school buildings in Lycoming County that were closed due to low enrollments that could be reopened if needed.

Both Centre County and Bradford County experienced little or no impact on their schools to date. Clinton County, on the other hand, experienced a 39% increase in school enrollment.

The counties that were interviewed did not know of any need to add English as a Second Language (ESL) to the curriculum as a result of the oil and gas industry. Bradford County, however, mentioned that all of their schools have ESL classes in place and that the gas industry changed the program very little if any.

The Titusville Area School District has been very proactive regarding natural gas drilling in the region. The Superintendent co-chairs TCDA's Education/Workforce Committee and has traveled to various areas

¹ Marcellus Shale Freight Transportation Study, Gannett Fleming, November 2011





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with TRA to discuss relevant issues. The School District has the physical space to accommodate more students within the existing school facilities. Some reconfiguration of the buildings may be needed, but overall, the existing buildings can handle more students.

Depending on what grade levels are affected by an influx of students, the District may have to hire more teachers. There is currently a full-time teacher to accommodate the needs of students and their families with English as a Second Language needs. In addition, there may be opportunities to rewrite curricula to meet the needs of the oil and gas industry directly and to ensure all curriculum areas are responsive to the needs of related business and industry.²

Workforce

There are several issues regarding the workforce that were discussed at length throughout this planning process, including:

WORKFORCE ISSUES

- The availability of local workforce to fill jobs in the gas and oil industry
- Existing skills of the local workforce
- Current workforce training programs and whether or not they meet the current needs of the gas industry
- How to entice young people to enter the oil and gas field
- Retaining and/or replacing workers who are attracted to higher paying jobs at the gas industry
- The Workforce Investment Board

The Marcellus Shale Coalition reported data released by the Pennsylvania Department of Labor and Industry that indicated that there are more than 240,000 employees statewide in Marcellus Shale and related industries. And nearly 75% of all new hires into Marcellus-related jobs call Pennsylvania home.³

Many gas companies have expressed the fact that they need employees and are having a difficult time finding individuals with skilled trades locally.⁴ There are people in the workforce in Pennsylvania who are available for new jobs, although they may not be located in the areas where the needs are. More importantly, they are not necessarily trained for jobs in the oil and gas profession, and many cannot pass drug and other entry-level tests; have criminal records or poor work history; lack the experience, education, skill, or certifications needed; lack interpersonal skills; or do not have drivers' licenses, and therefore, will not be hired by the industry.

Professions that are needed by the shale gas industry (as compiled from a number of resources) include:

GAS INDUSTRY PROFESSIONS

Heavy equipment and diesel operators	Operations and maintenance
Welders	Engineers, Geologists, Surveyors, and Inspectors
Construction and Earthmoving	Equipment Manufacturing, Servicing and Repair
Emergency Responders	Metal fabricators
Environmental permitting and Well servicing	Water transport and Wastewater Management
Timber logging	General labor
Legal, Accounting, and other professional services	Truck drivers with commercial drivers' licenses (CDL's)

Several sources have identified the types of jobs required by the industry. One source, the *Pennsylvania Statewide MS Workforce Needs Assessment* lists the types of jobs needed by phase of the natural gas exploration and production process, as well as by section of the State.⁵

² Ms. Karen Jez, Superintendent, June 2014

³ Marcellus Shale Coalition Fact Sheet

⁴ Titusville Redevelopment Authority

⁵ www.shaletec.org/docs/PennsylvaniaStatewideWorkforceAssessment1



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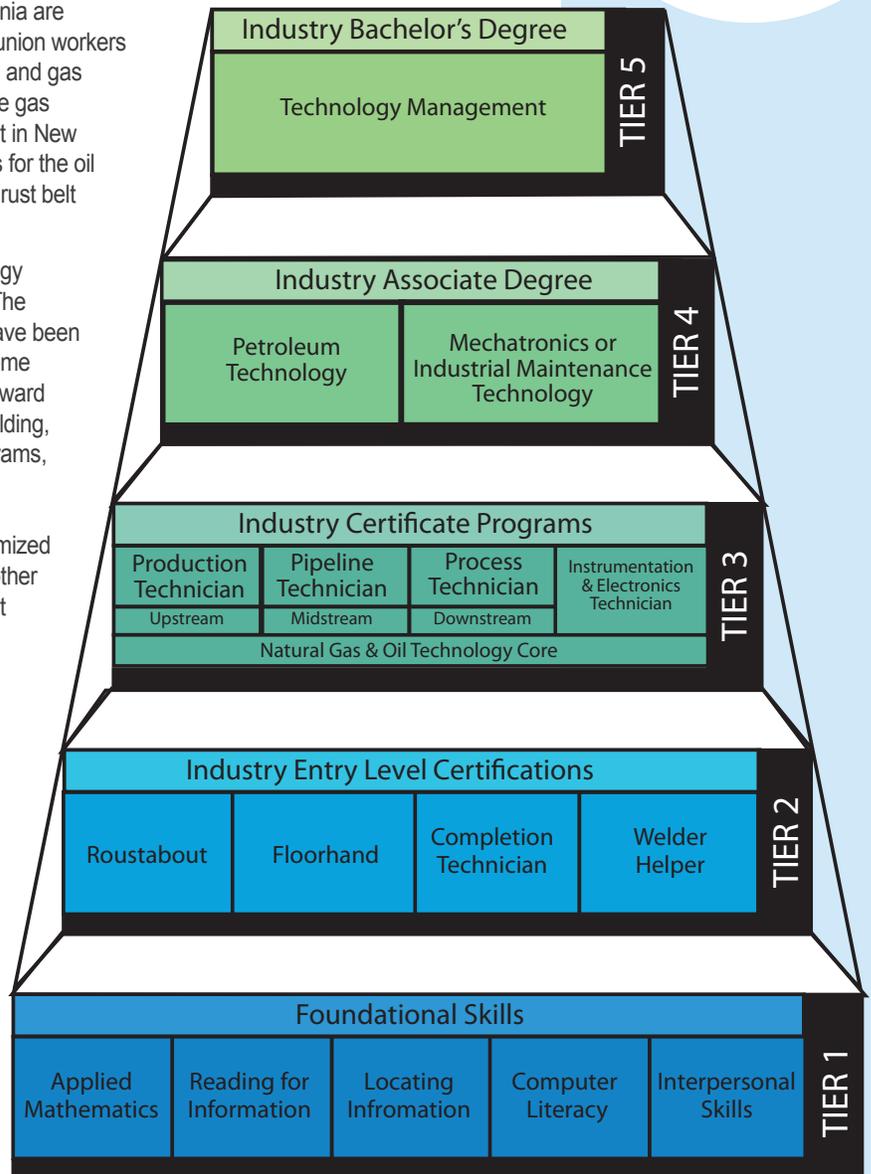
It should be noted that the labor unions in Pennsylvania are supportive of the oil and gas industry and almost all union workers in the State are trained and certified to work in the oil and gas industry. Communication with local unions early in the gas exploration stages is recommended.⁶ APA noted that in New York, labor unions are training and retraining workers for the oil and gas industry, investing in the revitalization of the rust belt communities.⁷

According to Bill Hall from the Ben Franklin Technology Partners, workforce training is needed desperately. The workforce initiatives in northwestern Pennsylvania have been fragmented, so Titusville is proceeding to address some issues on its own. The high schools are stepping forward and offering relevant natural gas classes such as welding, and the vocational school is adding oil and gas programs, which are discussed below and are being expanded to include adults. Centre County noted that the gas companies often pay for the training when it is customized to meet their specific needs. This training can help other industries trying to acquire trained employees, not just the natural gas industry.

Workforce Training Programs

There are many entities and agencies that are now offering oil and gas training courses and programs, and the impacts are beginning to be felt across the State. Larson Design Group noted that gas companies are now hiring more local people since they are receiving the proper training through all of these programs. Examples include:

Source: ShaleNET at www.shalenet.org



TRAINING COURSES AND PROGRAMS

ShaleNET—According to its website, ShaleNET “leverages the collective experience of industry, the public workforce system, and our consortium colleges to help industries build lasting careers in the oil and natural gas industry.” The program was launched in 2012 with a job training grant provided to Westmoreland County Community College in Youngwood, PA. In 2012, a second grant was provided to the Pennsylvania College of Technology in Williamsport, PA to build additional capacity, which resulted in part in the stackable credential model for industry careers as indicated on the accompanying chart. By June 2013, ShaleNET has served over 14,000 people through 20 recognized training providers in four states. The program trained over 5,000 people, with about 3,400 of them currently being employed in the industry. Penn College and ShaleNET offer multiple campuses and courses, including a site with well drilling equipment, wellheads, etc. for very specific training in well drilling procedures.

⁶ Clearfield County Economic Development Agency, Rob Swales, May 8, 2014

⁷ APA/AICP Webinar Fracking and Resource Extraction and Community Planning, February 13, 2013



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The Northern Tier Regional Planning and Development Commission (RPDC) sponsors training partnerships with Penn College and Lackawanna College for jobs in the natural gas industry in Lycoming County.

Mansfield University in Tioga County added The Marcellus Institute, and coordinates its activities with the economic development professionals at Northern Tier RPDC and Central Bradford Progress Authority.

Venango Technology Center, which services the Cranberry, East and West Forest, Franklin, Oil City, Titusville, and Valley Grove School Districts, is starting an entry level oil and gas program, with two new programs being offered in Fall 2014: Protective Services and Gas and Oil Technician. Venango Tech prepares students for all levels of jobs in technical, skilled, and semi-skilled occupations.⁸

The Crawford-Venango Counties Fire School provides annual two-day events offering about 16 different classes in fire protection and safety. The past three years, the School has partnered with the PA State Fire Academy to provide additional well site props and training at the fire grounds.

Penn State Cooperative Extension has a special Marcellus Education Team of more than 40 county-based educators and faculty who are teaching about and researching the wide range of issues arising from natural gas drilling.⁹

PIOGA has the facilities and expertise to start training people for work in the oil and gas industry, and they should be an early contact for municipalities anticipating natural gas activity.

Marcellus Center for Outreach and Research (MCOR)—This Penn State program integrates research and outreach teams to address a range of issues presented by the development of gas shales. Activities include research on energy and energy independence, (extraction methods, alternative fracturing methods, and water treatment and disposal); assessing workforce needs and training, demographic and community change, and the demand for government services and business retention; disseminating reports on issues including Naturally Occurring Radioactive Materials, land use changes, water quality, and landowner decision-making; and providing information on regulation, legal dimensions, pipeline siting, and local/state tax and non-tax revenues.¹⁰

Shale Training and Education Center (ShaleTEC) is a collaboration between Pennsylvania College of Technology and Penn State Extension, and was established to serve as the central resource for workforce development and education needs of the community and the oil and natural gas industry. Headquarters are at the Center for Business & Workforce Development on the main campus of Penn College in Williamsport. Training is offered at Penn State Extension offices, Penn College campuses and Penn State campuses across Pennsylvania. Some of the services provided by ShaleTEC include workforce needs assessments, new technology development, research, customized training, on-site training, industry-specific training and providing facilities for meetings and events.¹¹

The Marcellus Shale Education & Training Center (MSETC) is also a collaboration between Pennsylvania College of Technology and Penn State Extension to provide a wide variety of resources to the community and to the oil and gas industry. MSETC offers classes on Roustabouts, CDL, Downhand Welding, Certified Operations Technician, OSHA Rough Terrain Forklift Training, Natural Gas Development and Production, OSHA 10 Hour Construction, etc.¹²

The Marcellus Shale Coalition (MSC) works with exploration and production, midstream, and supply chain partners in the Appalachian Basin and across the country to address issues regarding the production of clean, job-creating, American natural gas from the Marcellus and Utica Shale plays. They provide in-depth information to policymakers, regulators, media, and other public stakeholders on the positive impacts responsible natural gas production is having on families, businesses, and communities across the region.¹³

⁸ <http://vtc1.org>

⁹ <http://extension.psu.edu/natural-resources/natural-gas>

¹⁰ www.marcellus.psu.edu

¹¹ www.shaletec.org

¹² www.msetc.org

¹³ www.marcelluscoalition.org



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The Pennsylvania Independent Oil and Gas Association (PIOGA) is “the principal nonprofit trade association representing Pennsylvania’s independent oil and natural gas producers, marketers, service companies and related businesses. PIOGA member companies drill and operate the majority of the state’s crude oil and natural gas, including the Marcellus Shale.

“PIOGA serves as a clearinghouse for our members’ awareness of issues impacting their businesses. Through PIOGA communications, newsletters, e-mails and meetings, the industry becomes aware of changes in proposed regulations early enough to have some response to the government agencies promoting these changes before they become “carved in stone.” PIOGA staff and committees work with regulators to achieve workable solutions to problems. PIOGA works to inform lawmakers and help develop legislation that is hopefully more meaningful and less onerous for our industry. The association is member-driven.

“The issues that we monitor are those with which the members are most concerned. Through our committee structure, companies have a mechanism to share ideas, concerns and solutions. Working together, we help members accomplish that which they may not be able to achieve alone.”¹⁴

There are discussions underway with industry experts, the University of Pittsburgh—Titusville, and Titusville community leaders regarding Pitt-Bradford’s petroleum engineering program and bringing more industry-related programs and training to the Titusville campus.

Some of the best methods to recruit people for jobs, according to Washington County Chamber of Commerce, include company websites, career websites and job portals, and referrals.¹⁵

Workforce Investment Board

There are currently two Workforce Investment Boards (WIBs) in the region. Workforce Investment Boards are regional entities created to implement the Workforce Investment Act of 1998. Every community in the fifty states is associated with a local WIB. For each local WIB, a chief elected official of a county or city appoints members to sit on the WIB. These appointed positions are unpaid; at least 50% of a WIB’s membership must come from private businesses. There are also designated seats for representatives from labor unions and educational institutions such as community colleges. Beyond these basic guidelines, many aspects of how an individual WIB operates can vary.

The WIB’s main role is to direct federal, state and local funding to workforce development programs. WIBs conduct and publish research on these programs and the needs of their regional economy. They also oversee the One-Stop Career Centers, where job seekers can get employment information, find out about career development training opportunities and connect to various programs in their area. One-Stop Career Centers also provide many no-cost services to employers. Services vary by state and WIB.¹⁶

WIBs work in conjunction with economic development related organizations in order to maximize the reaction time and create resources to intervene for both the dislocated workforce and the incumbent workforce members of a community. There are two WIBs that service the Titusville area: The Northwest PA WIB and the West Central WIB. The Northwest PA WIB is reorganizing in this region, with changing personnel and management, as well as new Board members. Changes are being made at this time to improve the Board, staff, and programming to properly align WIB training funds with workforce and business needs.

Northwest PA PREP (Partnerships for Regional Economic Performance)¹⁷ is doing a study to identify best practices in workforce development with a Jobs First regional grant. The study will include a regional skills gap analysis, as well as identification of providers or potential providers of workforce training programs. The study will be completed in June 2015. The potential for a regional council on workforce and education is an outcome of this study.



¹⁴ www.pioga.org

¹⁵ Washington County Chamber of Commerce, Mary Stollar, May 6, 2014

¹⁶ www.en.wikipedia.org/wiki/Workforce_Investment_Boards

¹⁷ www.newpa.com/business-assistance/prep-regions



Come Back to Where It All Started...

RECOMMENDATIONS:

Continue efforts with the School District and gas industry leaders to identify and address the educational needs of the students in regards to the oil and gas industry, and to encourage young people to pursue oil and gas-related careers. This includes an emphasis on soft skills such as ethics, use of cell phones, showing up on time, and maintaining clean records.

Work with the School District to assure that it is capable of handling potential issues that may arise from an influx of oil and gas workers and their families.

With regional workforce partners, resolve WIB issues, and develop/implement an aggressive workforce development program that addresses the needs of the natural gas industry, provides adequate incentives and facilities, and provides strong linkages between training entities and the oil and gas industry. This should include education on the need for clean records to acquire these jobs.

Continue to coordinate with University of Pittsburgh and the Titusville and Bradford campuses to offer training programs or become a training center for the natural gas industry, and develop initiatives to connect college graduate with gas companies.

With all the entities starting to provide natural gas training programs, facilitate coordination among them to reduce redundancies and assure that all training areas are covered.

Working with local economic development groups or chambers of commerce, initiate a "Hire Local" campaign to assure that skilled local workers have first opportunity to be hired for local jobs. This could include starting apprenticeship programs.

Assure that a local agency is sending out regular information on job openings, prepare videos and other educational materials on careers in the oil and gas industry, and continue to hold educational sessions for the public.





Come Back to Where It All Started...

Chapter 13

HOUSEHOLD ISSUES

This Chapter addresses some of the issues identified throughout the planning process that directly affect households. This did not seem to be a major issue, but there were some concerns expressed during the research. Issues identified include:

HOUSEHOLD ISSUES

- Destruction of drinking water wells (This was discussed in Chapter 5)
- Aesthetics and view sheds (These were discussed in Chapter 10)
- Noise and light pollution (Also discussed in Chapter 10)
- Access to more affordable energy
- Leasing issues and confusion about types of wells
- New-found wealth
- Job transitions—Gas industry hours, travel, and other nuances

Access to More Affordable Energy

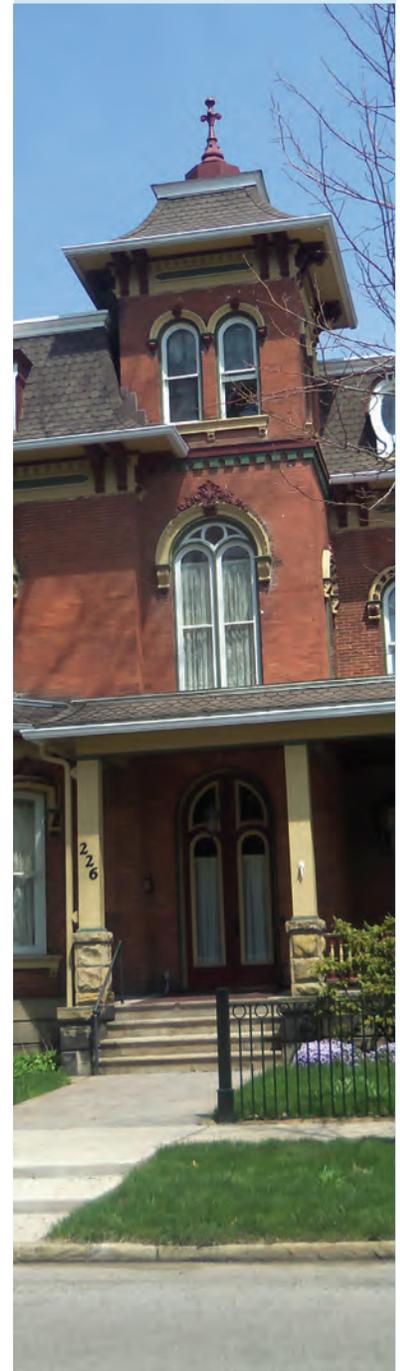
Currently, landowners may provide leases to gas companies or have gas wells or facilities as neighbors, and municipal residents may deal with industry truck traffic and other impacts, and yet have no access to the energy that these wells and the gas industry are producing. The problem generally is that there is no local infrastructure (pipelines) in place to provide the gas to local residents. The existing pipelines are transmitting gas to the larger market, not necessarily to the region in which they are located. Some counties have initiated discussions with the gas companies to determine how this issue can be resolved.

Leasing Issues

Landowners are not necessarily knowledgeable about gas well leases. Even if they currently have conventional wells and/or leases on their property, unconventional well leases are different and issues can get confusing between conventional and non-conventional well leases.

New-found Wealth

Landowners executing gas well leases with oil and gas companies generally receive a lease bonus upon execution of the lease. In addition, they receive royalties based on the well production and market prices for the product. Royalty incomes increased 407% in Tioga County between 2007 and 2009, according to Penn State University Extension.¹ In addition, property values have generally increased (by 48% in Clinton County, as an example). This new-found wealth has tax consequences for property owners, and tax advisors and/or estate planners may be needed to help them deal with those tax issues.



¹ Economic Impacts of Marcellus Shale in Tioga County, MSETC and Penn State Extension, 2012



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Job Transitions

Workers switching from government jobs to private sector, gas-related jobs may face different working conditions, longer work days, erratic hours, and extensive travel (at least for professional positions). The higher wages that attracted workers to these jobs may lose their attractiveness as the new work environment becomes a reality. The gas industry provides extensive training for safety and job skills, and requires many safety measures for which workers may or may not be accustomed. These issues present challenges to new workers in the field.

RECOMMENDATIONS:

Facilitate workshops or one-on-one sessions to assist property owners with understanding and negotiating leases.

Facilitate discussions among existing tax advisors, estate planners, and other financial experts to develop strategies to offer services to property owners.

Work with the gas companies to resolve issues between conventional and unconventional wells.

Continue to work on workforce training programs (as discussed in Chapter 12).





Come Back to Where It All Started...

Chapter 14

PLANNING AND DEVELOPMENT REGULATIONS

This Chapter addresses a wide range of issues dealing with community and county planning, zoning and other development regulations and/or guidelines, economic development, capital improvements planning, land use conflicts, regional coordination and other similar community planning issues. Specific issues which were identified during the planning process include:

PLANNING AND DEVELOPMENT ISSUES

- Planning for a boom-bust economic development pattern
- Compiling information, establishing data bases, and disseminating consistent shale information, and having a clearinghouse
- Regional coordination of shale-related efforts
- The need for a current Comprehensive Plan and Capital Improvements Plan, current Zoning Ordinance and map, having a current SALDO, and site plan review process
- The need for Guideline Documents to address shale drilling
- The need for a current Housing Study (discussed in Chapter 7)

Economic Development

A common thread through most of the research regarding shale drilling was the “boom or bust” nature of the industry. The discussion about potential drilling may go on for several years (such as in the Titusville area in 2013-2014), as can the process of the gas companies exploring the economic feasibility of drilling in the area and trying to acquire leases and property for offices and industrial facilities. However, once the decision is made, and leases and land are acquired, the boom starts and continues until such time as the resource is diminished and/or the company’s level of commitment in an area changes.

From an economic development perspective, this presents problems—if hotels are built to support the oil and gas industry workers, the utilization of these buildings after the industry leaves town is questionable. One source¹ suggested that an alternative use for hotels could be senior living apartments, which are currently in demand and will likely continue to be in the foreseeable future. On the other hand, if new houses are built, or buildings renovated for housing for gas workers, the investments made in these facilities may be lost when the workers leave town and there are fewer renters. Concerns regarding the reclamation of drilling sites are also valid, especially if forest or agricultural lands were converted for the drilling process.

Economic development issues related to tourism, and potential conflicts between tourism and drilling were discussed in Chapter 9. Redevelopment of brownfield sites for the oil and gas industry is one benefit frequently mentioned, as the industry has many potential uses for former brownfield sites. This was discussed in more detail in Chapter 9 as well.



¹ APA/AICP Webinar—Fracking and Resource Extraction and Community Planning, February 13, 2013



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The secondary impacts of oil and gas drilling are extremely important to consider, and may be more of what the City of Titusville itself may experience. Existing refineries in Pennsylvania have reopened to process oil and gas, often from distant production sites. Pipeline construction will require many local industrial services, and municipalities should get involved early in that process to help identify the best routes for pipelines.²

The Titusville Redevelopment Authority has been aggressively pursuing a variety of economic development issues related to the oil and gas industry, and is preparing for the industry to locate in the area again.

Data Compilation and Dissemination

It cannot be emphasized enough how important it is to provide accurate information to the community regarding the natural gas industry, as well as to provide accurate information to the gas companies about how things are done in the community. Different entities have assumed this responsibility in different areas. Bradford County, for example, has been collecting large amounts of data on the natural gas industry since 2008. They have collected data on locations of pipelines, compressor stations, well pads and impoundments; numbers and locations of withdrawal permits; DEP information; locations of gas lines and water lines; the status of well production; locations of roads that have been repaired by the gas industry; locations of bonded and posted roads; etc.—each data set was designed as a new layer on the County GIS system. The Freight Study noted that there has been a dramatic increase in the requests for GIS data mainly related to digital tax parcel maps. These issues were discussed in more detail in Chapter 8.

The Northern Tier Regional Planning and Development Commission faced increased pressure in its role as a regional coordinator of shale information. The need to gather, coordinate, and disseminate information regarding the natural gas activity at the regional level was noted as being needed to provide a more comprehensive understanding of the natural gas industry and to provide a consistent set of data for regional, countywide, and local planning activities.³

Regional Coordination

In addition to compiling information about the natural gas industry, there were needs expressed for greater coordination of overall natural gas activities at a regional level. Without regional, or at least county coordination, each municipality would be undertaking multiple tasks with little or no coordination with others, often recreating the wheel many times. Areas that could benefit from regional coordination, in addition to data compilation and dissemination, include:

NATURAL GAS ACTIVITIES

- GIS mapping
- Developing and implementing Guideline Documents and model ordinances
- Guidance on permitting, roadway usage, preferred truck routes, and roadway reconstruction
- Traffic studies based on well drilling forecasts
- Corridor planning
- Housing studies
- Suggested zoning changes and model language
- Best Practices
- Coordination of land uses across municipal boundaries
- Joint RFPs for professional services, studies, roadwork, etc.
- Guidance and technical assistance to municipalities
- Brownfield redevelopment

² APA/AICP Webinar, *Fracking and Resource Extraction and Community Planning*, February 13, 2013

³ *Marcellus Shale Freight Transportation Study*, Gannett Fleming, November 2011



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Shale plays cross municipal, county and state boundaries, making it necessary to work together as stakeholders in more regional approaches to planning for the impacts of the oil and gas industry. Four economic development corporations in eastern Montana, as an example, formed the Eastern Montana Impact Coalition to address the impacts of oil and gas on local jurisdictions and the region. The impacts being felt in the area transcended municipal boundaries and were better addressed from a more regional approach.⁴ Given a similar situation here in the Titusville Study Area and Northwest Pennsylvania, it would make sense for the Northwest Commission to assume a similar role.

As part of this planning process, a meeting was held with the Northwest Pennsylvania Regional Planning and Development Commission (Northwest Commission or NWC), which services the eight counties of Clarion, Crawford, Erie, Forest, Lawrence, Mercer, Venango, and Warren. Established in 1967, NWC is a public, non-profit, regional resource for economic and business development, as well as community development and planning. NWC's mission statement is "To provide leadership and assistance as well as collaborate and cooperate with our partners in strengthening business and job growth and improving the environment for economic and community development across the Northwest Pennsylvania region."

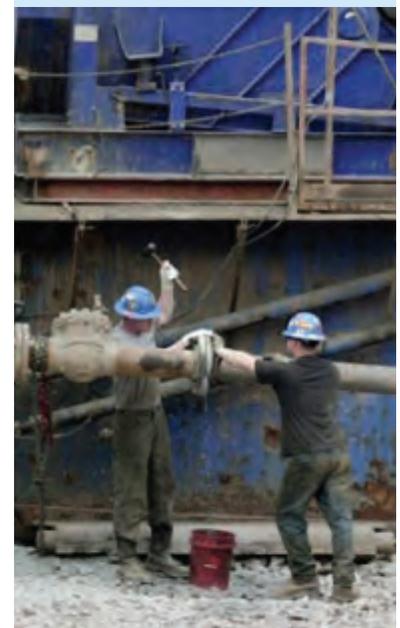


The Northwest Commission provides assistance to municipalities regarding energy, transportation, community revitalization, regional planning, technology, international marketing, government contracting, business financing, Keystone Innovation Zone, and business attraction. It seems only natural that some of the coordination and facilitation efforts required in the region regarding the natural gas industry could be handled by the Northwest Commission. And, the Northwest Commission is very interested in expanding its role in this area, as the natural gas industry touches on so many of its existing initiatives.

Planning and Development Regulations

The importance of a current Comprehensive Plan for the municipality was mentioned by almost all of the counties interviewed, as well as by industry experts; as was the fact that the Plan should address potential impacts of the oil and gas industry. The American Planning Association states that municipalities must think proactively, update their comprehensive plans, growth policies and related capital improvements plans to best prepare for the oil and gas industry.⁵ Some municipalities update their plans every ten years, but many in the region either do not have plans, or have outdated plans, and therefore, references to the oil and gas industry would not be included.

Centre County updated its Land Use Plan in 2010 and addressed many oil and gas industry issues, especially in its chapter on Forests. In that Chapter, Centre County identified natural gas wells, transmission pipelines, electrical transmission lines, strip mines and quarries, and wind energy turbines; and discussed forestry zoning throughout the County. The Plan recommends several techniques to protect forests from natural gas drilling including ridge top protection overlays, scenic view overlays, cluster development, riparian buffers, vegetation management, conservation easements, and other measures. Obviously, protection of forests was a big issue for Centre County, and they dealt with it effectively in the update of the County Comprehensive Plan.⁶



⁴ APA/AICP Webinar, *Fracking and Resource Extraction and Community Planning*, February 13, 2013

⁵ APA/AICP Webinar, *Fracking and Resource Extraction and Community Planning*, February 13, 2013

⁶ Centre County Comprehensive Plan www.co.centre.pa.us



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address visions for trails throughout the region, demographic data, a Trail Town assessment, a business and marketing strategy, and recommended projects to promote the Trail Town concept. Residents of the community were given several opportunities to participate in that planning process.

In addition, as part of the planning process, municipalities should identify projects that are needed, prioritize those projects, and prepare estimated costs and potential funding sources. These projects could be compiled into a Capital Improvements Plan (CIP), which should be updated every year or so. The CIP could help the counties and the municipalities identify eligible projects for Act 13 funding, as well as for other grant and loan programs. APA emphasized the importance of identifying short-term and long-term projects and goals as part of the CIP, and identifying potential sources of funding for those projects, including the use of any impact fees from the oil and gas industry.¹²

Zoning

Having a current Zoning Ordinance was also mentioned frequently as being critical to an effective natural gas industry process. Many municipal zoning codes have not been updated in the recent past and are not current with modern day terms, industry types, and/or state-of-the-art techniques for land development. If codes have not been updated within the last five years in this area, it is very likely that they do not address any issues related to a myriad of current and potential issues and land uses, including the natural gas industry.

Lycoming County amended its zoning code by adding a new section on oil and gas exploration in 2011, and County planners feel that it is working well for them. Planners spent 20 months on roundtable discussions to improve the County zoning code, while addressing quality of life issues and jobs. Twenty of the 52 municipalities in the County are in a County zoning partnership, using a balanced approach to zoning districts and issues. This makes it easier on natural gas companies, as well as zoning administrators.¹³

Many zoning ordinance in the Northern Tier are centered on agriculture and residential uses, with all other uses being addressed by special exception. These codes need to be updated to meet more current land uses, including oil and gas production.¹⁴ Bradford County needed to address the definition of "temporary use," which to the gas company means 10-15 years, while to the municipality means 6-12 months. Uses related to the natural gas industry needed to be defined and RV park regulations also needed to be addressed. "Man camps" should also be defined, including the number of residents permitted to live within a camp, and "temporary housing" should also be defined.¹⁵

Centre County has a chapter in its Comprehensive Plan that presents a variety of zoning and development



regulation tools that can be used to work more cooperatively with the oil and gas industry. These include a variety of districts to protect forests and natural areas, such as conservation district, forest conservation, forest preservation district, forest/gamelands district, open space district, open space/forest district, recreation/conservation, and woodland/conservation.

¹² APA/AICP Webinar, *Fracking and Resource Extraction and Community Planning*, February 13, 2013

¹³ Lycoming County Planning Director Kurt Hausammann and staff, February 26, 2014

¹⁴ Marcellus Shale Freight Transportation Study, Gannett Fleming, November 2011

¹⁵ APA/AICP Webinar, *Fracking and Resource Extraction and Community Planning*, February 13, 2013



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In addition, Centre County presents other regulatory alternatives to preserve key natural areas, such as a Ridge Top Protection Overlay: Slope Management; a Scenic View Overlay: View Shed Preservation, Open Space/Cluster Development, Riparian Buffers, Net-out of Natural Resources, Lot Averaging, Vegetation Management/Conservation, and Conservation Easements. These can all be found in the Forest Chapter of Centre County's Comprehensive Plan.¹⁶

Fort Worth, Texas established well and equipment setbacks from protected uses and rights-of-way. Examples include a 750' distance requirement from a compressor to a public building; 500' from a well to a public building or a school; 75' from a well to a public right-of-way--either existing or planned; 1000' from a well to a water supply extraction point; and 600' from a well to a protected use. In addition, tanks, batteries and equipment must be at least 200' from a protected use and 75' from a right-of-way. Fort Worth restricts the manufacture of gas, processing and storage to heavy industrial zoning districts, while permitting gas wells in all districts to abide by state law. The city also requires a noise management plan for each well.¹⁷

One consideration is to have setbacks from "residents" as opposed to from "residentially-zoned property."

Municipalities without zoning may want to consider a "temporary housing ordinance" to focus on review criteria and site standards for temporary housing associated with the oil and gas industry.¹⁸

Municipalities need to be cautious that they do not single out oil and gas industries as different from other industries, or saying that oil and gas industries are specifically prohibited. Regulations in place for oil and gas should apply to all industries and vice versa. Singling out oil and gas can be considered discriminatory, placing the municipality in a litigious situation. Planners should be cautious that they do not create a "takings" situation, and should be careful to follow procedures carefully.¹⁹

Several sources mentioned establishing setbacks for industrial uses, such as oil and gas from key land uses such as schools, nursing homes, hospitals, local government, day care facilities, and trails, as well as from vistas, ridge lines, steep slopes, hillsides, etc. Some counties looked at views from the valley floor and determined setbacks for industrial facilities based on those parameters. With some recent fires in Greene County, setback considerations are going to become even more critical.

Larson Design Group suggested that municipalities have conditional uses established for the oil and gas industry as one option, and have an approval process for conditional uses in place in the zoning ordinance. Municipalities should be sure to not prevent drilling everywhere in the community, and municipalities without zoning could find themselves with big problems.²⁰ No zoning basically means there will be no review of well pad development.²¹

Act 13 has placed several constraints on municipalities, which need to be understood when zoning codes are updated. All answers are not finalized regarding what municipalities can and cannot regulate per Act 13, but the key issue is that recent court rulings regarding municipal zoning and the oil and gas industry have gone back to pre-Act 13 on some issues, specifically that natural gas exploration and production can be permitted in some districts and not permitted in others. This puts land use planning for oil and gas back into the hands of the municipalities. However, municipalities need to assure that oil and gas are addressed in their zoning ordinances and land use plans, and proceed with caution.

Texas and Colorado municipalities have created special Oil & Gas Boards of Appeals, appointing people to those boards who are knowledgeable in the oil and gas industry. This has helped to resolve some of the issues more effectively and efficiently. In addition, municipalities have initiated "planning fees" to pay for more intense industrial types of review, often paying for outside experts to evaluate proposals and provide professional opinions.²²

¹⁶ www.co.centre.pa.us.

¹⁷ <http://fortworthtexas.gov/gaswells>

¹⁸ APA/AICP Webinar, *Fracking and Resource Extraction and Community Planning*, February 13, 2013

¹⁹ APA/AICP Webinar, *Fracking and Resource Extraction and Community Planning*, February 13, 2013

²⁰ Larson Design Group, *Marty Muggleton and Robert Tellish*, March 7, 2014

²¹ *Marcellus Shale Freight Transportation Study*, Gannett Fleming, November 2011

²² APA/AICP Webinar, *Fracking and Resource Extraction and Community Planning*, February 13, 2013



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Site plan review should be considered by municipalities that do not currently have this review process. Conditions for approval of plans and for reclamation of well pad sites and drilling sites should be included in the review and approval process. Site management and remediation issues could be considered in site plan review as well, including planned staging areas for trucks and other supplies, remediation plans, erosion control and grading plans, and acknowledgement of municipal comprehensive plans in future reclamation designs.

Guideline Documents

The Titusville area is very familiar with the oil and gas industry, and most of the government staff may be somewhat familiar with the natural gas exploration and production process. However, it would still be helpful to develop guideline documents for the Study Area. Centre County has already prepared numerous guideline documents that can be adapted to meet the needs of the Titusville Study Area. On the Center County website²³ are several documents including, but not limited to:

- *Municipal Road Use Agreement*
- *Natural Gas Lease Considerations*
- *Natural Gas Seismic Considerations*
- *Alternative Fuel Considerations for Fleet Applications*
- *Water Resources—Pre-Drilling Testing and Monitoring*

There are many other guidelines on various websites, and municipalities experiencing natural gas exploration and production can review these documents and use them as guides to develop their own guidelines and address their specific needs.

RECOMMENDATIONS:

Facilitate and/or encourage the updating or preparation of Comprehensive Plans for all municipalities in the Study Area.

Assure that zoning ordinances for all municipalities within the Study Area are in compliance with State regulations and are current. This could include preparing draft language to address key oil and gas issues for municipalities to use as samples.

Assure that all municipal zoning maps are current, correct, updated regularly, and easily accessible to the public. The zoning maps and ordinances should be available on municipal websites. This could include acquiring grant funding or a service provider to assist all municipalities.

Facilitate the development of Guideline Documents for the Study Area, using existing documents from other counties as a starting point.

Encourage municipalities to develop Capital Improvements Plans.

Work with the NWC to facilitate many of the needs for planning and development regulations, and to serve as a clearinghouse for information and technical assistance to all municipalities within the NWC region.

Encourage site plan review at the municipal level where it is not already in place.



²³ www.co.centre.pa.us



Come Back to Where It All Started...

Appendix A Shale Gas Glossary

Abandon—Discontinue attempts to produce oil or gas from a well or lease and to plug the reservoir in accordance with regulatory requirements and recover equipment.

Abandoned Well—A well that is no longer in production and is not in inactive status. Unknown and orphan wells are always abandoned wells.

Acidize—Increase the flow of oil from a well by introducing acid into a limestone formation to open passages through which oil can flow into the well bore.

Acquisition Well—A well drilled in exchange for a mineral interest in a property; also referred to as an “obligation well.”

Acre Foot—A reservoir analysis measure of volume, representing the volume which would cover one acre to a depth of one foot; 326,000 gallons.

Additives –

- **Acid** – Compounds that clean out the well bore, dissolve minerals, and initiate cracks in rocks
- **Friction Reducer** – Compounds that minimize friction between the fluid and the pipe
- **Corrosion Inhibitor** – Compounds that prevent corrosion of pipe by diluted acid
- **Iron Control** – Acids that prevent precipitation of metal oxides
- **Biocide** – Compounds that control bacteria
- **Gelling Agent** – Compounds that thicken water to suspend the sand
- **Crosslinker** – Salts that maximize fluid viscosity at high temperatures
- **Breaker** – Compounds that promote the breakdown of gel polymers
- **Oxygen Scavenger** – Compounds that remove oxygen from fluid to reduce pipe corrosion
- **pH Adjustment** – Compounds that maintain the effectiveness of other compounds such as crosslinkers
- **Proppant** (See below)
- **Scale Inhibitor** – Compounds that reduce deposition
- **Surfactant** – Compounds that decrease surface tension to allow water recovery

Advanced Royalty—An advance payment made by the owner of an operating interest to the royalty owner for a specific number of units of minerals regardless of whether oil or gas is extracted within the year. The payment is recoverable out of future production.

AFE—Authorization for expenditures is a form used during the planning process for a well about to be drilled, or for other projects. The form includes an estimate of costs to be incurred in the intangible drilling costs (IDC) category and in the tangible equipment category. Total costs are shown with accompanying breakdowns, representing a budget for the project against which actual expenditures are compared.

Air Drilling—The use of compressed air as a substitute for drilling mud in rotary drilling.

Air/Gas Lift—Method of raising oil from the formation by injecting air or gas directly into the fluid in the casing.

Allowable—The regulated amount of oil or gas that a well or lease can produce during a given time period.

Anticlines—Underground mountain-shaped strata covered with cap rock or an impervious layer.



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API Gravity—Liquid petroleum product measure of gravity of the product, derived from a formula using specific gravity.

Appalachian Basin – The geological formations that roughly follow the Appalachian Mountain range and contain potentially exploitable shale gas resources. The U.S. Department of Energy (DOE) associates the Appalachian Basin with the Marcellus Shale, the Devonian Shale, and the Utica Shale.

Apportionment Accounts—Accounts used to accumulate expenses during a period, with the accounts credited for amounts charged to activities on some predetermined basis.

Associated gas—Natural gas, occurring in the form of gas cap, overlying an oil zone.

Aquifer – A single underground geological formation or group of formations containing water.

Baffles—A device which changes the direction of the flow of fluids.

Barrel (BBL)—A standard measure of volume for crude oil and liquid petroleum products. One barrel equals 42 US gallons.

Base Gas—The quantity of natural gas needed to maintain adequate reservoir pressures and deliverability rates throughout the withdrawal season. Base gas usually is not withdrawn and remains in the reservoir. All natural gas native to a depleted reservoir is included in the base gas volume.

Battery—A group of leased storage tanks.

Beam—The horizontal portion of an “I” beam pumping unit.

Beam Well—A well from which oil is lifted by using a pumping unit, sucker rods and pump.

Biomass—Organic nonfossil material of biological origin constituting a renewable energy source.

Blowout—A strong flow of uncontrolled oil or gas from a reservoir to the surface and into the atmosphere.

Boilerhouse—A slang term for faking a report without having performed any work.

Bonus—The compensation received by the lessor or sublessor on execution of the oil or gas lease.

Borehole – The hole or shaft in the earth made by a well drill. Also, the uncased drill hole from the surface to the bottom of the well.

Bottom Hole Contributions—Money or property given to an operator for their use in drilling a well on property on which the payor has no property interest. The contribution is payable when the well reaches a predetermined depth, regardless of whether the well is productive or not. Usually, the payor receives geological data from the well.

Bottom Hole Pressure—The pressure at the bottom of a well in the producing formation.

Brine – Historical term used for produced water from all oil and gas wells. Not so commonly used today to refer to waters produced from Marcellus or Utica wells, but still applied to the water generated from conventional wells. Brine treatment refers to the grandfathered practice of treating produced water from those wells.

British Thermal Unit (BTU)—A measure of the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit.

Carried Interest—A sharing arrangement in which one party agrees to pay the cost incurred on behalf of another, which is the carried party. After production begins, the carried party receives no income until the carrying party has recouped all the costs incurred on behalf of the carried party.

Carried Party—The party for whom funds are advanced in a carried interest arrangement.

Carrying Party—The party advancing funds in a carrying interest arrangement.



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Carved-Out Interest—An interest that occurs when the owner of a working interest assigns it to another as an overriding royalty, net profits interest, or production payment.

Carved-Out Oil or Gas Payment—A payment in oil or gas assigned by the owner of a working interest or fee interest. The payment is expressed in dollars, barrels, MCF, or as a period of time, to be paid out of a fractional part of the fee interest or working interest. The payment will run for a period shorter than the life of the interest from which it was carved.

Casing – Pipe cemented in an oil or gas well to seal off formation fluids and to keep the borehole from caving in. Smaller diameter “strings” of casing are cemented inside larger diameter strings as a well is deepened.

Casinghead Gas—Gas produced along with crude oil from oil wells.

Casing Pressure—Gas pressure in a well that is built up between the casing and tubing, or casing and drill pipe.

Cathead—A spool shaped device attached to a winch around which rope is wound for hoisting and pulling.

Catline—A hoisting or pulling line powered by a cathead; it lifts equipment around the rig.

Cat Walk—The narrow walkway on a drilling rig or on top of a tank battery.

Cellar—An excavation under the rig floor to provide space for working equipment during drilling.

Cementing – Placing a cement mixture between the casing and a borehole to stabilize the casing and seal off the formation.

Centrifuge—Machine in which samples of oil are placed and whirled at high speed to break out sediment.

Checkerboard Acreage— Mineral interests situated in a checkerboard pattern. Generally, this is done to spread the risk, or to make sure the producer will have some ownership if production is found.

Christmas Tree—A term applied to the valves and fittings assembled at the top of a well to control the flow of oil.

Citygate— A point or measuring station at which a distributing utility receives gas from a natural gas pipeline company or transmission system.

Class II Disposal Wells –Underground injection wells for disposal of fluids associated with oil and gas production.

Clean Out Costs—Costs incurred to clean out a well to maintain its productive capacity or to restore it to original capacity; for example, the cost of removing sand and tubing or opening the pores in the producing formation.

Clean Water Act – The federal law that regulates discharges into waterways.

Clearing Accounts—Accounts used to accumulate expenses during a period, with the balance allocated to other accounts on some predetermined basis at the end of the period.

Coal Bed Methane (CBM) – A form of natural gas extracted from coal beds. Along with tight and shale gas, CBM is considered an unconventional natural gas resource.

Completion—Refers to work performed and the installation of permanent equipment for the production of oil or gas from a recently drilled well.

Compressed Natural Gas—Natural gas compressed to a pressure at or above 200-248 bar (i.e. 2900-3600 pounds per square inch) and stored in high-pressure containers. It is used as a fuel for natural gas-powered vehicles.



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Condensate—A light hydrocarbon liquid in a gaseous state in the reservoir, but which becomes liquid at the surface.

Connate Water—Water originally in the producing formation.

Continuing Interest—Any interest in mineral property that lasts for the entire period of the lease contract with which it is associated.

Conventional Natural Gas Reservoir—A geological formation in which the natural gas is in interconnected pore spaces, much like a kitchen sponge, that allows easier flow to a well.

Conveyance—The assignment or transfer of mineral rights to another person.

Cost Ceiling—The limit placed on the “carrying value” of mineral assets in the cost center.

Cost Center—The geological, geographical, or legal unit with which costs and revenues are identified and accumulated. Examples are the lease, the field country, etc.

Cross Section Mapping—Maps of cross sections of underground formations.

Crude Oil—Liquid petroleum after being produced but before being refined.

Daily Drilling Report—Twenty-four hourly report indicating all important events which occurred on a drilling rig.

Damage Payments—Payments made to the landowner by the oil or gas operator for damages to the surface, growing crops, streams, or other assets of the landowner.

Day Rate Contract—An agreement between a drilling rig contractor and an operator, wherein an agreed amount of money per day will be paid to the drilling contractor until a well is drilled to an agreed upon depth.

Deferred Bonus—Aka an “Installment Bonus,” a lease bonus payable in installments over a period of years. The deferred bonus is distinguished from delay rentals because the deferred bonus payments are due even if the lease is dropped, whereas delay rentals are discontinued with the dropping of the lease.

Delay Rentals—Amounts paid to the lessor for the privilege of deferring the commencement of a well on the lease. Oil and gas lease agreements generally provide a deadline for the lessee to begin drilling. If the drilling has not begun within this period, either the lease agreement will expire or the lessee must pay a stated sum of money to retain the lease an additional year without developing the property.

Delineation Well—A well to define or delineate the boundaries of the reservoir.

Delivered (gas)—The physical transfer of natural, synthetic, and/or supplemental gas from facilities operated by the responding company to facilities operated by others or to consumers.

Depleted Storage Field—A subsurface natural geological reservoir, usually a depleted gas or oil field, used for storing natural gas.

Depletion—Amortization of capitalized costs of a mineral property. The deduction is based upon minerals produced. For federal income tax purposes, depletion may be based on the amount of gross income from the property.

Department of Energy—The federal agency whose Office of Fossil Energy (FE) and National Energy Technology Laboratory (NETL) have played a significant role in advancing research and development related to hydraulic fracturing, horizontal drilling, and improved environmental practices.

Detailed Survey—An intensive geological and geophysical exploration of an area of interest.

Development Well—A well drilled within the proved area on an oil or gas reservoir to the depth of a horizon known to be productive.



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Deviated Well—A well drilled at an angle from the vertical.

Devonian Shale – The general term used to describe the thick sequence of shales in the Appalachian Basin that has been produced for more than a century. Development was greatest in the 1930s-through-1980s, using vertical wells and explosive fracturing. However, any shale deposited during the Devonian geologic period (360 million to 406 million years ago) is considered Devonian shale. Marcellus is a lower Devonian Shale.

Directional Drilling—Intentionally drilling a well at an angle from the vertical.

Disposal Well—A well through which salt water is pumped to subsurface reservoirs.

Dissolved Gas—Natural gas mixed with crude oil in a producing formation.

Division Order—A document that describes the economic interest owners of a property and the types of interest owned. It is used by the purchaser as the basis for paying each economic interest owner their share of revenue.

Doghouse—A small house on the rig floor used for keeping records, storage, etc.

Double—Two lengths of joints of drill or other pipe joined together.

Drilling Rig – Usually a large-standing structure employing a drill that creates holes or shafts in the ground for purposes of accessing and producing natural gas or oil from subsurface deposits.

Dry Natural Gas—A natural gas composed of vapors without liquids, that tends not to liquefy. Also known as consumer-grade natural gas.

Dry Hole—An exploratory or development well that does not produce oil or gas in commercial quantities.

Dry Hole Contributions—Money or property paid by adjoining property owners to another operator drilling a well on property in which the payors have no property interest. Such contributions are payable only in the event that the well reaches an agreed depth and is found to be dry.

Eastern Gas Shales Project – A program initiated by the U.S. Department of Energy in the late-1970s to evaluate the gas potential of – and to enhance gas production from – the extensive Devonian and Mississippian black shales located in the Appalachian, Illinois and Michigan basins of the eastern United States. The program not only identified and classified shales throughout the three basins, but also focused on developing and implementing new drilling, stimulation and recovery technologies to increase production potential. Between 1978 and 1992, DOE spent about \$137 million on the program, which helped develop and demonstrate directional and horizontal drilling technology.

Economic Interest—An economic interest is possessed in every case in which the taxpayer has acquired, by investment, any interest in mineral in place, and secures, by any form of legal relationship, income derived from the extraction of the mineral to which one must look for a return on the capital.

Enhanced Recovery—Any method used to extract oil from reservoirs in excess of that which may be produced through primary recovery.

Exploitation Engineering—Engineering related to subsurface geology, the recovery of fluids from reservoirs, and the drilling and development of oil reserves.

Exploration Costs—Costs incurred in identifying areas that may warrant examination, and in examining specific areas, including drilling exploratory wells and exploratory stratigraphic type test wells.

Exploration Rights—Permission granted by landowners allowing others to enter upon their property for the purposes of conducting geological and geophysical surveys.

Exploratory Well—Wells drilled to search for or produce oil or gas, except the cost of development wells and development-type stratigraphic test wells drilled to gain access to proved reserves.



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Farm-In—An agreement in which a person agrees to drill one or more wells in exchange for receiving a working interest from the person holding the lease.

Farm-Out—An agreement in which the person holding a lease assigns a working interest in the property to another in exchange for drilling one or more wells.

Faults—The breaks in strata resulting from significant moving or shifting of the earth's surface.

Fee Interest—Ownership of both mineral and surface rights on a tract of land, aka fee simple.

Field—An area consisting of a reservoir or multiple reservoirs related to the same geological structural feature. Reservoirs in overlapping or adjacent fields may be treated as a single operational field.

Field Exploratory Well—A well drilled in an area where there was previous production, but outside the limits of the known reserves—aka a delineation well.

Field Facility—Oil and gas production equipment serving more than one lease. For example, separator, extraction unit, etc.

Field Processing—Treating oil or gas before it is delivered to a gas plant or refinery.

Fire Wall—An earthen dike built around an oil tank to contain the petroleum if the tank ruptures.

Flaring – The controlled burning of natural gas that cannot be processed for sale, or used because of technical or economic reasons.

Flowback Water – Water used as a pressurized fluid during hydraulic fracturing that returns to the surface via the well. This occurs after the fracturing procedure is completed and pressure is released, and before the well is placed into production. Flowback water return occurs for several weeks. Produced water in the first days after a well is put in production is likely to contain flowback, but is frequently called 'produced' water.

Flow Chart—A record of the production of gas measured by a meter.

Flowing Well—A well which lifts oil and gas to the surface with natural reservoir pressure.

Flow Lines—The surface pipes through which oil moves from the well to the lease tank.

Flow Tank—The tank into which oil is stored after being produced.

Flow Treater—A piece of equipment that separates oil and gas, heats oil, and treats oil and water.

Fluid Injection—Inducing gas or liquid into a reservoir to move oil toward the well bore.

Flush Production—The large flow of production initially made by a well after being drilled.

Footage Drilling Contract—A well drilling contract which provides for payment at a specified price per foot for drilling to a certain depth.

Formation Pressure—Bottom hole pressure of a shut-in well.

Fossil Energy – Energy derived from crude oil, natural gas or coal. Shale gas is a form of fossil energy.

Frac Water – Usually applied to water after it has been used for fracking and has flowed back out of the well. The term may also be used to mean the water that is ready to be pumped into a well before fracking. Frac water will contain some of the chemicals added to support fracking.

Fracturing—A procedure to stimulate production by forcing under high pressure a mixture of oil and sand into the formation.

Fracturing Fluid – The primarily water-based fluid used to fracture shale. It is basically composed of 99 percent water, with the remainder consisting of sand and various chemical additives. Fracturing fluid is pumped into wells at very high pressure to break up and hold open underground rock formations, which in turn release natural gas.

FracFocus – A joint effort by the Ground Water Protection Council (GWPC) and the Interstate Oil and Gas



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Compact Commission (IOGCC) that is an online registry for companies to publicly disclose the chemicals used in their hydraulic fracturing operations. As of November 2012, more than 30,000 well sites and 200 companies were registered on the site (<http://fracfocus.org/>).

Free Well Agreement—A form of sharing arrangement in which one party drills one or more wells completely free of cost to a second party, in return for one type of economic interest in the property.

Fugitive Emissions – According to a study by DOE's Argonne National Laboratory, a primary air quality concern from natural gas production (including shale gas) is leaking and venting throughout the supply chain. These fugitive emissions can potentially result in releases of methane, the primary constituent of natural gas and a potent greenhouse gas (GHG). In addition, fugitive emissions of natural gas can release volatile organic compounds (VOCs) and hazardous air pollutants (HAPs), according to the study.

Full Costing—A concept under which all costs incurred in searching for, acquiring, and developing oil and gas reserves are capitalized.

Gas Oil Ratio—A measure of the volume of gas produced along with oil from the same well.

Gas Injection—The injection of gas into a formation to maintain pressure or for secondary recovery. Produced injected gas cannot usually be distinguished from the original formation gas.

Gas Lift Gas—Gas injected into the well bore to lift the oil to the surface. Gas lift gas, unlike injected gas, returns immediately to the mouth of the well without entering the reservoir. Normally, the sales price for reversed gas lift gas is lower.

Gas Payment—A production payment payable out of gas produced.

Gas Plant Products—Natural gas liquids removed from natural gas in gas processing plants or in field facilities.

Gas Well—A well producing natural gas.

Gathering Lines—A small pipeline which moves the oil from several wells into a single tank battery or major pipeline.

Gauge Ticket—A form on which the measurement of oil in lease tanks is recorded.

Geological Formation – A body of earth material with distinctive and characteristic properties, and a degree of homogeneity in its physical properties.

Geological and Geophysical (G&G)—Surveys of a topographical, geological, and geophysical nature along with other costs incurred to obtain the rights to make these surveys, and salaries and other expenses of the personnel required to carry out the surveys are often referred to as "G&G" costs.

Gravity—A standard American Petroleum Industry (API) scale which is related to specific gravity of petroleum fluid based on a technical formula. The greater the density of petroleum, the lower the API degree. The higher the API gravity, the greater the value of the oil.

Gravity Meter—An instrument measuring the variations in the gravitational pull.

Gross Withdrawals—Full well stream volume from both oil and gas wells, including all natural gas plant liquids and nonhydrocarbon gases after oil, lease condensate, and water have been removed. Also includes production delivered as royalty payments and production used as fuel on the lease.

Groundwater – The supply of usually fresh water found beneath the surface usually in aquifers, which are a body of permeable rock containing water and supplying wells and springs with drinking water.

Heating Value—The average number of BTUs per cubic foot of natural gas as determined from tests of fuel samples.

Horizon—An underground geological formation that is the portion of the larger formation with sufficient porosity and permeability to constitute a reservoir.



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Horizontal Assignment—An assignment of an interest in the minerals above, below, or between specified depths, or in a given stratum or horizon.

Horizontal Drilling – The process of drilling the deeper portion of a well horizontally to enable access to more of the target formation. Horizontal drilling can be oriented in a direction that maximizes the number of natural fractures present in the shale, which provide pathways for natural gas to escape once the hydraulic fracturing operation takes place. The more generic term, “directional drilling,” refers to any non-vertical well.

Hydraulic Fracturing – The use of water, sand and chemical additives pumped under high pressure to fracture subsurface non-porous rock formations such as shale, to improve the flow of natural gas into the well. Hydraulic fracturing is a mature technology used for 60 years, and today accounts for 95% of all new wells drilled.

Hydrocarbon—An organic compound of hydrogen and carbon.

Hydrocarbon Gas Liquids (HGL)—A group of hydrocarbons including ethane, propane, normal butane, isobutene, and natural gasoline, and their associated olefins, including ethylene, propylene, butylene, and isobutylene. As marketed products, HGL represents all natural gas liquids (NGL) and olefins. The EIS reports production of HGL from refineries (liquefied refinery gas or LRG) and natural gas plants (natural gas plant liquids or NGPL). This excludes liquefied natural gas (LNG).

Igneous Rock—Rock that formed directly from the molten state.

Impact Fees—Fees from O&G companies based on the average annual natural gas production. (Reference Act 13)

Independent Producer—As defined in IRC Section 613A(d), a producer with ≤ \$5 million in retail sales of oil or gas in a year, and who refines ≥ 50,000 barrels of crude on any day during the year. An exemption from the denial of percentage depletion is provided in IRC section 613A(a) for independent producers, if production is within the limits of the average daily production of oil and gas set in IRC section 613A(c).

Injection or Input Wells—A well used to inject gas, water, or liquid petroleum gas (LPG) under high pressure into a producing formation to maintain sufficient pressure to produce the recoverable reserves.

In Situ Combustion—The setting afire of some oil in the reservoir to create a burning front of gases that will drive oil ahead of it to the well bore.

Intangible Drilling Costs (IDC) — Any cost that in itself has no salvage value and is necessary for and incidental to the drilling of wells and getting them ready for production. IDC can also occur when deepening or plugging back a previously drilled oil or gas well, or an abandoned well, to a different formation.

Isopach Maps — Maps showing variations in the thickness of a particular sedimentary bed, as well as the interval or spacing between one bed and another.

Joint—A single length of drill pipe, casing, etc. usually from 20 to 30 feet long.

Joint Interest Audit — An audit performed by, or on behalf of, the non-operator working interest owners to determine if the operator is conforming to the provisions of an operating agreement and accepted accounting procedures.

Joint Interest or Joint Venture—An association of two or more persons or companies to drill, develop, and operate properties jointly. Each owner has an undivided interest in the properties.

Kill a Well—To bring high well pressure under control by the use of mud or water so that the well may be completed.

LACT Unit (Lease Automatic Custody Transfer Unit)—A unit which is used to account for purchases of oil. The LACT unit automatically transfers the oil, records the information, and prepares the run ticket.

Landman—A person experienced in mineral leasing activities.



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Lease Agreement—An agreement between two or more parties by which a lessee is given the right to enter a property, survey and locate a well site, perform drilling operations, and remove any minerals found.

Lease Bonus—The consideration paid by the lessee to the lessor for executing the lease.

Lease Fuel—Natural gas used in well, field, and lease operations, such as gas used in drilling operations, heaters, dehydrators, and field compressors.

Lease and Well Equipment—Capital investments in items of equipment having potential salvage value and used in a well or on a lease. Such items include the cost of casing, tubing, wellhead assemblies, pumping units, lease tanks, treaters, and separators.

Lessee—The person who leases the mineral rights from the owners in order to drill and operate wells.

Lessor—The person who owns the mineral rights and has executed a lease.

Lifting Cost—All customary expenses incurred in connection with the production and marketing of oil and gas.

Liquefied Natural Gas (LNG)—natural gas (primarily methane) that has been liquefied by reducing its temperature to -260 degrees Fahrenheit at atmospheric pressure.

Location—The site for a well to be drilled or at which a well has been drilled.

Logging—The taking and recording of physical measurements about formations being drilled.

Manufactured Gas—A gas obtained by destructive distillation of coal or by the thermal decomposition of oil, or by the reacts of steam passing through a bed of heated coal or coke. Examples are coal gases, coke oven gases, producer gas, blast furnace gas, blue (water) gas, carbureted water gas. Btu content varies.

Marcellus Shale—A large play that underlies most of northeastern U.S. Marcellus is a Devonian-age shale that is estimated by the Energy Information Administration to contain at least 410 tcf of unproved, technically recoverable gas. Most of the play is at the 5,000-to-8,000 foot level below the surface and was long considered too expensive to access, until advances in drilling and fracturing technology.

Marginal Well—A well whose production is so limited that it is no longer profitable to operate.

MCF—Thousands of cubic feet of natural gas.

Metamorphic Rocks—Rocks developed as a result of being subjected to heat and pressure.

Minimum Royalty—An obligation of a lessee to periodically pay the lessor a fixed sum of money after production occurs, regardless of the amount of production. Such minimum royalty may or may not be chargeable against the royalty owner's share of future production.

Miscible Fluid—A secondary recovery process that involves the injection of a mixture of hydrocarbons to displace fluid.

Mobile Drilling Rig—A drilling rig used offshore. It floats from one drill site to another. Drill ships, jack-ups, and semi-submersibles are mobile rigs.

Mud—Drilling fluid circulated through the drill pipe and back to the surface during rotary drilling and workovers.

Multiple Completion Well—A well producing oil and/or gas from more than one reservoir.

Native Gas—Gas in place at the time that a reservoir was converted to use as an underground storage reservoir in contrast to injected gas volumes.

Natural gas—A naturally occurring mixture of hydrocarbon and non-hydrocarbon gases beneath the surface, the principal component of which (50-to-90 percent) is methane.

Natural Gas Liquids (NGL)—Hydrocarbons that are liquids at normal temperatures and pressures,



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including ethane, propane, normal butane, isobutene, and natural gasoline.

Natural Gas Plant Liquids (NGPL)—Those hydrocarbons in natural gas that are separated as liquids at natural gas processing, fractionating, and cycling plants. Products obtained include ethane, liquefied petroleum gases (propane, normal butane, and isobutene), and natural gasoline. Component products may be fractionated or mixed.

Natural Gas Policy Act of 1978 (NGPA)—Signed into law on November 9, 1978, the NGPA is a framework for the regulation of most facets of the natural gas industry.

Natural Gasoline—A commodity product commonly traded in NGL markets that comprises liquid hydrocarbons (mostly pentanes and hexanes) and generally remains liquid at ambient temperatures and atmospheric pressure. Natural gasoline is equivalent to pentanes plus.

Net Profits Interest—Interest carved out of the working interest. It is non-operating interest that shares in the new profits, if any, but has no liability for capital investments or losses.

New Field Wildcat—A well drilled in an area where previously there had been no production of oil or gas.

Nonassociated Gas—Natural gas that is not in contact with reservoirs that contain significant quantities of crude oil.

Noncontinuing Interest—an interest in an oil or gas property that bears no costs of development or operation, such as landowners' royalty interest.

Nonhydrocarbon Gases—Typical nonhydrocarbon gases that may be present in reservoir natural gas, such as carbon dioxide, helium, hydrogen sulfide, and nitrogen.

Nonoperating Working Interest—A working interest owner who does not participate in the day-to-day operations of developing and operating a mineral interest.

Offset—Drilling a well adjacent to another.

Offset Well—A well drilled on one tract of land to prevent drainage of oil or gas to a nearby tract on which a well has been drilled.

Oil Payment—A production payment payable out of oil produced.

Oil Pool—An underground reservoir containing oil in the sedimentary rocks.

Oil Sand—Any porous reservoir containing oil.

Oil Seep—Areas where tiny amounts of petroleum have migrated to the surface.

Oil Well—A well completed for the production of crude oil from at least one oil zone or reservoir.

Olefinic Hydrocarbons (Olefins)—Unsaturated hydrocarbon compounds with the general formula C_nH_{2n} containing at least one carbon-to-carbon double-bond. Olefins are produced at crude oil refineries and petrochemical plants and are not naturally occurring constituents of oil and natural gas; sometimes referred to as alkenes or unsaturated hydrocarbons; excludes aromatics.

On-Site Water Treatment—A practice employed by many shale gas producers to facilitate reuse of flowback fluids. In this instance, mobile and fixed treatment units are employed, using processes such as evaporation, distillation, oxidation, and membrane filtration for recycling and reuse. On-site treatment technologies may be capable of returning 70-80 percent of the initial water to potable water standards, making it immediately available for reuse.

Operator—One who holds the working or operating rights, and is obligated for the costs of development and production, either as a fee owner or as an assignee.

Operating Interest—Same as "Working Interest."



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Operating Working Interest—A working interest owner who participated in the day-to-day operations of developing and operating the mineral interest.

Orphan Well—Old wells that are no longer in use and may not be properly abandoned. Ownership for an orphan well cannot be established. It is an abandoned well.

Outpost Well—A well drilled in an attempt to make a long extension of a producing pool; a well located outside the established reservoir boundaries.

Overriding Royalty Interest—An interest carved out of the working interest, which does not require the owner to bear a share of the developing or operating costs. It exists only for a stipulated time, but never longer than the life of the working interest. It is a non-operating interest.

Percentage Depletion—A deduction for federal income tax purposes based on the gross income from mineral properties. Percentage depletion is in lieu of cost depletion, aka “Statutory Depletion.”

Perforate—To penetrate the well casing with holes made with a perforating gun.

Permeability – The measure of the ability of a material, such as rock, to allow fluids to pass through it.

Pig—A scraping instrument for cleaning a pipeline.

Plug Back—To seal off a lower formation in a well bore in order to produce from a higher formation.

Pool—An underground reservoir having a common accumulation of oil or gas.

Porosity—The condition of a formation that permits oil to flow.

Posted Price—The price published and circulated between buyers and sellers in a particular field.

Pressure Maintenance—Injection of gas, water, etc. to repressure an oil field.

Pressure Regulator—An instrument for maintaining pressure in a pipeline, downstream from the valve.

Price Bulletin—A posting of the price per barrel that the purchaser will pay for each grade of crude oil in a field.

Primary Recovery—Oil that is forced into the well bore by natural reservoir pressure.

Primary Term—The maximum period of time allowed by a lease for the lessee to commence drilling a well. Drilling cannot be deferred beyond the primary term, even by the payment of delay rentals.

Produce—For purposes of IRC section 263A, it includes construct, build, install, develop, manufacture, improve, create, raise, or grow.

Produced Water – Naturally occurring water found in shale formations; it generally flows to the surface during the entire lifespan of a well, often along with natural gas. Produced water and flowback water from natural gas extraction may be reused in hydraulic fracturing operations; disposed of through underground injection; discharged to surface waters as long as it doesn't degrade water quality standards; or transferred to a treatment facility if necessary, processed and discharged into a receiving water body in compliance with effluent limits. Produced water, frac water, brine and used water are likely to contain high quantities of salt (NaCl), and varying quantities of metals depending on the amount of treatment it has received.

Producer—A generic term used to refer to all economic interest holders in a property.

Production Payment—A right to minerals in place that entitles its owner to a specific fraction of production for a limited period of time, or until a specific sum of money or a specific number of units of mineral has been produced.

Production Taxes—Taxes levied by state governments on mineral production based upon the value and/or quantity of production, aka severance taxes.



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Productivity Test—A test of the maximum or other rates at which a well can produce.

Project Area—A large territory that can be explored advantageously in a single integrated operation.

Property—Each separate interest owned by a taxpayer in each mineral deposit in each separate tract or parcel of land. Certain interests may be combined to form a property.

Proppant – A granular substance, often silica sand, ceramic media, or bauxite, that is mixed with and carried by fracturing fluid pumped into a shale well. Its purpose is to keep cracks and fractures that occur during the hydraulic fracturing process open so trapped natural gas can escape and flow to the well bore.

Proration—A system of allocating production from a well permitted to be produced during a period of time.

Prospect—A lease or a group of leases on which an owner proposes to drill one or more wells.

Proved Developed Reserves—Reserves that can be expected to be recovered through existing wells with existing equipment and operating methods.

Proved Energy Reserves—Quantities of reserves that, based on geologic and engineering data, appear with reasonable certainty to be recoverable in the future from known oil and gas reserves under existing economic and operating conditions.

Proved Undeveloped Reserves—Reserves that are expected to be recovered from new wells on undrilled proved acreage, or from existing wells where a relatively major expenditure is required for completion.

Proven Property—A property whose principal value has been demonstrated by exploration, discovery, or development.

Put on a Pump—To install a pump jack or pumping unit, sucker rods, and bottom hole sucker rod jump.

Put on a Well—To begin a well flowing or pumping.

Rabbit—Line cleaning instrument. A small plug that is run through a line.

Reclamation – The clean up or restoring of a well site to its pre-existing condition after drilling operations cease. Reclamation activities, which are governed by state, federal and local laws and regulations, can include soil replacement, compacting, and re-seeding of natural vegetation.

Reconnaissance Survey—A survey of a project area utilizing various geological and geophysical techniques to identify specific geological features with sufficient mineral producing potential to merit further consideration.

Pressuring—The injection of gas into oil or gas formations to effect greater ultimate recovery.

Remit Slip—Check stub from payee of oil and gas. It usually indicates barrels or MCF, gross revenue or net revenues, and the amount actually paid.

Retained Interest—The interest created when the owner sells the working interest and retains an overriding royalty, a net profits interest, or a production payment. An owner can retain the working interest and sell the others.

Royalty – A payment received by a lessor or property owner from an oil, gas or minerals-producing company, based on the production of a well or other extraction process and market prices.

Royalty Interest—An ownership interest that entitles its owner to share in the production from the mineral deposit, free of development and operating costs, and extends undiminished over the productive life of the property. It is non-operating interest.

Run Ticket—A document, prepared by the purchaser's gauger and witnessed by the lease pumper, that



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records the quantity of oil removed, its gravity, temperature, and impurities.

Safe Drinking Water Act – A federal law whose provisions also apply to shale production activities related to wastewater disposal through underground injection and discharge to surface waters.

Seismograph—The instrument used to record the refraction of sound waves.

Service Well—A well drilled to of support production—a gas injection well or a water injection well.

Shale – A fine-grained sedimentary rock composed mostly of consolidated clay or mud. Some large shale gas formations were formed more than 300 million years ago during the Devonian period of Earth's history, where conditions were particularly favorable for the preservation of organic material within the sediment. Methane that remained locked in the shale layers is the source of today's shale gas.

Shale Gas – Natural gas produced from shale formations. Shale gas is widely distributed in the United States and is currently being produced in 16 states. Although data are being constantly revised, the Energy Information Administration currently estimates the recoverable U.S. shale gas resource is 482 trillion cubic feet; domestic shale gas production has increased 12-fold over the past decade, and led to a new abundance of natural gas supply in the United States.

Shale Gas Play – A set of discovered, undiscovered or possible natural gas accumulations that exhibit similar geological characteristics. Shale plays are located within basins, which are large-scale geologic depressions, often hundreds of miles across, which also may contain other oil and natural gas resources. For a map detailing the location of major shale gas plays in the lower 48 states, see: http://www.eia.gov/oil_gas/rpd/shale_gas.pdf.

Slickwater Fracturing – Fracturing with fluid that contains mostly water along with friction reducers, proppants, and other additives; used for predominantly gas-bearing formations at shallower depths.

Source Rock – Organic-rich sedimentary rocks, such as shale, containing natural gas or oil.

Spot Price—A short-term price negotiated between the buyer and the seller.

Spud In—To start drilling a well.

Step Out Well—A well drilled adjacent to a proved well in an attempt to determine the limits of the reservoir.

Stratigraphic Test Well—A well drilled to obtain information about geologic conditions, common to offshore drilling. These wells are classified as Exploratory-type stratigraphic test wells (drilled in an unproved area) and Development-type stratigraphic test well (drilled in a proved area).

Stray Gas – Gas contained in geologic formation outside the well bore that is accidentally mobilized by drilling and/or hydraulic fracturing.

Strip Well—To pull both the rods and tubing from a well simultaneously.

Stripper—An unconventional well nearing the end of its productive life—very little oil (<90,000 CF/day) is being produced.

Structural Maps—Maps that indicate subsurface features.

Surface Water – Water that is open to the atmosphere, such as rivers, lakes, ponds, reservoirs, streams, impoundments, seas and estuaries.

Swab—A device that fits tightly inside the tubing; when pulled through the tubing, it lifts fluid.

Sweet Oil (or Gas)—Oil or gas without sour impurities.

Synthetic Natural Gas (SNG)—A manufactured product, chemically similar in most respects to natural gas, resulting from the conversion or reforming of hydrocarbons that may easily be substituted for or interchanged with pipeline-quality natural gas; also referred to as substitute natural gas.



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Take or Pay Contracts—An agreement in which a purchaser of gas agrees to take a minimum quantity of gas per year if one is not prevented from doing so by circumstances beyond his or her control and if the gas is available for delivery. If the purchaser does not take the minimum quantity, he or she is required to pay for that minimum quantity at the contract price. Normally, one may make up deficiency amounts in future years if he or she purchases in excess of minimum amounts.

Tangible Assets—The cost of assets that have a salvage value.

Tank Strapper—The individual who measures a tank and prepares a tank table.

Tank Table—A table showing the volume of a tank at various levels based on ¼ inch intervals.

Tertiary Recovery—The use of sophisticated techniques such as flooding the reservoir with chemicals to increase the production of oil or gas.

Therm—One hundred thousand (100,000) Btu.

Thief—A device for extracting oil samples from a tank.

Tight Gas – Natural gas found in low-permeability sandstones and carbonate reservoirs. The rock layers that hold the gas are very dense, preventing easy flow.

Top Lease—A new lease obtained covering a property currently leased before the expiration of the previous lease between the same parties.

Total Dissolved Solids—The solids remaining after a sample of filtered water has been evaporated.

Truncation Traps—Traps associated with nonconformities or discontinuities in the strata.

Turnkey Well—A completed well, drilled and equipped by a contractor for a fixed price.

Unconventional Natural Gas Reservoir – Coal bed methane, shale or tight gas, where the natural gas does not flow naturally to the well, but instead requires some form of extensive stimulation to generate economic flow rates.

Unconventional Well—A well drilled into unconventional formations like Marcellus or Utica shale; vertical and horizontal drilling; stimulated by fracking.

Underground Injection Well – A steel and concrete-encased shaft into which hazardous waste is deposited by force and under pressure. The Environmental Protection Agency's (EPA's) Underground Injection Control Program (UIC) is responsible for regulating the construction, operation, permitting and closure of injection wells that place fluids underground for storage or disposal.

Unit Value, Consumption—Total price per specified unit, including all taxes, at the point of consumption.

Unit Value, Wellhead—The wellhead sales prices, including charges for natural gas plant liquids subsequently removed from gas, gathering and compression charges, and state production, severance, and/or similar charges.

Unitization—An agreement under which two or more persons owning operating mineral properties agree to have the properties operated on a unified basis, and further agree to share in the production from all the properties on a stipulated percentage or fractional basis regardless of from which property the oil or gas is produced. All owners of economic interest in the properties should be involved in the agreement.

Undocumented Well—A well whose existence is not known or is not documented in DEP files. It is an abandoned well.

Used water – Water that has been used for one of several purposes (fracking, dust control, drilling) and that has to be managed, conveyed, or disposed of. After appropriate treatment, water to be re-used is frequently called 'used' water to distinguish it from fresh water.

Utica Shale – An Ordovician age natural gas-containing rock formation located below the Marcellus Shale. The formation (also called the Utica-Point Pleasant in some areas) extends from eastern Ohio through



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much of Pennsylvania to western New York.

Viscosity—The ability of a fluid to flow as a result of its physical characteristics.

Waterflooding—A method of secondary recovery in which water is injected into an oil reservoir for the purpose of pushing the oil out of the reservoir rock and into the bore of a producing well.

Water Well—A well drilled to obtain a supply of water for drilling or operating use.

Well—A hole drilled in the ground to obtain geological information, find and produce oil or gas, or provide service to the operation of an oil or gas property.

Wellhead—The point at which the crude oil (and/or natural gas) exits the ground. Following historical precedent, the volume and price for crude oil production are labeled as “wellhead,” even though the cost and volume are now generally measured at the lease boundary. In the context of domestic crude prices data, the term “wellhead” is the generic term used to reference the production site or lease property.

Wet Gas—Gas that contains a large quantity of liquids.

WMGR123—The permit required for processing and beneficial use of oil and gas liquid waste, or frac flowback and produced water.

WMGR128—The permit required to make salt from flowback and produced water. Salt, sodium chloride, or NaCl is the highest concentration solid in that water.

Working Interest—An interest that entitles the owner to share in the production, and requires the owner to bear its share of the developing and operating costs, aka operating interest. The life of the working interest is tied to the lease. If the lease is terminated, the working interest associated with the lease terminates.

Workover Costs—Expenses incurred in cleaning a well in an attempt to increase production.

Zone—A stratigraphic interval containing one or more reservoirs.



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Appendix B Acronyms & Abbreviations

AADT	Average Annual Daily Traffic
ADTT	Average Daily Truck Traffic
AFE	Authorization for Expenditures
AICP	American Institute of Certified Planners
AIR	Average Injection Rate
APA	American Planning Association
API	American Petroleum Institute
AVG	Average
BBL	Barrel
BGG	Background Gas
BHA	Bottom Hole Assembly
BLW	Barrels of Load Water
BLWTR	BLW to Recover
BO	Barrels of Oil
BOP	Blowout Preventor
BOPD	Barrels of Oil per Day
BS	Basic Sediment
BS&W	Basic Sediment & Water
BTM	Bottom
BTU	British Thermal Unit
BW	Barrels of Water
C&C	Circulate & Condition
CA	Calcium
CaCl	Calcium Chloride
CBL	Cement Bond Log
CBM	Coal Bed Methane
CCL	Casing Collar Locator
CDL	Commercial Driver's License
CHK	Choke
CHP	Combined Heat and Power



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CHL	Chlorides
CIP	Capital Improvements Program or Plan
CIRC	Circulate
CMT	Cement
CNG	Compressed Natural Gas
COMP	Compressor
CP	Casing Pressure
CPR	Cardiopulmonary Resuscitation
CSG	Casing
CWT	Combined Wastewater Treatment facility regulated by EPA and DEP
DC	Drill Collars
DEP	Department of Environmental Protection
DOE	U.S. Department of Energy
DP	Drill Pipe
DPT	Depth
DRLG	Drilling
DRLD	Drilled
DTD	Driller Total Depth
DSS	Days since Spud
D2PA	Designed & Developed in Pennsylvania
EDU	Equivalent Dwelling Unit
EIA	US Energy Information Administration
EISA	Energy Independence & Security Act of 2007 (formerly the Clean Energy Act of 2007)
EPA	U.S Environmental Protection Agency
ESC	Erosion Sediment Control
FCP	Flow Casing Pressure
FE	Fossil Energy
FHWA	Federal Highway Administration
FLWD	Flowed
FLWG	Flowing
FRAC	Fracture Stimulate
FTP	Flowing Tubing Pressure
G&G	Geological & Geophysical
GIS	Geographic Information Systems
GHG	Greenhouse Gas



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GR	Gamma Ray
GWPC	Ground Water Protection Council
HCP	Headwaters Conservation Partnership
HF	Hydrofluoric
HGL	Hydrocarbon Gas Liquids
HRS	Hours
IDC	Intangible Drilling Costs
IEA	International Energy Agency
IH	In Hole
IOGCC	Interstate Oil & Gas Compact Commission
IRC	Internal Revenue Code
ISIP	Initial Shut in Pressure
JTS	Joints
KB	Kelly Bushing
LACT	Lease Automatic Custody Transfer
LD	Laid Down or Land Development
LERTA	Local Economic Revitalization Tax Assistance Act a
LIHTC	Low Income Housing Tax Credit
LM	Lime
LNG	Liquefied Natural Gas
LPG	Liquid Petroleum Gas
LRG	Liquefied Refinery Gas
LRTP	Long Range Transportation Plan
LTD	Logged Total Depth
MCF	Thousand Cubic Feet
MCFD	Thousand Cubic Feet per Day
MIRU	Move in Rig Up
MMCF	Millions of Cubic Feet of Natural Gas
MSC	Marcellus Shale Coalition
MSETC	Marcellus Shale Education and Training Center
MW	Mud Weight
ND	Nipple Down
NETL	National Energy Technology Laboratories
NGL	Natural Gas Liquids
NGPA	Natural Gas Policy Act of 1978



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NGPL	Natural Gas Plant Liquids
NGV	Natural Gas Vehicle
NITRO	Nitrogen
NORM	Naturally Occurring Radioactive Material
NPDES	National Pollutant Discharge Elimination System
NU	Nipple Up
NWTF	National Wild Turkey Federation
PADEP	Pennsylvania Department of Environmental Protection
PBTD	Plug Back Total Depth
PD	Plug Down
PennDOT	Pennsylvania Department of Transportation
PERF	Perforate
PHARE	PA Housing Affordability & Rehabilitation Enhancement
PHFA	PA Housing Financing Agency
PIOGA	PA Independent Oil & Gas Association
PKR	Packer
PMPD	Pumped
PMPG	Pumping
PO	Present Operation
POOH	Pull out of Hole
POTW	Publicly Owned Treatment Works
PREP	Partnerships in Regional Economic Performance
PSIG	Pounds per Square Inch Gauge
PU	Pick Up
PUC	Public Utility Commission
PWD	Produce While Drilling
RD	Rig Down
RDMO	Rig Down Move Out
REV	Reverse
RFP	Request for Proposals
RIH	Ran in Hole
RTAC	Rural Transportation Advisory Committee
SALDO	Subdivision and Land Development Ordinance
SD	Shut Down
SDFN	Shut Down For Night



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SGICC	Shale Gas Innovation and Commercialization Center
SICP	Shut in Case Pressure
SITP	Shut in Tubing Pressure
SK	Sack
SN	Seating Nipple
SNG	Synthetic Natural Gas
STAMPP	Systematic Technique to Analyze and manage PA's Pavements
STEM	Science, Technology, Engineering & Math
STK	Stock
SU	Service Unit
SURF	Surface
SW	Storm Water
SX	Sacks
TB	Tank Battery
TBG	Tubing
Tcf	Trillion Cubic Feet
TD	Total Depth
TDS	Total Dissolved Solids
TENORM	Technologically Enhanced NORM
TR	Trace
TIH	Trip in Hole
TIP	Transportation Improvement Program
TK	Tank
TMDL	Total Maximum Daily Loads
TOH	Trip out Hole
TOC	Top of Cement
TF	Trip For
UIC	Underground Injection Control
VIS	Viscosity
VOC	Volatile Organic Compounds
W/	With; while
WIA	Workforce Investment Act
WIB	Workforce Investment Board
WL	Water loss
WO	Waiting on; work over



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- *Marcellus Center for Outreach and Research* www.marcellus.psu.edu
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Appendix D Survey

Titusville Oil and Gas Steering Committee Survey

The Titusville Redevelopment Authority has retained the services of CMK Planning, LLC to help the community plan for the potential impacts of oil and gas exploration and production. For the past two months, extensive research and interviews with other communities and agencies experiencing oil & gas drilling have occurred. The list of potential impacts is extensive.

The goal of this planning process is to develop a strategic plan to help the Titusville community deal with these potential impacts in innovative and proactive ways, for the overall betterment of the community, as well as the oil and gas industry.

As members of the Steering Committee, you are well aware of the industry, the issues, and the potential impacts. We would appreciate your taking some time to think about how oil & gas exploration and production might specifically impact the Titusville area, which is defined as the school district. Our goal is to maintain our existing quality of life, enhance the economic viability of the region, and embrace the positive aspects of the oil and gas industry, while addressing any potential negative impacts.



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Titusville Oil and Gas Steering Committee Survey

1. In your opinion, how important are the following issues for the Titusville area? (1--very important, 2--somewhat important, 3--neutral/not sure, 4--somewhat unimportant, 5--not important). This survey does not predict that shale gas development will occur, when it will occur, or exactly what the impacts or issues will be if it does occur. However, where shale gas development in Pennsylvania has occurred, some of these impacts resulted and some of these issues have become important.

	1	2	3	4	5
• Establishing baselines for surface water	<input type="radio"/>				
• Establishing baselines for ground water quality	<input type="radio"/>				
• Identifying areas of existing ground or surface water contamination	<input type="radio"/>				
• Continued monitoring of changes in ground water quality	<input type="radio"/>				
• Continued monitoring of changes in surface water quality	<input type="radio"/>				
• How frac, flowback, and produced water is transported and stored	<input type="radio"/>				
• Should frac, flowback, and produced water be recycled or disposed of in permitted deep disposal wells	<input type="radio"/>				
• Identification and protection of environmentally sensitive areas	<input type="radio"/>				
• The need for gas line infrastructure to get gas to the market	<input type="radio"/>				
• The need for gas line infrastructure to get gas to residential customers	<input type="radio"/>				
• Diminished air quality	<input type="radio"/>				
• Increased noise from trucks, pad site operation, and construction	<input type="radio"/>				
• Increased light pollution, limiting celestial viewing	<input type="radio"/>				
• Forest fragmentation-cutting of trees for roads, pad sites, and pipelines	<input type="radio"/>				
• Habitat fragmentation-failure to restore disturbed areas with exactly the	<input type="radio"/>				



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plants, trees, surface and shallow subsurface drainage that existed before	<input type="radio"/>				
• Regular monitoring of air and water quality	<input type="radio"/>				
• The impact of shale gas resource development impact on tourism and ag assets	<input type="radio"/>				
• Establishing a "Buy Local" program for gas companies	<input type="radio"/>				
• Converting individual cars or fleets to CNG	<input type="radio"/>				
• Building a CNG fueling station	<input type="radio"/>				
• Establishing baseline roadway conditions data	<input type="radio"/>				
• Living with temporary damage to roadways	<input type="radio"/>				
• Traffic backups in some locations	<input type="radio"/>				
• Additional truck traffic	<input type="radio"/>				
• Increased traffic at night	<input type="radio"/>				
• Conflicts between trucks and school buses	<input type="radio"/>				
• Road Use/Maintenance Agreements	<input type="radio"/>				
• Roadway Bonding	<input type="radio"/>				
• Designating truck routes	<input type="radio"/>				
• Increased workload on emergency responders	<input type="radio"/>				
• Specialized training for emergency responders	<input type="radio"/>				
• Increased need for government services and workers	<input type="radio"/>				
• Selection of projects paid with Act 13 impact fees	<input type="radio"/>				
• 911 addressing for all gas operations	<input type="radio"/>				
• Tougher penalties for trucking violations	<input type="radio"/>				
• Require Emergency Response Plans from companies	<input type="radio"/>				
• Establishing a baseline for housing and lodging data	<input type="radio"/>				



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• Influx of non local people and companies into the community	<input type="radio"/>				
• Impacts on the current housing supply	<input type="radio"/>				
• Impacts on the current lodging supply	<input type="radio"/>				
• Impacts on housing and lodging costs	<input type="radio"/>				
• Use of RV parks for industry workers	<input type="radio"/>				
• Affordable housing programs	<input type="radio"/>				
• Increased opportunities for service providers and retailers	<input type="radio"/>				
• The need for service businesses to adapt to new markets	<input type="radio"/>				
• Changes in levels of crime	<input type="radio"/>				
• Increases in STD's	<input type="radio"/>				
• Social and cultural impacts	<input type="radio"/>				
• Educating and informing the public	<input type="radio"/>				
• School enrollment increases	<input type="radio"/>				
• Capacity of existing school buildings	<input type="radio"/>				
• The need for curricula changes for transient workers' children	<input type="radio"/>				
• Capacity of Emergency Room at hospital	<input type="radio"/>				
• The industry attracting workers away from existing businesses	<input type="radio"/>				
• Lack of an adequately trained local workforce	<input type="radio"/>				
• Current workforce training programs	<input type="radio"/>				
• CDL license training	<input type="radio"/>				
• Capacity of existing workforce training facilities	<input type="radio"/>				
• Enticing young adults into gas-related careers	<input type="radio"/>				
• Active recruitment of oil & gas ancillary services	<input type="radio"/>				
• Helping local businesses	<input type="radio"/>				



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expand to meet gas industry needs	<input type="radio"/>				
• New disposable income for residents	<input type="radio"/>				
• Changes in property values	<input type="radio"/>				
• Providing income & tax advisors and estate planners	<input type="radio"/>				
• Educational sessions regarding leases	<input type="radio"/>				
• Clearinghouse of information	<input type="radio"/>				
• Updates to local zoning regulations to address drilling issues	<input type="radio"/>				
• Setbacks, buffers, landscaping, screening and sound barrier requirements	<input type="radio"/>				
• Updates to housing and building codes	<input type="radio"/>				
• Preservation of historic sites	<input type="radio"/>				
• Reuse of existing brownfield sites	<input type="radio"/>				
• Converting vacant sites and buildings to oil-related offices or housing	<input type="radio"/>				
• A consistent set of rules and regulations for the region re: oil & gas drilling	<input type="radio"/>				
• A streamlined permitting process	<input type="radio"/>				
• A viable GIS system including oil & gas data	<input type="radio"/>				
• Closing orphan wells	<input type="radio"/>				

Please provide any comments on the above issues, issues we may have missed, or topics we should investigate:



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Titusville Oil and Gas Steering Committee Survey

Thank you for participating on the Steering Committee and for completing this survey.

Each of these issues will be ranked according to how many times they were selected and with what degree of importance. This will enable us to get a prioritized list of issues.

If you would like have a one-on-one discussion about any of these issues or others dealing with the oil & gas industry, please call Charlene Kerr at 814.725.3938.



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APPENDIX E: STAKEHOLDER SURVEY RESULTS

1. In your opinion, how important are the following issues for the Titusville area? (1—very important, 2—somewhat important, 3—neutral/not sure, 4—somewhat unimportant, 5—not important). This survey does not predict that shale gas development will occur, when it will occur, or exactly what the impacts or issues will be if it does occur. However, where shale gas development in Pennsylvania has occurred, some of these impacts resulted and some of these issues have become important.

	Answered question					32	
	Skipped question					0	
	1	2	3	4	5	Rating Average	Rating Count
Establishing baselines for surface water	34.4% (11)	40.6% (13)	9.4% (3)	12.5% (4)	3.1% (1)	3.91	32
Establishing baselines for ground water quality	68.8% (22)	12.5% (4)	6.3% (2)	9.4% (3)	3.1% (1)	4.34	32
Identifying areas of existing ground or surface water contamination	65.6% (21)	12.5% (4)	9.4% (3)	9.4% (3)	3.1% (1)	4.28	32
Continued monitoring of changes in ground water quality	65.6% (21)	9.4% (3)	12.5% (4)	9.4% (3)	3.1% (1)	4.25	32
Continued monitoring of changes in surface water quality	53.1% (17)	18.8% (6)	18.8% (6)	6.3% (2)	3.1% (1)	4.13	32
How frac, flowback, and produced water is transported and stored	43.8% (14)	28.1% (9)	18.8% (6)	6.3% (2)	3.1% (1)	4.03	32
Should frac, flowback, and produced water be recycled or disposed of in permitted deep disposal wells	30.0% (9)	46.7% (14)	13.3% (4)	6.7% (2)	3.3% (1)	3.93	30
Identification and protection of environmentally sensitive areas	53.1% (17)	21.9% (7)	15.6% (5)	6.3% (2)	3.1% (1)	4.16	32



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1. In your opinion, how important are the following issues for the Titusville area? (1—very important, 2—somewhat important, 3—neutral/not sure, 4—somewhat unimportant, 5—not important). This survey does not predict that shale gas development will occur, when it will occur, or exactly what the impacts or issues will be if it does occur. However, where shale gas development in Pennsylvania has occurred, some of these impacts resulted and some of these issues have become important.

The need for gas line infrastructure to get gas to the market	75.0% (24)	21.9% (7)	0.0% (0)	0.0% (0)	3.1% (1)	4.66	32
The need for gas line infrastructure to get gas to residential customers	29.0% (9)	38.7% (12)	12.9% (4)	16.1% (5)	3.2% (1)	3.74	31
Diminished air quality	46.9% (15)	15.6% (5)	15.6% (5)	18.8% (6)	3.1% (1)	3.84	32
Increased noise from trucks, pad site operation, and construction	6.3% (2)	43.8% (14)	21.9% (7)	21.9% (7)	6.3% (2)	3.22	32
Increased light pollution, limiting celestial viewing	9.4% (3)	28.1% (9)	25.0% (8)	18.8% (6)	18.8% (6)	2.91	32
Forest fragmentation-cutting of trees for roads, pad sites, and pipelines	9.4% (3)	37.5% (12)	18.8% (6)	28.1% (9)	6.3% (2)	3.16	32
Habitat fragmentation-failure to restore disturbed areas with exactly the plants, trees, surface and shallow subsurface drainage that existed before	25.8% (8)	29.0% (9)	16.1% (5)	19.4% (6)	9.7% (3)	3.42	31
Regular monitoring of air and water quality	46.9% (15)	28.1% (9)	15.6% (5)	6.3% (2)	3.1% (1)	4.09	32
The impact of shale gas resource development impact on tourism and ag assets	21.9% (7)	43.8% (14)	25.0% (8)	6.3% (2)	3.1% (1)	3.75	32
Establishing a "Buy Local" program for gas companies	37.5% (12)	37.5% (12)	15.6% (5)	9.4% (3)	0.0% (0)	4.03	32
Converting individual cars or fleets to CNG	21.9% (7)	59.4% (19)	9.4% (3)	6.3% (2)	3.1% (1)	3.91	32
Building a CNG fueling station	40.6% (13)	40.6% (13)	9.4% (3)	3.1% (1)	6.3% (2)	4.06	32



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Establishing baseline roadway conditions data	31.3% (10)	43.8% (14)	12.5% (4)	6.3% (2)	6.3% (2)	3.88	32
Living with temporary damage to roadways	9.4% (3)	43.8% (14)	25.0% (8)	15.6% (5)	6.3% (2)	3.34	32
Traffic backups in some locations	3.1% (1)	40.6% (13)	34.4% (11)	15.6% (5)	6.3% (2)	3.19	32
Additional truck traffic	9.4% (3)	40.6% (13)	31.3% (10)	12.5% (4)	6.3% (2)	3.34	32
Increased traffic at night	9.4% (3)	25.0% (8)	31.3% (10)	28.1% (9)	6.3% (2)	3.03	32
Conflicts between trucks and school buses	31.3% (10)	31.3% (10)	18.8% (6)	9.4% (3)	9.4% (3)	3.66	32
Road Use/Maintenance Agreements	40.6% (13)	37.5% (12)	9.4% (3)	3.1% (1)	9.4% (3)	3.97	32
Roadway Bonding	38.7% (12)	35.5% (11)	9.7% (3)	9.7% (3)	6.5% (2)	3.90	31
Designating truck routes	43.8% (14)	40.6% (13)	6.3% (2)	0.0% (0)	9.4% (3)	4.09	32
Increased workload on emergency responders	22.6% (7)	38.7% (12)	19.4% (6)	9.7% (3)	9.7% (3)	3.55	31
Specialized training for emergency responders	56.3% (18)	18.8% (6)	9.4% (3)	9.4% (3)	6.3% (2)	4.09	32
Increased need for government services and workers	9.4% (3)	28.1% (9)	31.3% (10)	18.8% (6)	12.5% (4)	3.03	32
Selection of projects paid with Act 13 impact fees	31.3% (10)	37.5% (12)	25.0% (8)	0.0% (0)	6.3% (2)	3.88	32
911 addressing for all gas operations	46.9% (15)	28.1% (9)	9.4% (3)	9.4% (3)	6.3% (2)	4.00	32
Tougher penalties for trucking violations	25.0% (8)	37.5% (12)	15.6% (5)	15.6% (5)	6.3% (2)	3.59	32
Require Emergency Response Plans from companies	59.4% (19)	25.0% (8)	9.4% (3)	0.0% (0)	6.3% (2)	4.31	32



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Establishing a baseline for housing and lodging data	25.0% (8)	50.0% (16)	12.5% (4)	6.3% (2)	6.3% (2)	3.81	32
Influx of non local people and companies into the community	15.6% (5)	40.6% (13)	25.0% (8)	12.5% (4)	6.3% (2)	3.47	32
Impacts on the current housing supply	12.5% (4)	56.3% (18)	18.8% (6)	9.4% (3)	3.1% (1)	3.66	32
Impacts on the current lodging supply	18.8% (6)	53.1% (17)	12.5% (4)	9.4% (3)	6.3% (2)	3.69	32
Impacts on housing and lodging costs	15.6% (5)	53.1% (17)	12.5% (4)	9.4% (3)	9.4% (3)	3.56	32
Use of RV parks for industry workers	9.4% (3)	40.6% (13)	31.3% (10)	12.5% (4)	6.3% (2)	3.34	32
Affordable housing programs	12.5% (4)	50.0% (16)	31.3% (10)	3.1% (1)	3.1% (1)	3.66	32
Increased opportunities for service providers and retailers	50.0% (16)	40.6% (13)	0.0% (0)	6.3% (2)	3.1% (1)	4.28	32
The need for service businesses to adapt to new markets	50.0% (16)	37.5% (12)	3.1% (1)	6.3% (2)	3.1% (1)	4.25	32
Changes in levels of crime	28.1% (9)	21.9% (7)	28.1% (9)	15.6% (5)	6.3% (2)	3.50	32
Increases in STD's	16.1% (5)	16.1% (5)	29.0% (9)	22.6% (7)	16.1% (5)	2.94	31
Social and cultural impacts	6.3% (2)	31.3% (10)	50.0% (16)	3.1% (1)	9.4% (3)	3.22	32
Educating and informing the public	59.4% (19)	25.0% (8)	9.4% (3)	3.1% (1)	3.1% (1)	4.34	32
School enrollment increases	12.5% (4)	40.6% (13)	37.5% (12)	6.3% (2)	3.1% (1)	3.53	32
Capacity of existing school buildings	9.4% (3)	46.9% (15)	34.4% (11)	6.3% (2)	3.1% (1)	3.53	32



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The need for curricula changes for transient workers' children	6.5% (2)	38.7% (12)	25.8% (8)	25.8% (8)	3.2% (1)	3.19	31
Capacity of Emergency Room at hospital	18.8% (6)	43.8% (14)	21.9% (7)	12.5% (4)	3.1% (1)	3.63	32
The industry attracting workers away from existing businesses	25.0% (8)	34.4% (11)	18.8% (6)	15.6% (5)	6.3% (2)	3.56	32
Lack of an adequately trained local workforce	50.0% (16)	40.6% (13)	3.1% (1)	3.1% (1)	3.1% (1)	4.31	32
Current workforce training programs	56.3% (18)	40.6% (13)	0.0% (0)	0.0% (0)	3.1% (1)	4.47	32
CDL license training	43.8% (14)	31.3% (10)	15.6% (5)	3.1% (1)	6.3% (2)	4.03	32
Capacity of existing workforce training facilities	43.8% (14)	37.5% (12)	12.5% (4)	3.1% (1)	3.1% (1)	4.16	32
Enticing young adults into gas-related careers	53.1% (17)	28.1% (9)	15.6% (5)	0.0% (0)	3.1% (1)	4.28	32
Active recruitment of oil & gas ancillary services	50.0% (16)	37.5% (12)	9.4% (3)	0.0% (0)	3.1% (1)	4.31	32
Helping local businesses expand to meet gas industry needs	56.3% (18)	28.1% (9)	9.4% (3)	3.1% (1)	3.1% (1)	4.31	32
New disposable income for residents	37.5% (12)	18.8% (6)	25.0% (8)	12.5% (4)	6.3% (2)	3.69	32
Changes in property values	31.3% (10)	34.4% (11)	28.1% (9)	0.0% (0)	6.3% (2)	3.84	32
Providing income & tax advisors and estate planners	15.6% (5)	34.4% (11)	34.4% (11)	9.4% (3)	6.3% (2)	3.44	32
Educational sessions regarding leases	40.6% (13)	40.6% (13)	9.4% (3)	6.3% (2)	3.1% (1)	4.09	32
Clearinghouse of information	35.5% (11)	41.9% (13)	12.9% (4)	6.5% (2)	3.2% (1)	4.00	31



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Updates to local zoning regulations to address drilling issues	41.9% (13)	29.0% (9)	12.9% (4)	12.9% (4)	3.2% (1)	3.94	31
Setbacks, buffers, landscaping, screening and sound barrier requirements	40.6% (13)	28.1% (9)	18.8% (6)	6.3% (2)	6.3% (2)	3.91	32
Updates to housing and building codes	18.8% (6)	28.1% (9)	31.3% (10)	15.6% (5)	6.3% (2)	3.38	32
Preservation of historic sites	46.9% (15)	15.6% (5)	18.8% (6)	9.4% (3)	9.4% (3)	3.81	32
Reuse of existing brownfield sites	48.4% (15)	38.7% (12)	3.2% (1)	6.5% (2)	3.2% (1)	4.23	31
Converting vacant sites and buildings to oil-related offices or housing	48.4% (15)	45.2% (14)	3.2% (1)	0.0% (0)	3.2% (1)	4.35	31
A consistent set of rules and regulations for the region re: oil & gas drilling	61.3% (19)	29.0% (9)	0.0% (0)	3.2% (1)	6.5% (2)	4.35	31
A streamlined permitting process	59.4% (19)	28.1% (9)	6.3% (2)	0.0% (0)	6.3% (2)	4.34	32
A viable GIS system including oil & gas data	43.8% (14)	28.1% (9)	18.8% (6)	3.1% (1)	6.3% (2)	4.00	32
Closing orphan wells	37.5% (12)	37.5% (12)	15.6% (5)	3.1% (1)	6.3% (2)	3.97	32

Please provide any comments on the above issues, issues we may have missed, or topics we should investigate:

Show replies

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COME BACK TO WHERE IT ALL STARTED

We have been drilling here since 1859 – We get it!

TITUSVILLE, PA

UTICA SHALE STRATEGIC PLAN

JULY 2014



CMK Planning, LLC