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Ohio Housing Finance Agency

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**HOUSING IMPACT OF
SHALE DEVELOPMENT IN
EASTERN OHIO UPDATE:
FEBRUARY 2017**

**Center for
Economic
Development**

**Center for
Community
Planning and
Development**

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Acknowledgments

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About the Center for Economic Development

The Center for Economic Development at Cleveland State University's Maxine Goodman Levin College of Urban Affairs provides research and technical assistance to government agencies, non-profit organizations, and private industry. The Center has expertise in studying ecology of innovation, entrepreneurship, performance of economic clusters, industry analysis, economic analysis of cities and regions, economic impact, economic development strategy and policy, workforce development and evaluation of economic development initiatives. The Center has served as a designated Economic Development Administration (EDA) University Center since 1985. The Center's professional staff includes four full-time researchers, a system analyst, associated faculty, and several graduate research assistants.

The Center works with funders, partners, and clients at the national, state, regional, and local levels. All Center's research are summarized in publications, including working reports, journal articles, and book chapters. For more information on the Center for Economic Development, use the following link:

<http://urban.csuohio.edu/economicdevelopment/>

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The Center strengthens the practice of planning and community development through independent research, technical assistance, and civic education and engagement. The Center works in partnership with public, private and non-profit organizations, local governments, and development and planning professionals.

Areas of Expertise:

- Planning, program development and evaluation to foster resilient, just and prosperous communities, improve the quality of life, attack the causes of poverty and inequality, and advance the sustainable development of urban regions.
- Public policy research to inform policymakers, students and market actors (businesses) as they respond to issues related to housing and neighborhood development and change (including foreclosures and vacant and abandoned property).
- Data development and dissemination to promote the exchange of information and data and technical assistance about community planning, development, and housing issues.
- Convening and engaged learning to link the university and the community in the dynamic exchange of ideas, expertise and knowledge on issues of importance to the future of Northeast Ohio communities. Provide opportunities for students and faculty to extend classroom learning to real-world applications.

For more information on the Center for Community Planning and Development, use the following link: http://cua6.urban.csuohio.edu/community_planning/

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INTRODUCTION

This quarterly update of the Housing Impact of Shale Drilling Study and Dashboard (Appendix 1) includes indicators measuring oil and gas shale development activities in the fourth quarter and indicators measuring the housing market in third quarter of 2016. As with previous reports and dashboards, the companion documents were prepared by a team of researchers from Cleveland State University's Levin College of Urban Affairs (CSU) for the Ohio Housing Finance Agency (OHFA) to monitor the impact of the Utica shale development in Ohio on housing affordability and availability in eight counties of eastern Ohio where the core upstream and midstream activities of shale development are concentrated. The eight counties include Belmont, Carroll, Columbiana, Guernsey, Harrison, Jefferson, Monroe, and Noble.

Updates of the upstream and midstream activities are provided for all indicators developed in the second iteration of the dashboard and report: well count, potential employment, oil price, and sales tax.

The housing market update for the third quarter of 2016 uses the five indicators developed in the initial dashboard and report: number of home sales, median sale price, days on market, rent per square foot, and rental vacancy rate. The indicators of multi-family affordability and availability are derived from CoStar data and include an update of the first and second quarter 2016 data as well.

A PROFILE OF THE REGION

Study Area

The study area is comprised of eight counties: Belmont, Carroll, Columbiana, Guernsey, Harrison, Jefferson, Monroe, and Noble. These eight eastern Ohio counties along the Ohio River have been the site of much of the shale-related activity in Ohio since 2013.

Housing and Demographics

The eight eastern Ohio counties are home to 358,107 people and 142,158 households or about 3% of Ohio's population and households. More than two-thirds of the people and households in the region live in three counties: Columbiana, Belmont, and Jefferson.

Table 1 provides the most recent housing and population data for the region and the state. This data is from the American Community Survey's (ACS) 5-year average estimates, 2010-2014. The data indicates:

- The percentage of renters in the region (26%) is lower than the state average (33%). Within the region of eight eastern Ohio counties, Noble County has the smallest percentage of renters (18%); Jefferson County has the highest (29%).

- The regional housing stock is older than Ohio’s; 36% of the study area’s housing was built before 1950, compared to 27% for the state. Further, only 8% of the region’s housing stock has been constructed since 2000 compared with 10% for the state.
- One indicator of housing availability is an area’s vacancy rate. The region’s overall vacancy rate (14.5%) is higher than the overall vacancy rate for Ohio (11%). This higher vacancy rate indicates that the regional housing market is weakening somewhat.
- Another indicator of availability is the number of households per housing units. There are slightly fewer households per housing unit in the region (0.85) than in the state overall (0.89), which provides further evidence that there may be slack in the region’s housing market.

Table 1. Housing and Population-8 Eastern Ohio Counties

County	Population	Households	Housing Units	Households per Unit	Percent Vacant Units	Percent Renters	Percent Built Before 1950	Percent Built Since 2000
Belmont	69,793	28,007	32,295	0.87	13.2%	25%	40%	7.8%
Carroll	28,539	10,922	13,636	0.80	19.9%	21.5%	26.5%	11.6%
Columbiana	106,622	42,184	46,860	0.90	9.9%	28.4%	35.7%	8.5%
Guernsey	39,794	15,564	19,127	0.81	18.6%	25.9%	34.4%	10.7%
Harrison	15,698	6,333	8,130	0.78	22.1%	22.2%	40.4%	8.8%
Jefferson	68,510	28,176	32,661	0.86	13.7%	28.8%	35.2%	4.2%
Monroe	14,590	6,056	7,525	0.80	19.5%	22.6%	35.6%	9.3%
Noble	14,561	4,916	6,037	0.81	18.6%	18%	32.4%	14.1%
8-County	358,107	142,158	166,271	0.85	14.5%	26.1%	35.6%	8.3%
Ohio	11,560,380	4,570,015	5,135,173	0.89	11%	33.1%	27.5%	10%

Source: U.S. Census Bureau, American Community¹ (2010-2014)

Table 2 provides overall vacancy rate trends for housing units in the region. The table illustrates that annual vacancy rates increased slightly, but steadily by 0.5% per year from 2012 to 2014 (13.5 to 14.5%).

¹ Population: Table S0101; Households: Table B11016; Housing Units, Percent vacant units: Table B25002; Percent Renters: Table B25106; Percent Built Before 1950 and as of 2010: Table B25034.

Table 2. Housing Units and Overall Vacancy Rates

County	Number of Housing Units		Occupied Units		Vacant Units		Vacancy Rate	
	2012	2014	2012	2014	2012	2014	2012	2014
Belmont	32,408	32,295	28,716	28,007	3,692	4,288	11.39	13.28
Carroll	13,664	13,636	11,424	10,922	2,240	2,714	16.39	19.90
Columbiana	47,025	46,860	42,476	42,184	4,549	4,676	9.67	9.98
Guernsey	19,185	19,127	15,808	15,564	3,377	3,563	17.60	18.63
Harrison	8,154	8,130	6,324	6,333	1,830	1,797	22.44	22.10
Jefferson	32,807	32,661	28,608	28,176	4,199	4,485	12.80	13.73
Monroe	7,552	7,525	6,071	6,056	1,481	1,469	19.61	19.52
Noble	6,020	6,037	4,804	4,916	1,216	1,121	20.20	18.57
8-Counties	166,815	166,271	144,231	142,158	22,584	24,113	13.54	14.50
Ohio	5,124,503	5,135,173	4,555,709	4,570,015	568,794	565,158	11.10	11.01

Source: U.S. Census Bureau, American Community Survey, 5-year files for (ending years) 2012, 2013, 2014, Table B25002

Table 3 provides information about the type of housing in the region. It shows that the region's housing stock is predominantly single family units (78%). However, the share of housing classified by the Census as "other" (mobile homes, trailer parks, etc.) is more than twice that of Ohio as a whole.

Table 3. Housing Units by Type

County	Total Housing Units, 2012	Percent of Each Type				
		1-Unit	2-19	20-49	50+	Other
Belmont	32,408	77.5	12.3	1.0	1.3	7.9
Carroll	13,664	80.9	5.0	0.2	0.3	13.6
Columbiana	47,025	77.7	11.6	0.7	1.2	8.8
Guernsey	19,185	75.0	8.6	1.3	1.0	14.1
Harrison	8,154	78.8	6.1	0.3	0.0	14.8
Jefferson	32,807	79.9	11.1	1.0	1.7	6.3
Monroe	7,552	82.7	3.9	0.5	0.8	12.1
Noble	6,020	79.8	4.8	0.8	0.0	14.6
8-Counties	166,815	78.4	9.9	0.8	1.1	9.8
Ohio	5,124,503	73.1	17.7	2.1	3.1	4.0

Source: U.S. Census Bureau, ACS, 5-year file for 2012 (ending year), Table B25024

Table 4 provides an estimate of the median household income for the region in 2014. The estimated median of \$42,384 was below the statewide median of \$48,849.

Table 4. Estimated Median Household Income

County	Total Households	Percent in Income Range, 2014						Median Income
		0-<15	15-<25	25-<35	35-<50	50-<100	100+	
Belmont	28,007	14.1	14.7	13.1	15.3	29.4	13.4	43,045
Carroll	10,922	11.7	11.7	13.3	17.3	32.8	13.2	45,660
Columbiana	42,184	13.8	14.1	12.0	16.0	32.1	11.9	43,707
Guernsey	15,564	14.4	16.1	13.2	14.9	28.9	12.5	40,420
Harrison	6,333	14.0	14.0	15.1	16.4	28.5	12.0	41,819
Jefferson	28,176	16.8	14.2	12.1	16.5	28.5	11.8	40,816
Monroe	6,056	13.6	14.4	12.7	19.6	29.8	9.8	41,394
Noble	4,916	14.1	19.1	14.9	15.2	28.3	8.3	37,126
8- Counties	144,231	15.1	14.3	13.5	16.6	30.4	10.2	42,384
Ohio	4,570,015	13.8	11.7	11.0	14.5	30.5	18.5	48,849

Source: U.S. Census Bureau, ACS 5-year data for 2010-2014, Table S1901

Note: The eight county medians are estimates. They were calculated by weighting each county's median household income.

Employment

To place the impact of shale-related employment on the housing market in a larger context, the study looked at the 10 largest employers in each county of the study area. Total employment in the top 10 employers by county is summarized below.

Table 5 shows that the region's largest companies employed 26,272 people in 2014. Employment is concentrated in Jefferson, Columbiana, Guernsey and Belmont Counties.

Table 5. 2014 Employment in the Top 10 Employers by County

County	Number of Employees
Belmont	3,923
Carroll	2,175
Columbiana	5,548
Guernsey	4,145
Harrison	1,331
Jefferson	6,453
Monroe	1,399
Noble	1,298
Total	26,272

Source: LexisNexis Academic, ReferenceUSA, Ohio Department of Development's County profiles, Ohio Department of Education, counties' websites.

Baseline: Housing Affordability

The following tables provide baseline information about housing affordability in the region. This baseline data is drawn from U.S. Census estimates. However, it is important to note that the most recent estimates are from 2014. Although they are two years old, these data provide a useful context in which the dashboard’s quarterly updates can be interpreted.

Table 6. Housing Affordability

	Renters			Owners		
	Percent Cost-Burdened		Pct. Point Change	Percent Cost-Burdened		Pct. Point Change
	2012	2014		2012	2014	
LIHTC-eligible	71.9%	66.7%	-5.2%	53.6%	57.6%	4%
Not LIHTC-eligible	4.6%	10.2%	5.6%	7.6%	8.9%	1.3%
Total	40.7%	41.8%	1.1%	17.4%	19.2%	1.8%

Sources: IPUMS-USA, University of Minnesota, www.ipums.org.

Note: Calculations are based on PUMA geographies that, in some cases, cover an area larger than the eight-county region. Data is weighted accordingly. (See appendix 5 for more details).

Table 6 illustrates housing affordability for low-income and all other renters and owners in the region. Households paying more than 30% of their household income for housing are considered “cost burdened”. For the purpose of this study, a *low-income* household is defined as one with a household income less than 60% of the HUD Area Median Family Income (HAMFI). This definition is consistent with the standard of eligibility for the Low-Income Housing Tax Credit program (LIHTC-eligible). For a household of four living in the region in 2014, an income of 60% HAMFI would equate to approximately \$33,000 per year. All other households are considered “Not LIHTC-eligible”.

- In 2014, 42% of all renter households and 19% of owner households were cost burdened.²
- Among all cost burdened renters, the vast majority (89%) were low income. Among all cost burdened homeowners, 66% were low income.
- Not all low-income renters and homeowners are cost-burdened, but more than half of each group are. Of low income renters, 66.7% were cost burdened, compared to 57.6% of low-income homeowners.
- For low-income renters, housing became more affordable from 2012-2014, but low-income owners did not experience a similar trend. While the percent of low-income, cost-burdened renters declined by 5.2% over the two-year span (indicating an increase in affordability), low-income homeowners found the housing market becoming less affordable with a 4% increase in cost-burdened households during the same time frame.

² Cost burden is defined as paying more than 30% of household income toward housing.

- For all other “Not-LIHTC-eligible” households, the percent of cost-burdened renters increased by 1.1% and the percent of cost-burdened homeowners increased by 1.8% from 2012-2014.

Baseline: Housing Availability by Housing Value

Table 7. Housing Availability for Homeowners

		Ohio		Shale County PUMAs	
		2012	2014	2012	2014
< \$100,000	Owner-occupied housing units	1,072,186	1,082,604	94,872	98,880
	Vacancy Rate	3.09	3.18	1.18	1.84
\$100,000+	Owner-occupied housing units	1,944,221	1,921,393	104,461	98,795
	Vacancy Rate	1.21	0.96	1.48	0.60
All	Owner-occupied housing units	3,016,407	3,003,997	199,333	197,675
	Vacancy Rate	1.89	1.78	1.34	1.23

Source: U.S. Census Bureau, American Community Survey Public Use Microdata. Sample (PUMS), 1-year data for 2012 and 2014.

Table 7 shows the vacancy rate for homeowner occupied housing. It is broken down by housing valued at less than \$100,000 and housing valued at more than \$100,000. As will be noted later in the report, \$100,000 is used in this analysis as a proxy for “affordable” housing. As noted above, a low income, four-person household living in the region could have a maximum income of about \$33,000 in 2014. Using an industry rule of thumb - mortgage affordability is equal to about three times annual income - a low income household could therefore theoretically afford to purchase a home costing \$100,000 or less.

The vacancy rate in the eight-county region for “affordable housing” increased slightly from 1.18 to 1.84 from 2012-2014 while the rate for housing priced over \$100,000 decreased from 1.48 to .60 over the same period. The trend is similar for the state, although the state’s vacancy rate for “affordable” housing is higher than the region’s. For all units in the region, the vacancy rate is lower than the state’s and declined slightly from 1.34 to 1.23 from 2012 to 2014; a similar trend is evident at the state level.

This indicates that in 2012 and 2014, the region’s for-sale housing market had lower vacancy rates than the state’s, especially for homes price at under \$100,000.

Baseline: Federally Subsidized Housing

Table 8. Federally Subsidized Housing Units

County	Public Housing Units	Project-based Section 8 Units	RD 515 Units	RD 538 Units	County Total	LIHTC Units
Belmont	722	645	570	238	2,175	280
Carroll	0	155	44	82	325	85
Columbiana	479	375	336	96	1,286	340
Guernsey	181	517	634	90	1,470	351
Jefferson	695	637	48	218	1,598	642
Harrison	50	0	32	40	122	164
Monroe	0	9	100	0	109	60
Noble	28	0	144	0	172	48
8-Counties	2,155	2,338	1,908	764	7,257	1,970

Source: County Housing Authorities; National Historic Preservation Database, and LIHTC counts are from Bryan Grady, Research Analyst, OHFA, e-mail correspondence, May 9, 2016.

- The region has about 7,257 federally subsidized, project based rental units and another 1,970 LIHTC units.
- There are an estimated 2,500 housing choice voucher holders living in the region. ³
- Approximately 1 in 7 renters in the region received some form of federal rent subsidy from HUD, compared to about 1 in 8 renters statewide. ⁴

Trends

Trends Update, January 2016

Number of Interviews were conducted with local housing, social service and civic officials. Information gathered through these interviews was used to identify perceived regional trends from those 'on the ground.' Some of these trends may not be revealed in the data.

³ Sources: This data is derived from two sources. The first is telephone interviews with local housing authorities listed in Appendix 7. The second is the U.S. Department of Housing and Urban Development, "Housing Choice Vouchers by Tract", data current as of 6/15/2015.

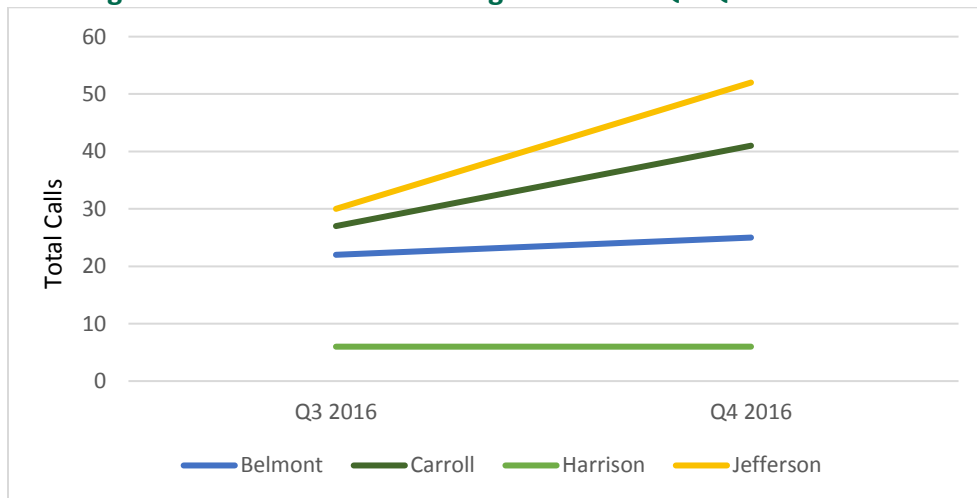
[http://egis.hud.opendata.arcgis.com/datasets?q=Housing%20Choice%20Vouchers%20by%20Tract&sort_by=relevance]

⁴ Ohio Housing Needs Assessment, Technical Supplement to the Fiscal Year 2017 Annual Plan, DRAFT, Ohio Housing Finance Agency, May 3, 2016.

As of the end of the third quarter of 2016:

- In Harrison and Carroll counties, not much has changed since July 2016. The market for rental housing affordable to housing choice voucher holders has not loosened any further. The perception on the ground is that shale-related activity has remained static.⁵
- Monroe and Belmont counties seem to be experiencing the most shale drilling activity of the counties in the study area. Even there, however, shale activity is slow relative to two years ago when activity was at its peak. While both counties saw less contraction when oil prices fell and recovered more quickly afterward, it would appear that the current level of shale activity is not impacting the availability of homes. ‘For Rent’ and ‘For Sale’ signs are visible, and there are fewer RVs and other semi-temporary housing visible in the area than there were during previous years.⁶
- Another indicator of the demand for housing assistance is the number of calls received by Cleveland’s United Way 211 which serves 26 counties. That data is available for the third and fourth quarters of 2016 for four counties, Belmont, Carroll, Harrison and Jefferson. In Belmont, Carroll and Jefferson, the number of calls for housing assistance increased, while in Harrison County the number of calls, while quite small (6) stayed the same. These trends are illustrated in Figure 1.

Figure 1: Total Calls for Housing Assistance Q3-Q4 2016



Source: Cleveland United Way 211

⁵ E-mail communication with Dan Gichevsky, Executive Director, Harrison County Housing Authority, January 26, 2017.

⁶ E-mail communication with Mark Landefeld, OSU Extension – Monroe, February 14, 2017

UTICA SHALE DEVELOPMENT

OVERVIEW

This study assists OHFA in understanding the impact of the shale development on housing markets in core areas of the Utica play. The oil and gas industry and its suppliers are analyzed in relation to three main industry components: upstream, midstream and downstream.⁷

Updates of four main indicators for Ohio's Utica Shale development are presented in this iteration of the dashboard and report. They illustrate key trends that potentially impact the housing market in the study area. These indicators track changes over time in the West Texas Intermediate (WTI) oil price, oil and gas well count, and quarterly potentially created jobs.⁸ Total sales tax revenue collected primarily from retail sales complements the projected quarterly employment by indirectly indicating an influx of transient workers into the region.

In addition to the dashboard indicators, the accompanying report includes industry updates that illustrate the strategy of the main players – exploration companies and main midstream companies. As in the previous iteration, additional shale indicators discussed in the report track the status of horizontal well permits, number of drilling rigs, number of wells in different phases of construction and operation, and progress in the projects conducted by the midstream operators. The interplay of these indicators provides additional context for the analysis of the housing indicators.

QUARTER 4 OF 2016 AND QUARTER 1 OF 2017

Industry Updates

In December 2016, the Organization of Petroleum Exporting Countries (OPEC) and a group of non-OPEC countries came to an agreement to reduce oil output in response to global oil oversupply and low oil prices. This is the first time OPEC and non-OPEC countries have come to such an agreement since 2001. In the first month of 2017, OPEC members have reduced output by 958,000 barrels per day. This is 82% of the target output reduction and is an early indication of strong compliance.⁹

⁷ More on the description of upstream, midstream and downstream industries read in the report Lendel, Iryna; Thomas, Andrew R.; Townley, Bryan; and Dick, Jeffrey C., "Mapping the Opportunities for Shale Development in Ohio" (2015). *Urban Publications*. Paper 1328. http://engagedscholarship.csuohio.edu/urban_facpub/1328.

⁸ More on the description of the three main indicators can be found in the report Hexter, Kathryn W.; Lendel, Iryna; Post, Charlie; Downer, Nick; and Martis, Sydney, "Housing Impact of Shale Development in Eastern Ohio" (2016). *Urban Publications*. 0 1 2 3 1384. http://engagedscholarship.csuohio.edu/urban_facpub/1384.

⁹ OPEC achieves 82 percent of pledged oil output cut in January: Reuters survey. Reuters. January 31, 2017. <http://www.reuters.com/article/us-opec-oil-survey-idUSKBN15F14D>

On January 24, 2017, President Donald Trump signed an executive order that re-opened federal review of the Keystone XL and Dakota Access pipelines, projects that both had been blocked under the Obama administration. The new document signed by Trump allows for expedited review of specially designated large infrastructure projects. Trump requested a determination from the State Department within 60 days on whether or not the Keystone XL project should move forward and advised the US Army Corps of Engineers proceed on a Dakota Access decision with previously collected environmental impact data.¹⁰

Upstream Development: Activity and Oil Price

U.S. drilling has increased to fill the void created by the OPEC led oil cuts. In January 2017, the number of oil rigs operating in the U.S. was at its highest since November 2015, with the most production since April 2016.¹¹

Chesapeake Energy Corporation CEO Doug Lawler says that his company plans to primarily focus on completing existing wells in the Utica and Marcellus basins in 2017, rather than drilling new wells. The company also plans to begin applying more aggressive fracture stimulation procedures in hopes of improving production output from existing wells.¹²

Midstream: Approved Pipelines and Increased Storage Capacity

In February 2017, the Federal Energy Regulatory Commission (FERC) approved the \$4.3 billion Rover Pipeline, which is being developed by Texas-based Energy Transfer Partners. The pipeline, beginning in West Virginia, crossing through Ohio, and ending in Michigan, will have a carrying capacity of 3.25 billion cubic feet of gas per day and improve market access for the Utica and Marcellus regions.¹³

In January 2017, FERC approved construction of the TransCanada Corporation's Leach XPress and Rayne XPress pipelines designed to carry natural gas from the Marcellus and Utica regions to Midwestern and Gulf Coast markets. Total expected investment in the two pipelines is

¹⁰ Trump Pins Keystone, Dakota Pipeline Fate on Renegotiation. Bloomberg. January 24, 2017. <https://www.bloomberg.com/politics/articles/2017-01-24/trump-advances-keystone-and-dakota-pipelines-fulfilling-pledge>

¹¹ Oil Falls a Second Day as U.S. Drilling Expands While OPEC Cuts. Bloomberg. January 30, 2017. <https://www.bloomberg.com/news/articles/2017-01-29/oil-falls-as-u-s-steps-up-drilling-amid-opec-output-reduction>

¹² Chesapeake Energy Corporation Provides 2017 Guidance And Operational Update. February 14, 2017. <http://www.chk.com/media/news/press-releases/Chesapeake+Energy+Corporation+Provides+2017+Guidance+And+Operational+Update+2+14+2017+>

¹³ \$4.3 Billion Rover Pipeline Approved. The Intelligencer. February 5, 2017. <http://www.theintelligencer.net/news/top-headlines/2017/02/4-3-billion-rover-pipeline-approved/>

projected to be \$1.8 billion. TransCanada hopes to have the pipelines operational by November 1, 2017.¹⁴

A natural gas storage facility, to be located in underground salt caverns, is in the early stages of development in Monroe County. The proposed site, still in the permitting stage, is 12 miles from a proposed ethane cracker site in Belmont County. The storage facility, with possibly 168 million gallons of storage capacity, would be the first of its kind in the Marcellus/Utica region.¹⁵

Downstream

Royal Dutch Shell PLC subsidiary Shell Chemical Appalachia LLC is on schedule with completion of the early works program in preparation for a targeted late-2017 start of construction on its petrochemical complex along the Ohio River in Potter Township, Beaver County, PA. The early works program, including site preparation and detailed design and engineering work, has been progressing safely, efficiently, and to the highest standards of engineering, with main site construction on track to begin later this year. According to the company, completed works include installation of 4,200 steel pilings for the foundations of several permanent structures, relocation of an existing state highway, and improvements to interchanges intended to benefit area motorists as well as accommodate trucks working on the main construction phase.¹⁶

Plans for a potential multi-billion dollar ethane cracker facility to be located in Belmont County are still being considered by the Thailand based energy company PTT Global Chemical. An announcement was originally expected by summer 2017, but the company is now saying that a decision on the plant will not be finalized until closer to the end of the year.¹⁷

Clean Energy Future, a Boston-based energy company, recently proposed two additional natural gas power plants to be built in Ohio, adding to the two the company is already constructing in the state. There are now 10 natural gas power plants in various stages of development throughout Ohio as natural gas continues to build its market share over coal.¹⁸

¹⁴ Moving Gas: FERC Approves Construction of TransCanada's Leach XPress and Rayne XPress Pipelines. Oil and Gas 360. January 19, 2017. <http://www.oilandgas360.com/moving-gas-ferc-approves-construction-of-transcanadas-leach-xpress-and-rayne-xpress-pipelines/>

¹⁵ Ethane to Be Stored Underground In Monroe County. The Intelligencer. February 5, 2017. <http://www.theintelligencer.net/news/top-headlines/2017/02/ethane-to-be-stored-underground-in-monroe-county/>

¹⁶ Robert Brelsford "Shale's Appalachian ethylene complex construction set for late 2017." Oil and Gas Journal Online, April 4, 2017.

¹⁷ Decision on Ohio 'cracker' plant delayed to late this year. The Columbus Dispatch. February 14, 2017. <http://www.dispatch.com/news/20170214/decision-on-ohio-cracker-plant-delayed-to-late-this-year>

¹⁸ Boston developer planning two new natural-gas fired plants in Ohio. The Business Journals. January 4, 2017. <http://www.bizjournals.com/columbus/news/2017/01/04/boston-developer-planning-two-new-natural-gas.html>

SHALE DASHBOARD INDICATORS

New Well Count

There were 108 new wells developed in the eight-county region in the fourth quarter of 2016. This is a 29% increase from the activity in the third quarter, and marks the most active quarter of 2016. However, the number of new wells developed in this quarter was still 20% lower than in the fourth quarter of 2015. Tracking the count of wells helps to estimate creation of potential jobs in the study area and, in turn, to assess a pressure on the housing market as the largest number of employees in the upstream industry is related to construction of wells.

Potential Employment

Potential jobs are generated primarily by drilling, drilled, and producing wells. The cumulative potential employment generated in the eight counties totaled 10,220 at the end of the fourth quarter. This was a 6% increase from the cumulative potentially created jobs at the end of the third quarter. Despite the increase in new well count, many of the new wells are in the permitted stage which do not create any new employment. The potential employment is about 15% lower than it was at the end of the fourth quarter in 2015.

WTI Oil Price per Barrel

The WTI oil price was \$53.75 per barrel to end 2016, which shows a significant price recovery from the 2016 low of \$26.19 per barrel in February. This was also 46% higher than the price in the fourth quarter of 2015 and 4% higher than the price at the end of the third quarter of 2016.

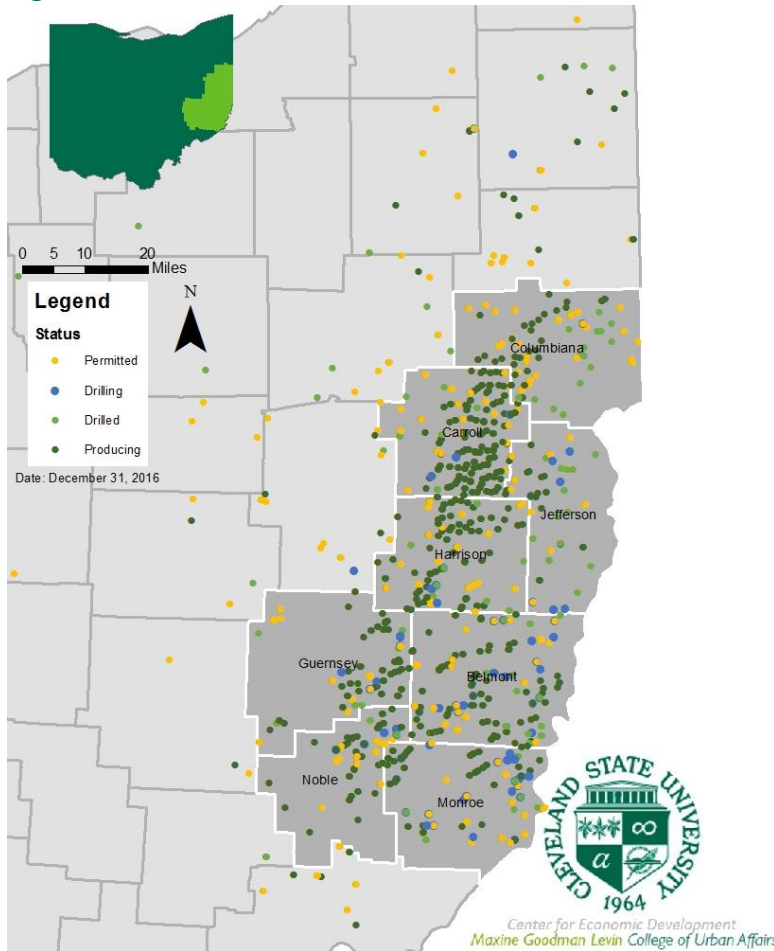
Sales Tax Activity

The revenue generated from sales tax allocation in the fourth quarter of 2016 was \$15,712,648. This was a 6.5% decrease from the third quarter and a 15% decrease from the fourth quarter of 2015.

UTICA UPSTREAM ACTIVITIES

Data collected from the Ohio Department of Natural Resource's Division of Oil and Gas (ODNR) at the end of the fourth quarter listed the total Utica well count in the State of Ohio at 2,342. The total well count in the eight eastern Ohio counties as of December 31, 2016 was 2,207. The eight counties account for 94% of the total Utica well count in Ohio. Figure 2 shows the Utica wells, corresponding well status, and well location in Ohio. The eight counties of study are marked in darker grey.

Figure 2. Utica Well Status, December 31, 2016



Source: Ohio Department of Natural Resources

Of the 2,207 wells within the eight counties, 397 had the well status of permitted, 138 were in the process of drilling, 247 wells had been drilled but were not yet producing, and 1,425 wells were in the producing phase (Table 9).

Table 9. Cumulative Number of Wells in 8 Eastern Ohio Counties, Quarter 4, 2016

	Well Status
	As of December 31, 2016
Permitted	397
Drilling	138
Drilled	247
Producing	1,425
Total	2,207

Source: Ohio Department of Natural Resources

Among the eight eastern Ohio counties, Carroll County remains the county with the highest number of total wells and producing wells in Ohio with totals of 506 and 430, respectively (Table 10). Monroe County has both the most drilled wells and drilling wells in the fourth quarter. Belmont County has the largest number of permitted wells, with 81, and is the county with the most wells in the pre-production stage with 159. This information is displayed in Figure 3.

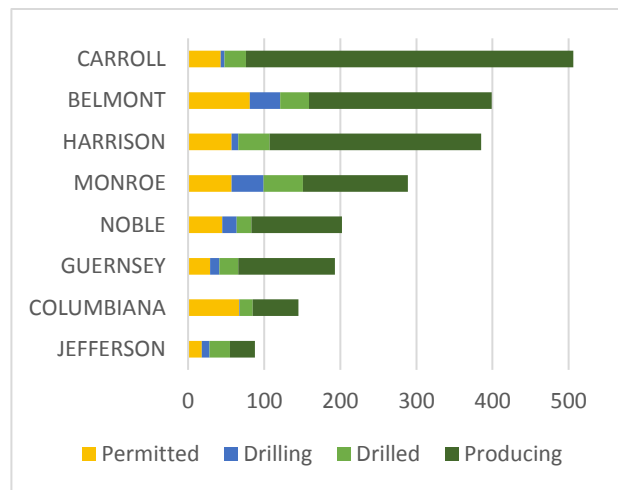
Table 100. Well Status, December 31, 2016

County	Permitted	Drilling	Drilled	Producing	Total
CARROLL	43	5	28	430	506
BELMONT	81	40	38	240	399
HARRISON	57	9	41	278	385
MONROE	57	42	52	138	289
NOBLE	45	19	19	119	202
GUERNSEY	29	12	25	127	193
COLUMBIANA	67	1	17	60	145
JEFFERSON	18	10	27	33	88
Grand Total	397	138	247	1,425	2,207

2016

Source: Ohio Department of Natural Resources

Figure 3. Well Status, December 31,



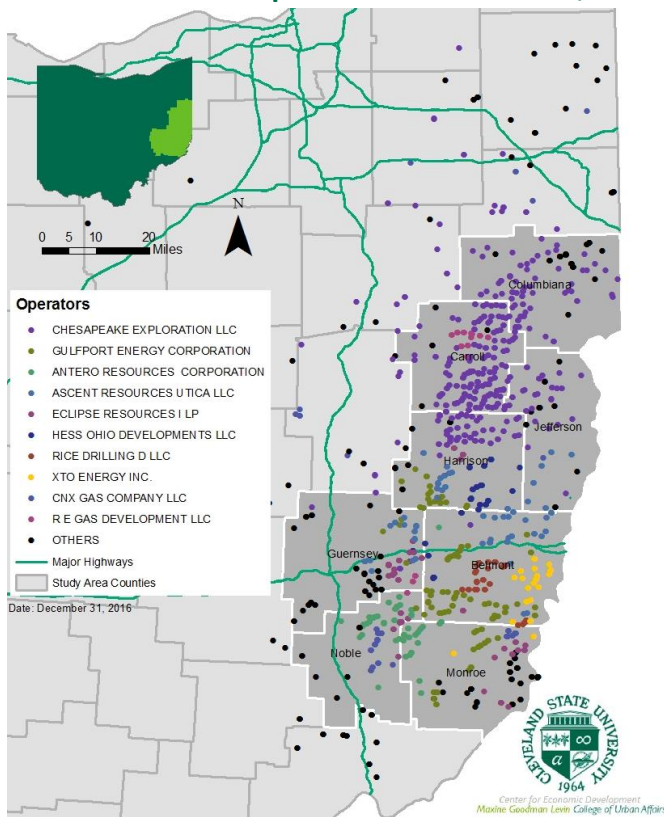
Source: Ohio Department of Natural Resource

The number of drilling rigs have been part of a common metric for estimating future oil and gas production. While the shale development and new methods of product extraction altered the direct relationship between number of rigs, drilling wells, and volume of produced oil and gas, it is still an indicator of investment and upstream development pointing to further development of upstream and midstream infrastructure, and subsequent increase in regional employment.

According to Baker Hughes, there are 21 total Ohio Utica rigs as of January 27, 2017. This is up from 14 rigs in November of 2016. Belmont County has the highest number of rigs with 9, Monroe County has 7 rigs, Jefferson has 2, and Guernsey, Noble and Carroll have one rig each. These rigs have a drilling productivity of about three weeks of drilling per well which amounts to about 16 wells per rig annually.

While monitoring the new well count in the Utica Shale development, it is important to track activities of companies considered as main players in the oil and gas industry in Ohio. The 2,207 Utica wells in the 8 eastern Ohio counties are operated by 32 different companies. Chesapeake Exploration LLC continues to be the largest well operator in Ohio with a total of 785 wells in a phase of development. Gulfport is the second-largest player in Utica upstream operating 318 wells. Antero Resources, Ascent Resources Utica and Eclipse Resources operate between 135 and 214 wells. Approximately 90% of all 8 eastern Ohio county Utica wells are operated by the top 10 companies (Table 11).

Figure 4. Main Utica Upstream Companies, Companies December 31, 2016



Source: Ohio Department of Natural Resources

Table 111. Main Utica Upstream

Well Operators	Number of Wells
Chesapeake Exploration LLC	785
Gulfport Energy Corporation	318
Antero Resources Corporation	214
Ascent Resources Utica LLC	196
Eclipse Resources LP	135
Hess Ohio Developments LLC	90
Rice Drilling LLC	76
XTO Energy Inc.	61
CNX Gas Company LLC	60
R E Gas Development LLC	52
Others	220
Total Number of Wells in 8 Counties	2,207

Figure 4 shows all the Utica wells color-coded by their respective well operator. The largest concentration of wells can be seen in Carroll, Columbiana, Harrison and Jefferson County, and their operator is Chesapeake Exploration LLC.

UTICA MIDSTREAM ACTIVITIES

Investor presentations of the main well operators are the source of data on Utica midstream activities throughout the eight eastern Ohio counties. Midstream activities are very capital intensive. The construction of pipelines and processing gas plants generate a large number of short-term jobs, filled mostly by transient workers. The construction companies for the gas plants and pipelines are usually drawn from a national pool. The maintenance of pipelines and the operation of the processing plants generate a small number of permanent jobs for local operators and maintenance staff.

SHALE DEVELOPMENT AND JOB CREATION

Jobs Created by Shale Activities

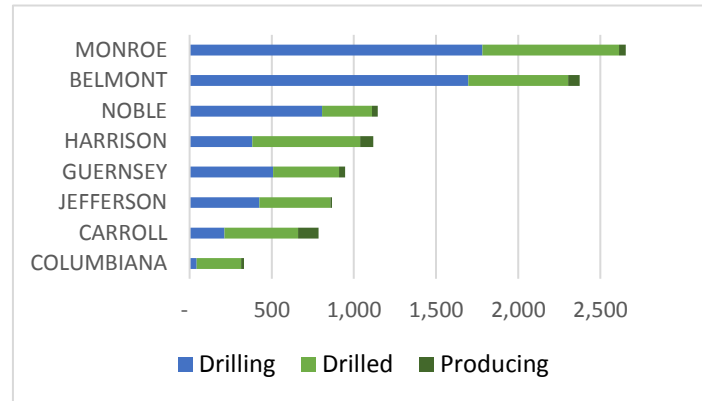
The CSU research team developed a multiplier to estimate the number of jobs potentially created from shale development.¹⁹ The multiplier is used for the job creation estimates in this section.

Table 122. Potentially Created Jobs in 8 Eastern Ohio Counties, December 31, 2016

County	Drilling	Drilled	Producing	Total
MONROE	1,782	832	40	2,654
BELMONT	1,697	608	70	2,375
NOBLE	806	304	35	1,145
HARRISON	382	656	81	1,118
GUERNSEY	509	400	37	946
JEFFERSON	424	432	10	866
CARROLL	212	448	125	785
COLUMBIANA	42	272	17	332
Grand Total	5,855	3,952	413	10,220

Source: Ohio Department of Natural Resources; Center for Economic Development

Figure 5. Count of Jobs per Well Status per County, December 31, 2016



The number of jobs presented in Table 12 is “quarterly,” not annualized. If 12 jobs in well completion services are created within one month, the quarterly count of jobs will indicate 4 of full-time equivalent (FTE). If 180 jobs required for fractionation were involved during 2 weeks, 30 FTEs will be reported on a quarterly basis. The estimate of quarterly jobs better reflects possible short-term demand on the housing market in specific counties, especially during the process of well completion. This process usually takes from one to two weeks with a short-term influx of up to 200 employees completing different incremental tasks. In addition, some of the top producers in Utica have created local divisions of their companies to provide fracturing and completion services. These subsidiary companies or divisions hire mostly local employees and do not create a demand for housing in the local housing market.

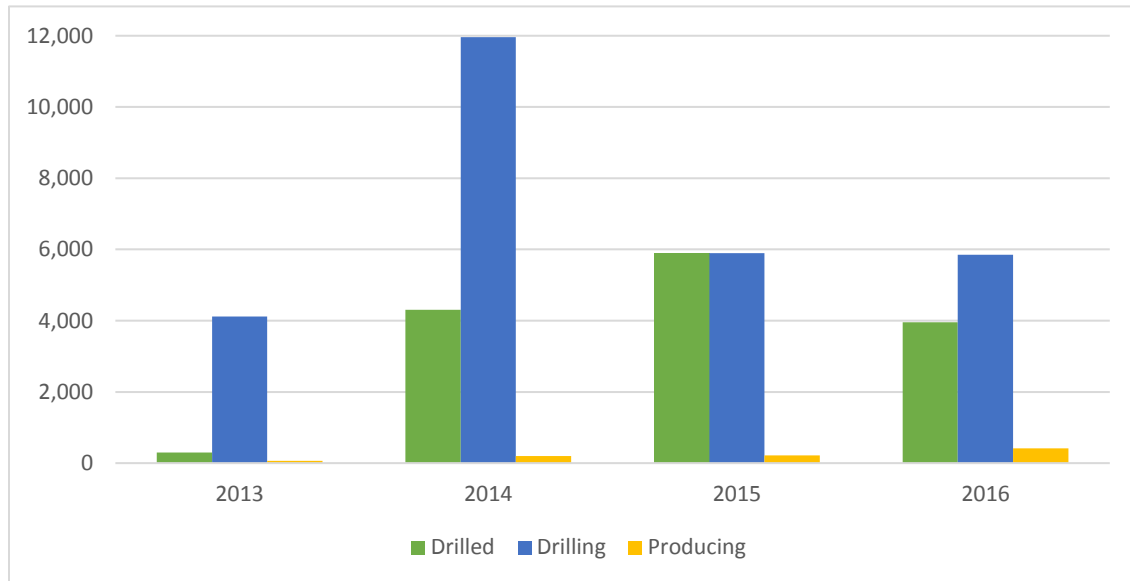
In upstream development, the largest number of jobs is generated during the “drilling” phase of well construction. These jobs are also generally short term (three to four weeks) and while many members of drilling crew are out-of-state workers they may or may not create pressure on local housing markets. The impact varies by company. Many companies bring in drilling crews from places traditionally regarded as “oil” states. These employees work a four-shift schedule and usually stay in temporary housing provided at the drilling site. Drilling phase includes construction of vertical and horizontal segments of a well and completion. After a well is drilled, fractured, and completed, it is connected to a gathering pipeline system and its status is changed

¹⁹ The methodology behind developing this multiplier can be found in the first version of this report, Hexter, Kathryn W.; Lendel, Iryna; Post, Charlie; Downer, Nick; and Martis, Sydney, "Housing Impact of Shale Development in Eastern Ohio" (2016). *Urban Publications*. 0 1 2 3 1384. http://engagedscholarship.csuohio.edu/urban_facpub/1384, on page 37.

to a producing well. Typically, a well could be drilled and wait for fractionation and completion depending on an availability of a gathering pipeline or a fractionation and completion crew. Once the well is completed and starts producing, it requires only maintenance, which does not generate many jobs. Permitted wells also do not yield a large number of jobs that can be assessed on a well basis; therefore, the count of these jobs are omitted in the analysis.

Different job multipliers are associated with each stage of well development.²⁰ Potential jobs for the eight-county region were estimated based on a count of wells per well status in each county (Table 12). Monroe and Belmont counties have the highest number of total jobs created and the largest number of wells currently in the drilled phase. These data are illustrated in Figure 5. Although the jobs are potentially created in a county where a well is drilled, this job can be taken by a transient worker who may live in temporary housing, by a local resident or a resident of a nearby county within reasonable commuting distance from the drilling site.

Figure 6. Potentially Created Jobs from Utica wells in Eastern Ohio Counties, December 31, 2016



Source: Ohio Department of Natural Resources; Center for Economic Development

Figure 6 shows the dynamic of potentially created jobs from the beginning of shale development in eastern Ohio in 2013 to the present. The 2016 numbers reflect a decrease in drilling and production that corresponded with low oil prices from the end of 2015 and the first half of 2016, which reduced the number of potential jobs generated by Utica development. However, with

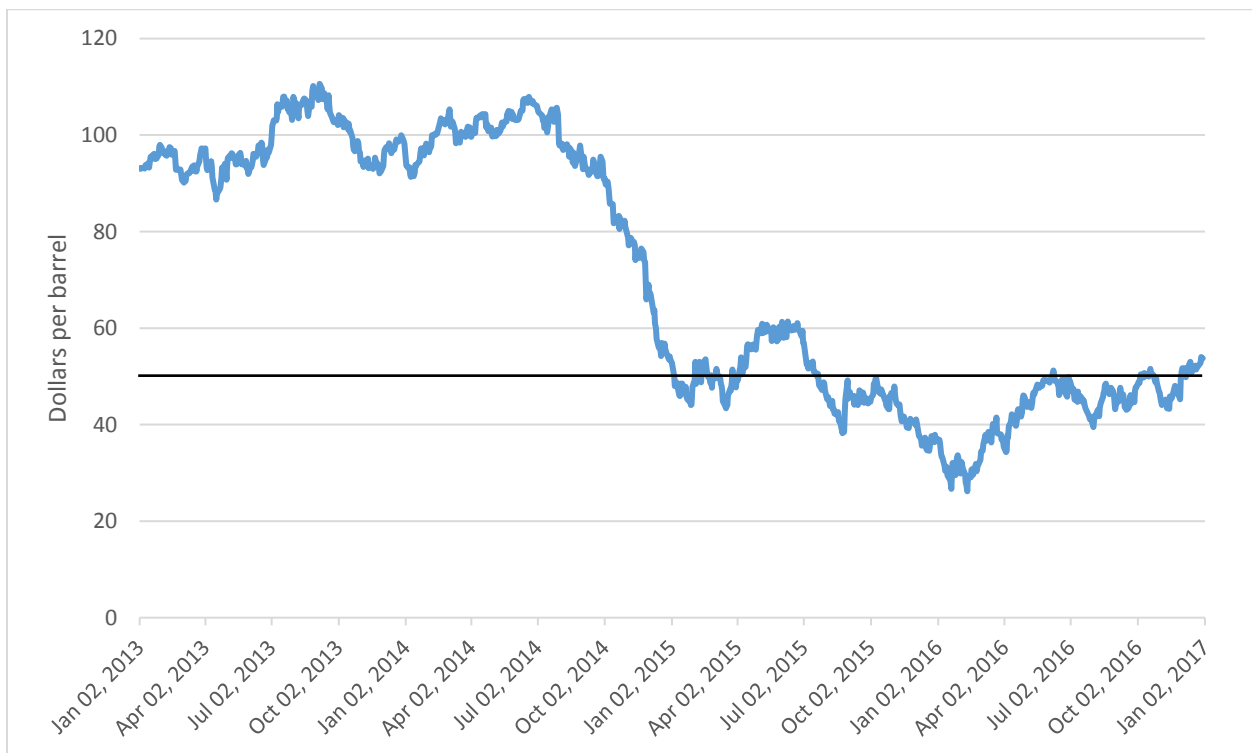
²⁰ Detailed explanation of labor multipliers methodology is in Lendel, Iryna; Thomas, Andrew R.; Townley, Bryan; Murphy, Thomas; and Kalynchuk, Ken, "Economics of Utica Shale in Ohio: Workforce Analysis" (2015). Urban Publications. Paper 1330. http://engagedscholarship.csuohio.edu/urban_facpub/1330

the OPEC production cuts and the rising price of oil, there was an uptick in drilling and potentially created jobs to end the year.

WTI Oil Price Trend

Figure 7 shows the trend of crude oil prices from the beginning of 2013 to the end of 2016. The black line indicates the \$50 per barrel mark, the approximate price point that makes shale development worthwhile. As the graph shows, WTI oil price was fluctuating around \$100 per barrel until a substantial price decline from mid-2014 into early-2015. Prices stabilized for a time in 2015 before dropping again and staying below the \$50 per barrel mark for almost a full year. The final quarter of 2016 saw oil prices rise above \$50 per barrel and reach their highest levels since July 2015.

Figure 7. Crude Oil Prices: West Texas Intermediate (WTI), 2013-2016



Source: FRED Economic Data, U.S. Energy Information Administration

Note: Not seasonally adjusted. Daily frequency.

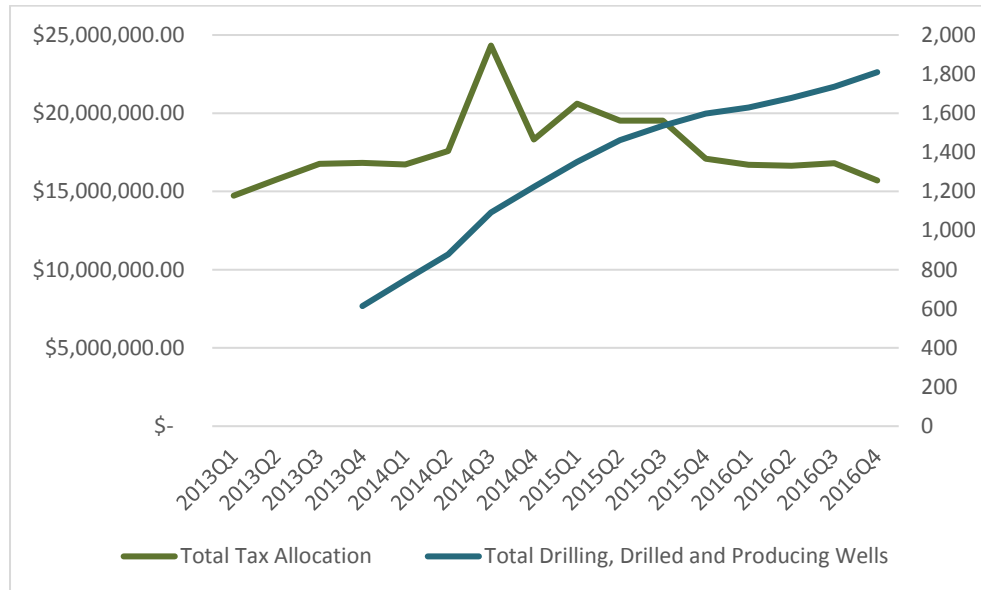
Sales Tax Activity

Sales tax revenue is an indicator of economic activity reflecting primarily retail sales. Sales tax revenue is measured by the county in which the sales transaction occurred and is reported by the Ohio Department of Taxation as “county sales tax allocation”. The sales tax revenue data is presented by the month in which the tax was collected from the transaction.

Tracking the generation of sales tax over time will allow us to identify county level trends in retail sales. We can infer that any increased retail sales activity in these counties is at least partly the result of an influx of out-of-state workers. In turn, increased retail activity might suggest that out-of-state workers will create some pressure on the local housing markets.

Figure 8 displays total sales tax allocation and the total number of wells. The total sales tax allocation was \$15,712,648.18 for the fourth quarter, which was 6.5% lower than the previous quarter and 15% low than the fourth quarter of 2015.

Figure 8. Total Sales Tax Allocation and Number of Wells in 8 Eastern Ohio Counties, 2013-2016



Source: Ohio Department of Taxation; Ohio Department of Natural Resources

HOUSING INDICATORS, Q3 2016 UPDATE

SUMMARY

Overall, housing markets in the eight-county region continue to be stable. There is a good supply of for-sale housing available, and sales have slowed somewhat from the previous quarter. There was also a very slight decline in rental vacancy rates. In terms of affordability, median home sale prices in the region have remained virtually unchanged from \$95,000 in the second quarter to \$95,250 in the third quarter of 2016 and are up 2% year over year. Median sales price showed little growth (2%) over the same quarter of last year. The total number of home sales continued to grow slowly, increasing 5% from the second quarter. However, for-sale housing still remains relatively affordable with 52% of homes selling for less than \$100,000. This is a decline from the 60% reported for Quarter 1. Median rents in the third quarter held steady overall at 72 cents per square foot; rents for market units increased by 1%.

Our data for cost burdened renters and owners is derived from census data and cannot not be updated quarterly. As noted in prior reports, more than half of low-income renters and owners were cost burdened in 2014. The percentage of cost burdened renters declined since 2012, while the percentage of cost burdened homeowners increased.

HOUSING INDICATORS

We have developed five indicators to track quarterly changes in housing availability and affordability for owners and renters (See methodology in Appendix 5.) The housing indicators are reported for the eight-county region.

Each indicator is presented as year-over-year change as well as quarter-over-quarter change. Shale activity began in earnest in 2013, so 2012 can be viewed as a “pre-shale” year. Each indicator is therefore compared to the base year 2012 whenever possible.

Figure 9. List of Housing Dashboard Indicators

<i>Housing Affordability</i>	Source
<u>Renters</u>	
Multi-family rental housing cost, affordable	CoStar ²¹
Multi-family rental housing cost, market	CoStar
<u>Owners</u>	
Median Sales Price, less than \$100,000	MLS
Median Sales Price, greater than \$100,000	MLS
Median Sales Price, all prices	MLS
<i>Housing Availability</i>	
<u>Renters</u>	
Multi-family rental vacancy rate, affordable	CoStar
Multi-family rental vacancy rate, market	CoStar
<u>Owners</u>	
Number of sales, less than \$100,000	MLS
Number of sales, more than \$100,000	MLS
Days on the market, all prices	MLS

Affordability: Multi-family rental housing cost

As a quarterly indicator of rental housing affordability, this study is tracking the effective rent per square foot for multi-family rentals, including both affordable, market and overall. This data is provided by CoStar Group, Inc. from a proprietary database of commercial property transactions. CoStar divides the multi-family rental market into several categories: most records fall into either “affordable”, which carries some subsidy, or “market” which carries none.

It is important to note that the CoStar data has advantages and disadvantages as a source for the indicators. The biggest advantage is that it captures quarterly changes in the market. Further, the data is representative of the range of types of units available and it includes both affordable and market rate units. The biggest disadvantage is that the data reported covers only about half of the 11,000 multi-family, 3+ unit rentals in the region (ACS 2010-2014). CoStar reports include data from 167 buildings with 5,073 units. Further, the CoStar data does not include single-family rentals or duplexes for these counties.

“Effective rent” is the rent that is actually paid, accounting for any incentives, concessions or give-backs. In this case, the effective rents were slightly lower than the asking rents in every year from 2012-2016.

²¹ The Costar report for Quarter 3 included retroactively updated data for Quarter 2. Costar is a “live database”; as such, data is updated – even retroactively - so that historical numbers will be as accurate as possible.

Table 13. Overall Multi-family Rent per Square Foot, Q1 2012-Q1 2016, updated²²

County	Percent Change in Rent, Q1 2012-Q1 2016	Number of buildings, Q1 2016	Number of Units, Q1 2016
Belmont	23.3%	27	1,347
Carroll	8.8%	4	185
Columbiana	15.5%	54	1,704
Guernsey	0%	18	490
Harrison	13.0%	6	154
Jefferson	13.4%	17	868
Monroe	NA	2	19
Noble**	12.2%	2	41
8-County Total	5.7%	167	5,073
8-County Affordable	6.2%	56	3,024
8-County Market	13.2%	80	1,733

Source: CoStar (Updated as of November 1, 2016)

In the eight counties, 34% of the buildings and 60% of the units are designated as affordable. Rents in these buildings have increased by 6.2% from 2012-2016. Market rents have increased by 13.2%. The ‘affordable’ vs. ‘market’ breakdown by County was not available for this release of the study.

Across all units, rents have increased 5.7% for all eight eastern Ohio counties. Rents increased by the highest percentage in Belmont County (23.3%) and by the lowest percentage in Guernsey County, where no increase in rents was reported.

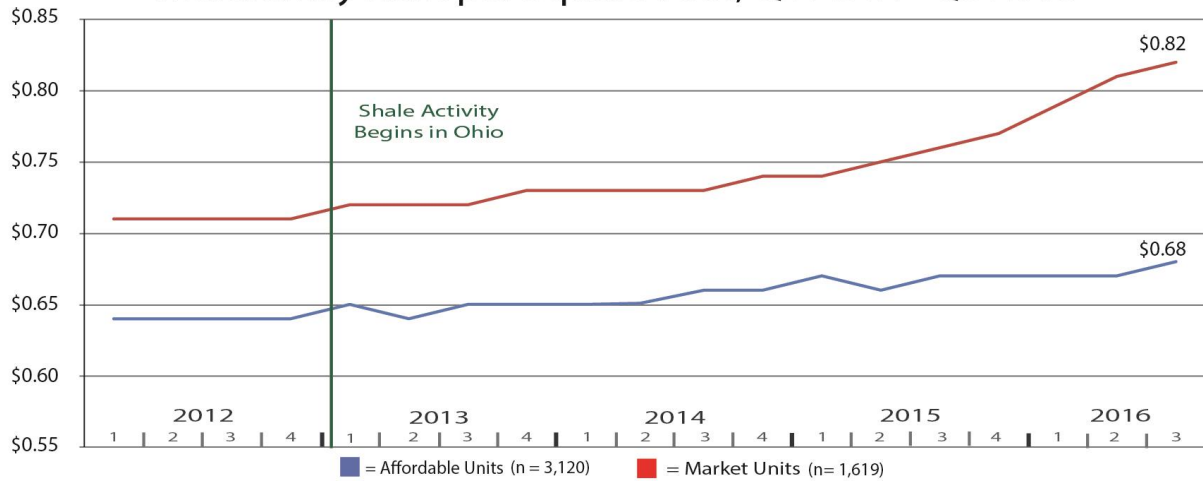
Q3 2016 Update

As of the end of the third quarter of 2016, across all units, rents remained stable from the previous quarter but had increased 2.9% from the previous year (Q3 2015-Q3 2016). Vacancy rates decreased only slightly, by .4% percentage points from the previous year, and .1% percentage points from the previous quarter. These factors taken together indicate a fairly steady rental market.

Figure 10 illustrates the breakdown in rent per square foot for affordable and market rents through the third quarter of 2016. As the figure shows, market rents began to increase at a rate faster than affordable rents beginning in 2014, a trend that continues.

²² The Costar report for Quarter 2 included retroactively updated data for Quarter 1. Costar is a “live database”; as such, data is updated – even retroactively - so that historical numbers will be as accurate as possible.

Figure 10. Affordable and Market Multi-family Rents per Square Foot, Q1 2012 – Q3 2016
Multifamily Rent per Square Foot, Q1 2012 - Q3 2016



Source: CoStar, Quarter 1 2017

While rents for affordable units leveled off in 2015, the effective rent per square foot for market units continued to increase. They increased by 7.8% between the third quarter of 2015 and the third quarter of 2016, and by 1.2% from the second to the third quarter of 2016. (Table 15.)

Table 14. Affordable & Market Rents per Square Foot, Q1 2012-Q1 2016

	Q1 2012	Q1 2013		Q1 2014		Q1 2015		Q1 2016	
	Rent	Rent	% Change	Rent	% Change	Rent	% Change	Rent	% Change
Affordable	\$0.64	\$0.65	1.5%	\$0.65	0%	\$0.67	1.5%	\$0.67	0%
Market	\$0.71	\$0.72	1.4%	\$0.73	1.4%	\$0.74	1.4%	\$0.79	6.7%

Source: CoStar, Quarter 3

Table 15. Affordable & Market Rents per Square Foot by Quarter, Q1 2015-Q3 2016

	2015				2016		% Change Q3 2015-Q3 2016	% Change Q2-Q3 2016
	Q1	Q2	Q3	Q4	Q2	Q3		
Affordable	\$0.67	\$0.66	\$0.67	\$0.67	\$0.67	\$0.68	1.5%	1.5%
Market	\$0.74	\$0.75	\$0.76	\$0.77	\$0.81	\$0.82	7.8%	1.2%

Source: CoStar, Quarter 3.

Affordability: Homeowners

As a quarterly indicator of owner occupied housing affordability, this study is tracking median sales price. The data source is the Multiple Listing Service (MLS), a proprietary database provided by the Northern Ohio Regional Multiple Listing Service, Inc. (NORMLS).

The median sales price was calculated for three groups of sales: all sales, sales for less than \$100,000 and sales for homes over \$100,000. It is important to note that \$100,000 is used in this analysis as a proxy for “affordable” housing. As noted above, a low income (as defined in this study), four-person household living in the region could have a maximum income of about \$33,000 in 2014. Using an industry rule of thumb - mortgage affordability is equal to about three times annual income - a low income household could theoretically afford to purchase a home costing \$100,000 or less.

Table 16 shows the median sales price in years 2013 to 2016. In the first quarter of 2016, the median sales price for all housing in the region was \$80,000, lower than the statewide median of \$109,912.²³

Table 16. Single Family Median Sale Price (MSP) Q1 2013-Q1 2016

	2013	2014		2015		2016		2013-2016
	MSP	MSP	Percent Change	MSP	Percent Change	MSP	Percent Change	Percent Change
All	\$67,500	\$75,000	11.1%	\$79,900	6.5%	\$80,000	0.1%	18.5%
< \$100,000	44,600\$	49,750\$	11.5%	\$49,500	-0.5%	\$54,950	11%	23.2%
\$100,000+	\$140,000	\$145,600	4%	\$153,000	5.1%	\$153,500	.33%	9.6%

Source: MLS, Quarter 3

Table 17. Single Family Median Sale Price (MSP) by Quarter, Q1 2015-Q3 2016

	2015 MSP				2016 MSP		Percent Change, Q3 2015-Q3 2016	Percent Change, Q2-Q3 2016
	Q1	Q2	Q3	Q4	Q2	Q3		
	All	\$79,900	\$88,500	\$93,500	\$86,000	\$95,000		
< \$100,000	\$49,500	\$60,000	\$58,750	\$54,250	\$63,000	\$57,000	-3%	-9.5%
\$100,000+	\$153,000	\$160,000	\$150,000	\$156,000	\$155,000	\$154,900	3.3%	-0.1%

Source: MLS

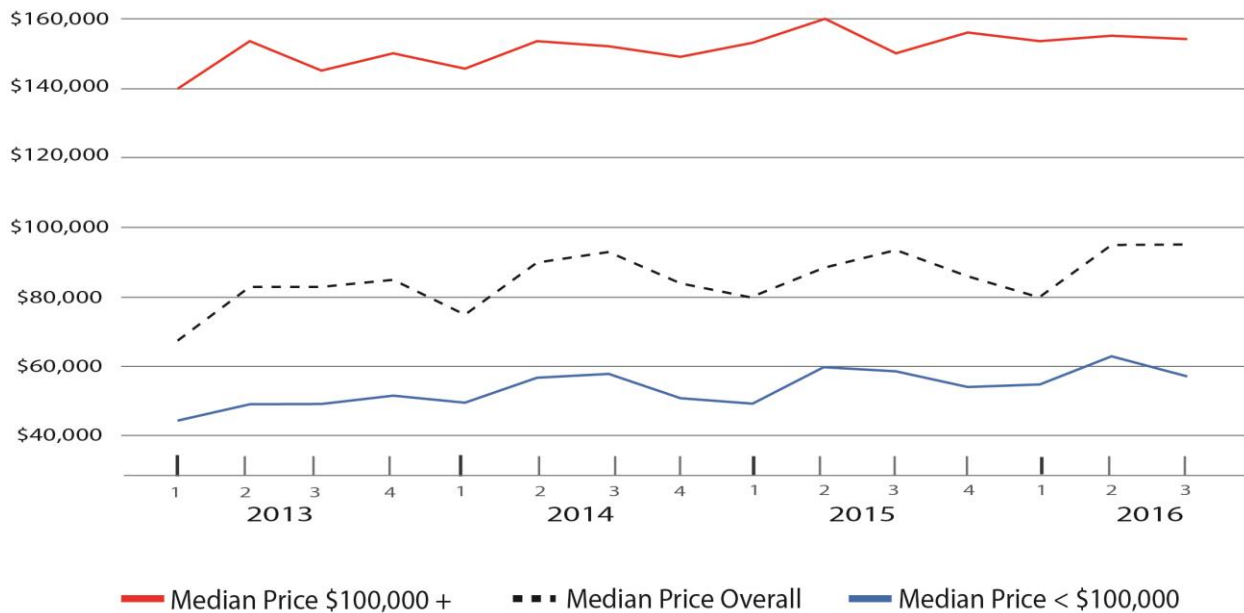
As illustrated in Table 17, the MSP for \$100,000+ homes increased by 3.3% between the third quarter of 2015 and the third quarter of 2016. The MSP for homes priced less than \$100,000

²³ OHFA Draft Housing Needs Assessment, FY 2017, p. 93.

declined 3% during the same period. The MSP for all homes increased by 0.3% from the second quarter to the third quarter of 2016; prices for “affordable” homes saw a decrease of 9.5%. Homes priced greater than \$100,000 held steady, with a decline of 0.1%.

From the third quarter of 2013 to the third quarter of 2016, the overall median sales price in the region increased by 14.8%. The median sales price for affordable homes (less than \$100,000) has increased at the fastest rate of any category measured since 2013 (15.4%); during the same time period, the total volume of affordable home sales have fallen 9.2%.

Figure 11. Single-Family MSP, 8-County Region, Q1 2013- Q3 2016



Source: MLS. Quarter 3

Housing Availability — Renters

As a quarterly indicator of housing availability for renters, this study is tracking the multi-family rental vacancy rate for affordable and market multi-family rentals. This information is derived from the CoStar data.

Table 18. Rental Housing Availability: 2012, 2014, and 2016

	Vacancy Rate		
	Q1 2012	Q1 2014	Q1 2016
Affordable	4.8%	4.6%	4.4%
Market	9.8%	9.6%	9.2%

Source: CoStar, Quarter 3

Rental vacancy rates in the region were 9.8% for market rate multi-family rental units in the first quarter of 2012; for affordable units, vacancy was 4.8%. Both market and affordable rates have been fairly stable since 2012, with consistent but slight reductions in vacancy. The industry standard for affordable housing is 5% vacancy and Ohio, statewide, is running at just under 4%. There is sufficient slack in the market for non-subsidized units, but the low vacancy rate for affordable units indicates a shortage. Low-income families may have difficulty finding quality units, a trend which has persisted since 2012 and even before the shale boom. A shortage of affordable, quality rental housing can be found throughout the state.

Table 19. Rental Housing Availability: Q1 2015-Q3 2016

	Vacancy Rate, 2015				Vacancy Rate, 2016		Percentage Point Change, Q3 2015-Q3 2016	Percentage Point Change, Q2-Q3 2016
	Q1	Q2	Q3	Q4	Q2	Q3		
	Affordable	4.4%	4.3%	4.3%	4.4%	4.4%	4.4%	0.1%
Market	10%	9.6%	9.5%	9.5%	8.5%	8.0%	-1.5%	-0.5%

Source: CoStar, Quarter 3

Vacancy rates for affordable rental housing stayed at a highly stable 4.4%. Market housing reported a vacancy rate of 8%, a sizable drop from 9.5% a year ago.

Housing Availability — Homeowners

As quarterly indicators of housing availability for homeowners, this study tracks the number of sales and median days a house for sale remains on the market. These two measures are used here as a proxy for availability or housing market strength or weakness. As a general rule, the more quickly homes sell, the stronger the market. It was not possible to break out median days on the market by the two groupings of sales price so the data is presented for all housing in the for-sale market, regardless of price.

Table 20. Single-Family Home Sales, Q1 2013- Q1 2016

	2013, Q1	2014, Q1		2015, Q1		2016, Q1		2013-2016
	Number of Sales	Number of Sales	Percent Change	Number of Sales	Percent Change	Number of Sales	Percent Change	Percent Change
Overall	463	397	-14.3%	385	-3%	468	21.6%	1.1%
< \$100,000	324	254	-21.6%	250	-1.6%	282	12.8%	-13%
\$100,000+	139	143	2.9%	135	-5.6%	186	37.7%	33.8%

Source: MLS, Quarter 3

Table 21. Single-Family Home Sales, Q1 2015- Q3 2016

	2015 Number of Sales				2016 Number of Sales		Percent Change, Q3 2015-Q3 2016	Percent Change, Q2-Q3 2016
	Q1	Q2	Q3	Q4	Q2	Q3		
Overall	385	569	671	623	645	676	0.7%	4.8%
< \$100,000	250	324	354	370	335	353	-0.3%	5.4%
\$100,000+	135	245	317	253	310	323	1.9%	4.2%

Source: MLS, Quarter 3

As Table 21 shows, the number of single family home sales for homes priced under \$100,000 declined 13% between the first quarter of 2013 and the first quarter of 2016. The number of home sales for homes priced over \$100,000 increased by 33.8% from the first quarter of 2013 to the first quarter of 2016. Just over 60% of homes sold were priced under \$100,000.

Table 22 shows quarterly changes, updated through Q3 2016. By the end of the third quarter 2016, the number of home sales for all housing had increased 4.8% from the previous quarter, and 0.7% from the third quarter a year ago. This fluctuation reflects seasonal variations in the housing market, spring tends to be an active season, with sales typically falling off in the third quarter. The share of homes sold for under \$100,000 declined to 52% but is still more than half of all home sales.

Table 22. Single Family Home Sales, Median Days on the Market, Q1 2013-Q1 2016

	2013	2014 Annual		2015 Annual		2016 Annual		2013-2016
	Number	Number	Percent Change	Number	Percent Change	Number	Percent Change	Percent Change
All	84	94	11.9%	104	10.6%	84	-19.2%	0%

Source: MLS, Quarter 3 dataset

As Table 23 shows, for the third quarter of 2016, the median days on the market was 78. This is a decline of 3.7% from the previous quarter and an increase of 18.2% from the previous year, another indicator of a strengthening market.

Table 233. Median Days on Market, Q1 2015-Q3 2016

	2015 Median Days on Market				2016 Median Days on Market		Percent Change, Q3 2015-Q3 2016	Percent Change, Q2-Q3 2016
	Q1	Q2	Q3	Q4	Q2	Q3		
All	104	83	66	70	81	78	18.2%	-3.7%

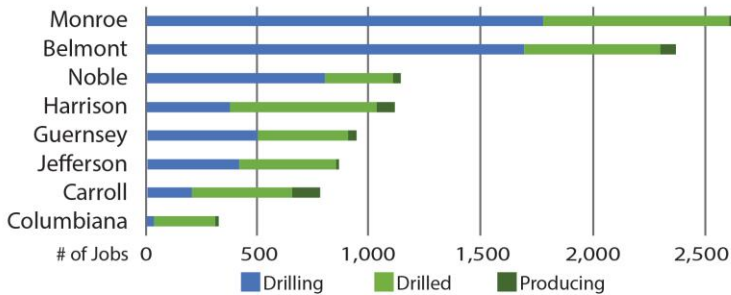
APPENDICES

Appendix 1. Eastern Ohio Shale & Housing Dashboard

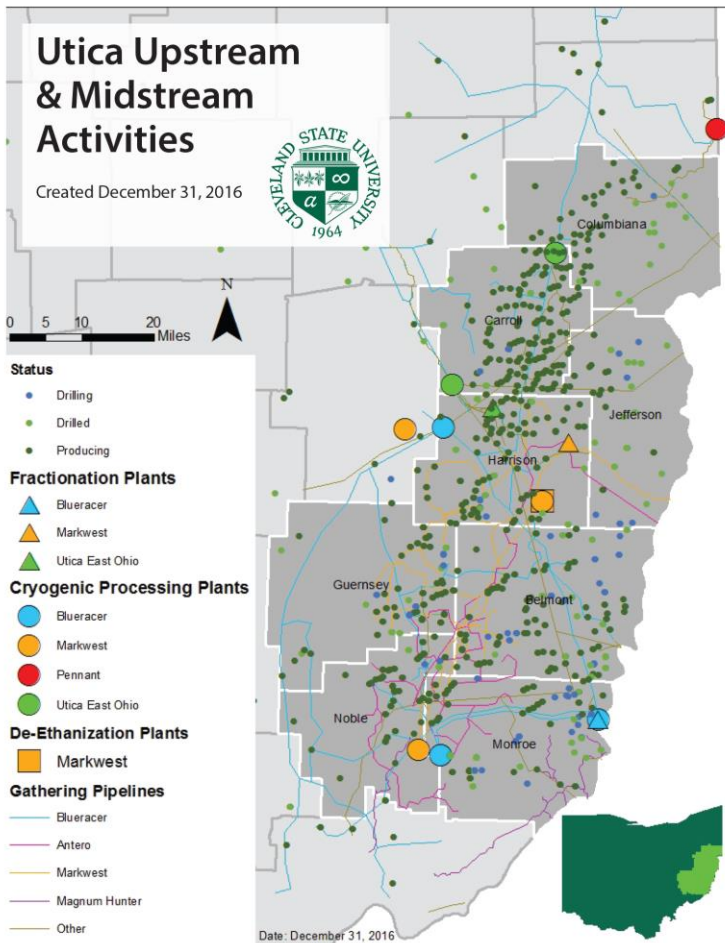
Eastern Ohio Shale & Housing Dashboard

January 1, 2017

Potentially Created Jobs by County



Source: ODNR, Center for Economic Development; as of December 31, 2016
Note: Jobs are calculated with quarterly coefficients.



Source: ODNR, Center for Economic Development

Shale Indicators

Quarter Change Quarter 4 Year Change*

New Well Count

Source: ODNR
▲ +29% 108 ▼ -20%

Employment

Source: CSU
▲ +6% 10,220 ▼ -15%

WTI Oil Price per Barrel

Source: FRED
▲ +13% \$53.75 ▲ +46%

Sales Tax

Source: Department of Taxation (Quarter 4)
▼ -6.5% \$15.7 M ▼ -15%

Housing Indicators

Quarter Change Quarter 3 Year Change

Number of Home Sales

Source: MLS
▲ +4.8% 676 ▲ +0.7%

Median Sale Price

Source: MLS
▲ +0.3% \$95,250 ▲ +1.9%

Median Days on Market

Source: MLS
▲ +18.2% 78 ▼ -3.7%

Multifamily Rent per Square Foot

Source: Costar
■ 0% \$0.72 ▲ +2.9%

Multifamily Rental Vacancy Rate

Source: Costar. Note: Percentage point changes.
▼ -0.1% 5.6% ▼ -0.4%

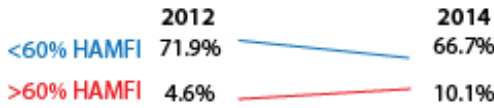
*Note: Year changes are calculated from the current quarter to the same quarter the year before.

Belmont Carroll Columbiana Guernsey Harrison Jefferson Monroe Noble

Belmont Carroll Columbiana Guernsey Harrison Jefferson Monroe Noble

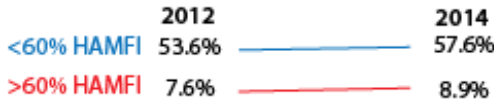
Housing Affordability

Renters Cost Burdened >30%



Source: IPUMS-USA, University of Minnesota, www.ipums.org

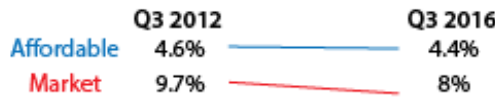
Owners Cost Burdened >30%



Source: IPUMS-USA, University of Minnesota, www.ipums.org

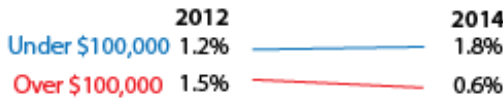
Housing Availability

Multifamily Vacancy Rate



Source: Costar

Owner Vacancy Rate



Source: ACS Public Use Microdata Sample, 2012 and 2014

Housing Summary

Market Trends. Housing activity tends to slow in the third quarter. Overall, the third quarter housing indicators for the eight counties are consistent with this and reflect little change in the housing market.

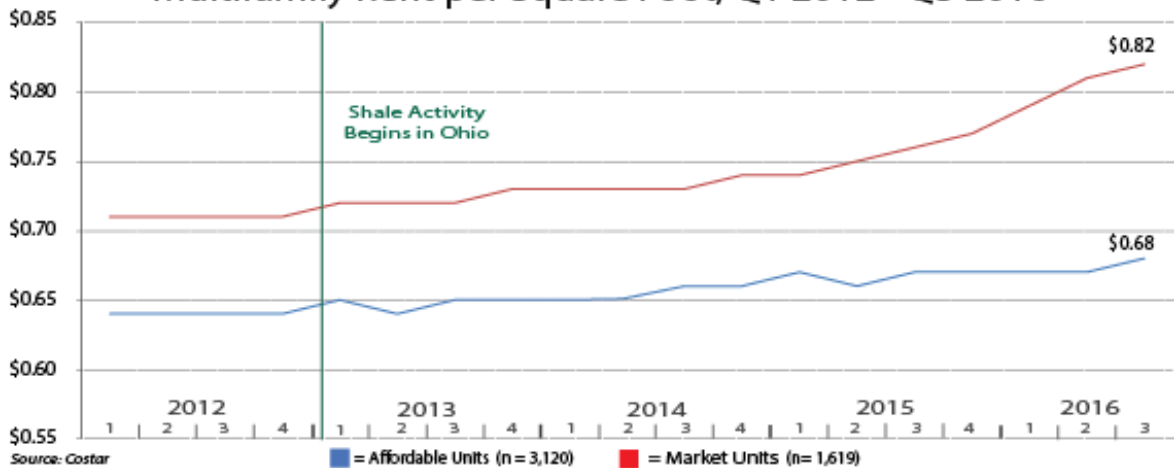
Vacancy. The quarterly slowdown is reflected by the increase in median days on the market, which is up 18% from the second quarter. The decline of 3.7% from this time last year indicates that the market is stable and improving slightly. Rental vacancy rates went down, indicating a slight tightening of the rental market as well.

Cost Burden.* More than half of low-income renters and owners were cost burdened in 2014. The percentage of cost burdened renters declined since 2012, while the percentage of cost burdened homeowners increased.

*Note: Cost burden data could not be updated due to data limitations.

Sales Price. Home sales activity increased slightly by 0.7% from Q2 to Q3 and median sales price gained 1.9%, indicators of a stabilizing for-sale housing market. Overall, median rents hovered around 72 cents per square foot; market units continued a slight upward trend, with rents rising 1.2%.

Multifamily Rent per Square Foot, Q1 2012 - Q3 2016



Prepared by the Center for Economic Development and the Center for Community Planning & Development



Maxine Goodman Levin College of Urban Affairs

APPENDIX 2. SHALE QUARTERLY COMPARISONS

Appendix Table 2.1 Total Number of Wells in 8 East Ohio Counties, 2016 Quarters 2, 3, 4

County	As of June 25, 2016					As of October 1, 2016					As of December 31, 2016				
	Drilled	Drilling	Permitted	Producing	Total	Drilled	Drilling	Permitted	Producing	Total	Drilled	Drilling	Permitted	Producing	Total
Carroll	28	6	48	425	507	25	6	47	430	508	28	5	43	430	506
Harrison	55	11	54	262	382	43	10	54	275	382	41	9	57	278	385
Belmont	79	27	63	166	335	64	26	74	197	361	38	40	81	240	399
Monroe	42	28	42	129	241	42	31	55	133	261	52	42	57	138	289
Noble	14	15	45	114	188	17	20	46	116	199	19	19	45	119	202
Guernsey	36	13	31	108	188	32	9	32	119	192	25	12	29	127	193
Columbiana	17	0	57	59	133	17	0	57	59	133	17	1	67	60	145
Jefferson	18	7	31	20	76	20	17	24	27	88	27	10	18	33	88
Grand Total	289	107	371	1,283	2,050	260	119	389	1,356	2,124	247	138	397	1,425	2,207

Source: Ohio Department of Natural Resources

Appendix Table 2.2 Utica Main Well Operators in Study Counties, 2016 Quarters 2, 3, and 4

	As of June 25, 2016	As of October 1, 2016	As of December 31, 2016
Well Operators	Number of Wells	Number of Wells	Number of Wells
Chesapeake Exploration LLC	779	786	785
Gulfport Energy Corporation	281	294	318
Antero Resources Corporation	190	201	214
Ascent Resources Utica LLC	171	191	196
Eclipse Resources LP	129	132	135
Hess Ohio Developments LLC	90	90	90
Rice Drilling LLC	55	61	76
XTO Energy Inc.	56	58	61
CNX Gas Company LLC	50	56	60
R E Gas Development LLC	52	52	52
Others	197	203	220
Total Number of Wells in 8 Counties	2,050	2,124	2,207

Source: Ohio Department of Natural Resources

Appendix Table 2.3 Potentially Created Jobs in 8 Eastern Ohio Counties

County	As of June 25, 2016				As of October 1, 2016				As of December 31, 2016			
	Drilling	Drilled	Producing	Total	Drilling	Drilled	Producing	Total	Drilling	Drilled	Producing	Total
Belmont	1,146	1,264	48	2,458	1,103	1,024	57	2,184	1,697	608	70	2,375
Harrison	467	880	76	1,423	424	688	80	1,192	382	656	81	1,118
Carroll	255	448	123	826	255	400	125	779	212	448	125	785
Monroe	1,188	672	37	1,897	1,315	672	39	2,026	1,782	832	40	2,654
Jefferson	297	288	6	591	721	320	8	1,049	424	432	10	866
Guernsey	552	576	31	1,159	382	512	35	928	509	400	37	946
Noble	636	224	33	893	849	272	34	1,154	806	304	35	1,145
Columbiana	0	272	17	289	0	272	17	289	42	272	17	332
Total	4,540	4,624	37	9,536	5,049	4,160	393	9,602	5,855	3,952	413	10,220

Source: Ohio Department of Natural Resources

Appendix Table 2.4. Quarterly Sales Tax Allocation by County

Allocation Period	BELMONT	CARROLL	COLUMBIANA	GUERNSEY	HARRISON	JEFFERSON	MONROE	NOBLE	Total Tax Allocation
2013Q1	\$3,557,321.16	\$883,871.16	\$3,728,181.59	\$1,825,143.95	\$1,044,872.39	\$2,787,434.99	\$510,778.70	\$396,043.66	\$14,733,647.60
2013Q2	\$3,674,881.70	\$844,959.15	\$4,115,952.98	\$2,014,028.48	\$1,228,777.62	\$2,849,570.51	\$554,019.31	\$473,814.64	\$15,756,004.39
2013Q3	\$3,840,751.29	\$833,016.96	\$4,234,624.00	\$2,342,508.91	\$1,373,009.22	\$2,935,886.85	\$577,943.50	\$639,151.94	\$16,776,892.67
2013Q4	\$3,929,590.87	\$836,540.44	\$3,894,099.13	\$2,376,855.04	\$1,699,725.75	\$2,966,810.08	\$515,877.41	\$619,175.49	\$16,838,674.21
2014Q1	\$4,103,977.26	\$911,848.85	\$3,908,255.46	\$2,329,727.57	\$1,370,049.62	\$2,843,400.62	\$607,725.64	\$658,869.46	\$16,733,854.48
2014Q2	\$4,236,784.34	\$1,030,798.95	\$4,097,686.07	\$2,492,145.52	\$1,210,596.86	\$3,036,801.93	\$736,029.45	\$747,306.15	\$17,588,149.27
2014Q3	\$6,087,864.27	\$1,272,928.84	\$5,673,487.80	\$3,516,668.70	\$1,880,535.08	\$3,987,627.26	\$1,072,153.55	\$835,132.99	\$24,326,398.49
2014Q4	\$4,654,208.03	\$1,050,257.81	\$4,073,219.33	\$2,671,341.28	\$1,308,150.63	\$3,085,831.82	\$841,489.13	\$629,896.34	\$18,314,394.37
2015Q1	\$4,593,522.81	\$912,087.82	\$4,033,101.27	\$2,476,114.10	\$1,186,232.90	\$3,385,419.06	\$3,425,715.37	\$593,107.11	\$20,605,300.44
2015Q2	\$4,681,608.43	\$838,625.65	\$4,446,877.62	\$2,420,442.43	\$1,341,578.90	\$4,020,428.41	\$1,233,147.19	\$540,298.96	\$19,523,007.59
2015Q3	\$4,968,077.67	\$812,740.42	\$4,427,125.11	\$2,577,221.41	\$1,418,513.49	\$3,324,300.34	\$1,300,776.65	\$690,892.86	\$19,519,647.95
2015Q4	\$4,733,165.21	\$785,798.78	\$3,939,024.58	\$2,129,879.54	\$976,744.30	\$3,175,914.01	\$844,817.08	\$499,212.61	\$17,084,556.11
2016Q1	\$4,655,227.45	\$680,438.00	\$4,056,221.16	\$2,057,737.06	\$874,949.87	\$3,139,909.91	\$857,429.52	\$374,908.07	\$16,696,821.04
2016Q2	\$4,533,965.71	\$710,342.12	\$4,178,522.45	\$2,063,166.22	\$876,165.14	\$3,123,074.77	\$807,458.25	\$353,392.80	\$16,646,087.46
2016Q3	\$4,167,309.45	\$766,866.19	\$4,158,222.10	\$2,170,626.75	\$1,206,484.07	\$3,120,838.51	\$786,138.35	\$433,922.33	\$16,810,407.75
2016Q4	\$3,685,869.59	\$628,099.62	\$4,052,838.90	\$2,055,134.59	\$985,207.50	\$3,140,584.30	\$764,904.05	\$400,009.63	\$15,712,648.18

Source: Ohio Department of Taxation

APPENDIX 3. HOUSING METHODOLOGY

IPUMS

Calculations to estimate owner and renter affordability (the housing cost burden) and the owner unit availability in the region are based on Public Use Micro-data Area (PUMA) geographies. PUMAs are statistical geographic areas defined by the census. By definition, they contain at least 100,000 people, are built on census tracts and counties and are geographically contiguous. In the study region, some of the PUMAs conform to the 8-county boundaries, while others do not. For PUMAs that include counties outside the eight-county region or multiple counties within the region, the 60% HAMFI was calculated as a household-weighted average of the county medians and was based on household size.

Owner and renter affordability (or cost burden) was calculated as the percent of households that are paying more than 30% of their household income on housing costs. Households were divided into two income categories for the purpose of this study: low-income, or those households that would be eligible for the Low-income Housing Tax Credit because they earn less than 60% of the HUD Area Median Family Income (HAMFI) and those not LIHTC-Eligible, i.e. earning more than 60% of HAMFI. The percent point change indicates the change in the percent of LIHTC-eligible households that are cost-burdened. For example, positive change reflects an increase in the proportion of households that are cost-burdened, meaning that housing has become less affordable.

Owner unit availability is the vacancy rate for owner units. The census does not assign vacant units as to being owned or rented in IPUMS, so the number of vacant owner units (vacant, for sale) was imputed by applying the same proportion of owned units for each type of housing (1-attached, boat, etc.) as exists in the owned occupied units of the same type.

CoStar

The study team purchased CoStar data to track quarterly change in the cost and availability or vacancy rate of rental housing in the region. This data is a proprietary database of commercial property transactions. While it is among the most comprehensive such systems available, it does not include all properties. For example, it only includes multi-family buildings. It does not include single family or duplex rentals. In this region, it covers an estimated one-quarter of the multi-family rentals. CoStar divides the multi-family rental market into two categories, “affordable” which carries some subsidy, and market.

It is also important to note that there is likely some overlap between the affordable units in the CoStar database and the count of project based, subsidized housing. This overlap is most likely in the number of LIHTC units.

For this dashboard, we are using the most recent Quarter 3 dataset. As mentioned earlier in this document and previously in the Quarter 2 Report, Costar is a ‘live’ database and as such updates numbers retroactively when necessary.

Multiple Listing Service (MLS) data

The study team purchased MLS data, a proprietary database of home sales provided by the Northern Ohio Regional Multiple Listing Service, Inc. (NORMLS). This data is used in the study to provide quarterly updates on the “Owner” market including number of sales, median sales price, and number of days on the market. It is important to note that the number of condominium sales in the region is very low, so only single-family sale stats were calculated. Counts of sales, the median sale price and days on the market were calculated for three groups of sales:

- All sales
- Sales for less than \$100,000 (theoretically affordable for first time homebuyers and LIHTC-eligible households or those earning \$33,000 a year)
- Sales for \$100,000 or greater

APPENDIX 4. LIST OF INTERVIEWS

Andrea Dimitrovic, Housing Choice Voucher Program Manager – Cambridge Metropolitan Housing Authority, May 11, 2016

Kate Dodds, Director of United Way - Jefferson County, April 5, 2016

Bill Faith, Executive Director – Coalition on Homelessness and Housing in Ohio, May 11, 2016

Alan Fraley, Executive Director – Noble County Chamber of Commerce, May 25, 2016

Dan Gichevsky, Executive Director – Harrison County Housing Authority, May 11, 2016

Angela Goodson, Director of Info Helpline at United Way - Belmont and Monroe Counties, April 5, 2016

Cathy Grizinski, United Way 2-1-1 Information Helpline for Mahoning County, April 12, 2016

George Hayes, Director of United Way – Columbiana County, April 6, 2016

Summer Jenkins, Housing Choice Voucher Program Manager – Belmont County Housing Authority, May 24, 2016

Cathy Johnston, Advocacy Director, Coalition on Homelessness and Housing in Ohio, May 11, 2016

Stephanie Luaby, Director of United Way – Guernsey, April 6, 2016

Patricia Mader, Executive Director - Jefferson Metropolitan Housing Authority, May 23, 2016

Domenick Mucci, Mayor of Steubenville, Jefferson County Land Bank, May 3, 2016

Gary Obloy, Executive Director, Belmont Community Action Commission, April 12, 2016

Gary Ricer, Executive Director, Guernsey-Monroe-Noble (GMN) Community Action, April 18, 2016

Bob Ritchey, Columbiana Land Bank, Columbiana Planning Department, May 3, 2016

Tracy Sambuco, Executive Director – Harrison Metropolitan Housing Authority, April 28, 2016

Jackie Tracy, Public Housing Manager – Belmont County Housing Authority, May 24, 2016

Spencer Wells, Community Manager - Rental Housing Information Network in Ohio (RHINO), September 10, 2015