OHIO SHALE

QUARTERLY ECONOMIC TRENDS FOR OHIO OIL AND GAS INDUSTRIES

APRIL 2020

Ohio | **Department of Job and Family Services**

CONTENTS

A Message from Director Hall

In 2011, we began tracking shale employment in Ohio. Since that time, opportunities in this field have nearly doubled. Core shale-related employment, such as oil and gas pipeline construction and well drilling, increased 77.6 percent from the third quarter of 2011 to the third quarter of 2019. Ancillary shale employment, including freight trucking and environmental consulting, also increased. Non-shale industries, such as food and retail businesses near drilling sites and the surrounding communities, also benefit from shale activity. The average wages of shale-related jobs are excellent: $81,749 in core industries and $70,787 in ancillary industries. In both cases, this is higher than the average wage in all Ohio industries: $51,740.

The Ohio Department of Job and Family Services (ODJFS) Workforce Development team has been working hard to help more Ohioans take advantage of these opportunities. We work closely with local workforce investment areas, community colleges, other post-secondary educational institutions, and employers to identify the occupations most in need of workers and to make sure that appropriate training programs are in place. In any given month, thousands of shale-related job openings are posted online, at **OhioMeansJobs.com**.

Individuals can sign up for training opportunities at any of the state's local OhioMeansJobs centers, which provide job training and other services to Ohioans looking for work and employers looking for workers. Individuals can post their resumes, and employers can post job openings at **OhioMeansJobs.com**.

We encourage any Ohioans in need of work or who may be considering new careers to explore these opportunities. We are committed to improving the well-being of Ohio's workforce and families and are excited about the potential shale holds to make a difference in so many families' lives.

Kimberly Hall, Director
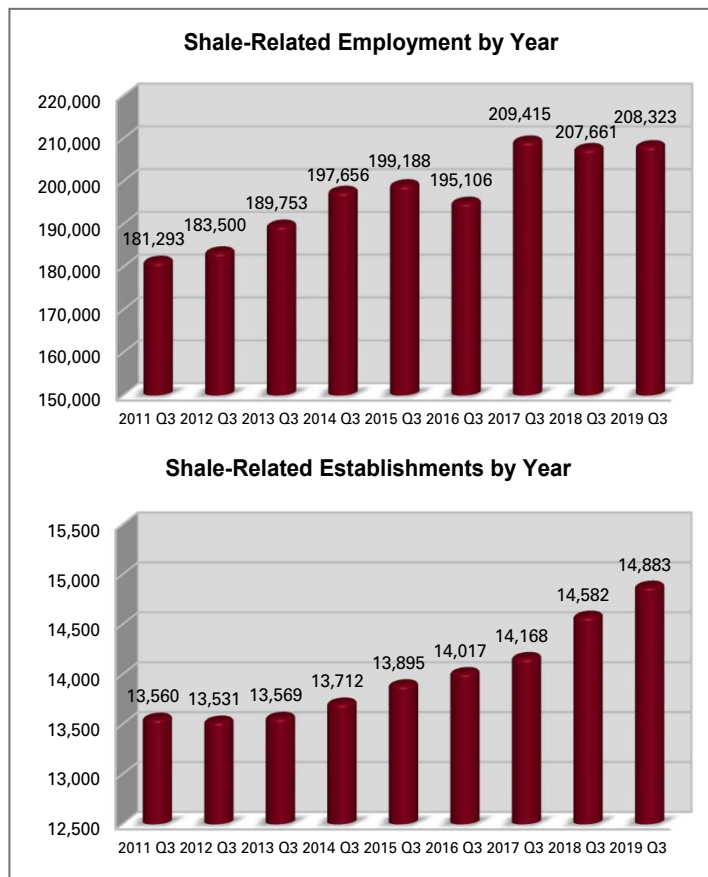Ohio Department of Job and Family Services

EXECUTIVE SUMMARY

Employment (2011 Q3 to 2019 Q3) See page 6.

- Core shale-related industry employment (such as pipeline construction and well drilling) was up by 5,655 (77.6 percent).

- Ancillary shale-related industry employment (such as freight trucking and environmental consulting) increased by 21,375 (12.3 percent).

- All industry employment was up by 450,904 (9.0 percent).

Business Establishments (2011 Q3 to 2019 Q3)
See page 6.

- Core shale-related business establishments grew by 161 (26.4 percent).

- Ancillary shale-related establishments increased by 1,162 (9.0 percent).

- Over the same time period, Ohio experienced an increase of 12,857 (4.4 percent) business establishments in all industries.

- Shale-related business establishments totaled 14,883 during the third quarter of 2019.

Shale-Related Employment by Year

Year	Employment
2011 Q3	181,293
2012 Q3	183,500
2013 Q3	189,753
2014 Q3	197,656
2015 Q3	199,188
2016 Q3	195,106
2017 Q3	209,415
2018 Q3	207,661
2019 Q3	208,323

Shale-Related Establishments by Year

Year	Establishments
2011 Q3	13,560
2012 Q3	13,531
2013 Q3	13,569
2014 Q3	13,712
2015 Q3	13,895
2016 Q3	14,017
2017 Q3	14,168
2018 Q3	14,582
2019 Q3	14,883

Wages (2018 Q4 through 2019 Q3) See page 9.

- The four-quarter average wage across all industries was $51,740.

- The four-quarter average wage in core shale-related industries was $81,749, which was $30,009 greater than the average for all industries.

- The four-quarter average wage in ancillary shale-related industries was $70,787, which was $19,047 higher than the average for all industries.

Online Job Postings (2020 Q1) See page 10.

- Ohio had 2,718 online job postings in core and ancillary shale-related industries in 2020 Q1.

Stable Employment, All Hires and Separations (2011 Q1 to 2019 Q1) See page 14.

- Stable jobs, those present at the beginning and end of a quarter, increased in three core shale-related industries: support activities for mining, utility system construction, and pipeline transportation of natural gas.

These data are meant to provide a barometer of shale-related economic activity and employment trends. While the vast majority of shale-related employment can be found in certain industries, not all business establishments in those industries are involved in shale activity. For those that are, not all of their products and services and, therefore, their employment, are necessarily linked to shale-related economic activity.

BACKGROUND INFORMATION

Data Sources

The purpose of this quarterly publication is to provide the most current available data on shale-related economic activity in Ohio as compared to the base year of 2011. Although several data sources are cited in this publication, the primary source is the Quarterly Census of Employment and Wages (QCEW).

The QCEW program derives its data from quarterly tax reports of employers subject to state and federal unemployment insurance laws. This includes 95 percent or more of all wage and salary employment in Ohio. Under the QCEW program, employment data represent the number of covered workers who worked during, or received pay for, the pay period including the 12th of the month. Excluded are members of the armed forces, the self-employed, unpaid family workers and railroad workers covered by the railroad unemployment insurance system. Data is published approximately six months after the quarter ends.

Also included in this publication are several additional data sources that capture Ohio's most current overall economic situation (Local Area Unemployment Statistics and Current Employment Statistics), employer demand (Gartner TalentNeuron™ job posting analytics platform) and hiring activity (Quarterly Workforce Indicators). For an explanation of all data sources, please refer to the "Definitions" section on page 18.

In this edition, most current data from the QCEW program are for the third quarter of 2019. Because the data are not seasonally adjusted, the same quarter of a given year must be used when analyzing growth over time. This will ensure that seasonal factors are not influencing employment change. Therefore, third quarter 2019 QCEW data are compared to third quarter 2011 QCEW data.

Data Limitations

The North American Industry Classification System (NAICS), which is reviewed and revised every five years, was used to define shale-related industries. Much of the information included in this publication reflects data on a group of six industries identified as "core" and a group of 30 industries identified as "ancillary." See page 20 for the impact the NAICS 2017 revision had on the shale-related industries.

These data are meant to provide a barometer of shale-related economic activity and employment trends. While the vast majority of shale-related employment can be found in these industries, not all business establishments in these industries are involved in shale activity. For those that are, not all of their products and services and, therefore, their employment are necessarily linked to shale-related economic activity. This is particularly true for the ancillary industries.

The data in this publication include government employment (federal, state and local) in all shale-related industries because significant non-private employment is present in a number of these industries, most notably: highway, street and bridge construction; engineering services; water supply and irrigation systems; and sewage treatment facilities.

As shale-related activity develops further in Ohio, additional industries may be added to the ancillary group, based on such factors as significant employment gains in an industry in a geographic region or the identification of a group of companies in the same industry involved in shale-related activity.

Snapshot of Employment in Ohio

- **Ohio's seasonally adjusted unemployment rate for March 2020 was 5.5 percent.**
    - The rate was up 1.4 percent from February.

Seasonally Adjusted Unemployment Rates

Recession ▬▬Ohio ▬▬U.S.
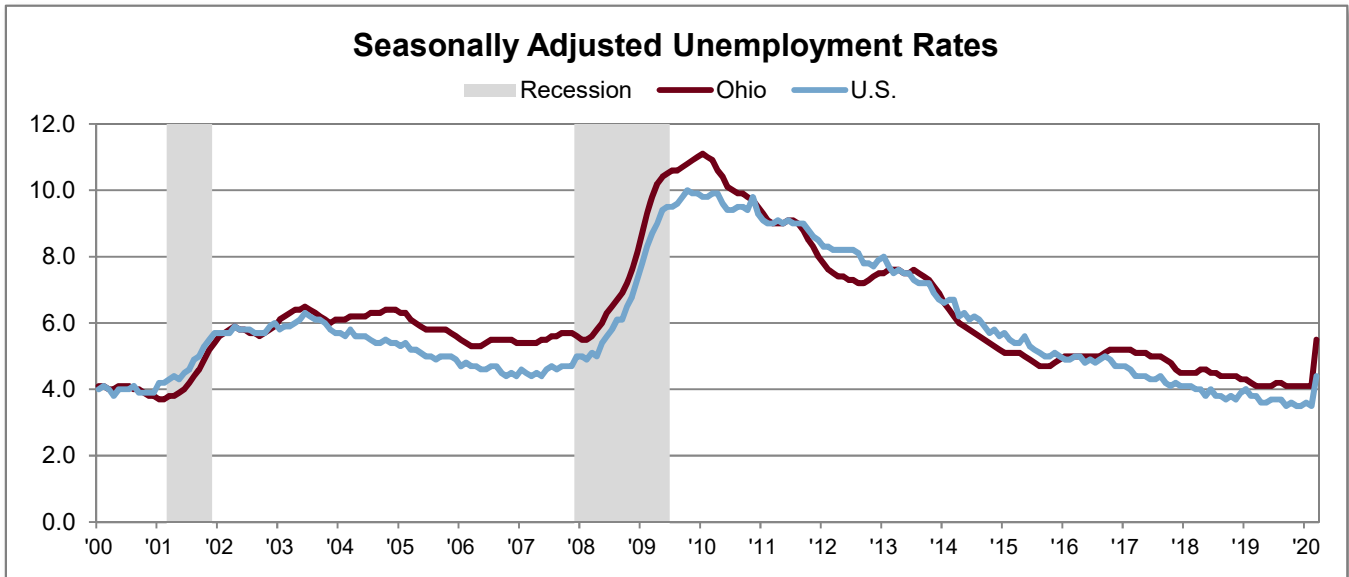
Note: Recessionary periods are defined by the National Bureau of Economic Research (NBER).

- **Ohio had 5,559,400 seasonally adjusted nonfarm jobs in March 2020.**
    - Total nonfarm employment decreased by 39,700 over the month.
    - Over the past 12 months, Ohio lost 30,800 jobs.

Ohio Nonfarm Employment Over-the-Month Change
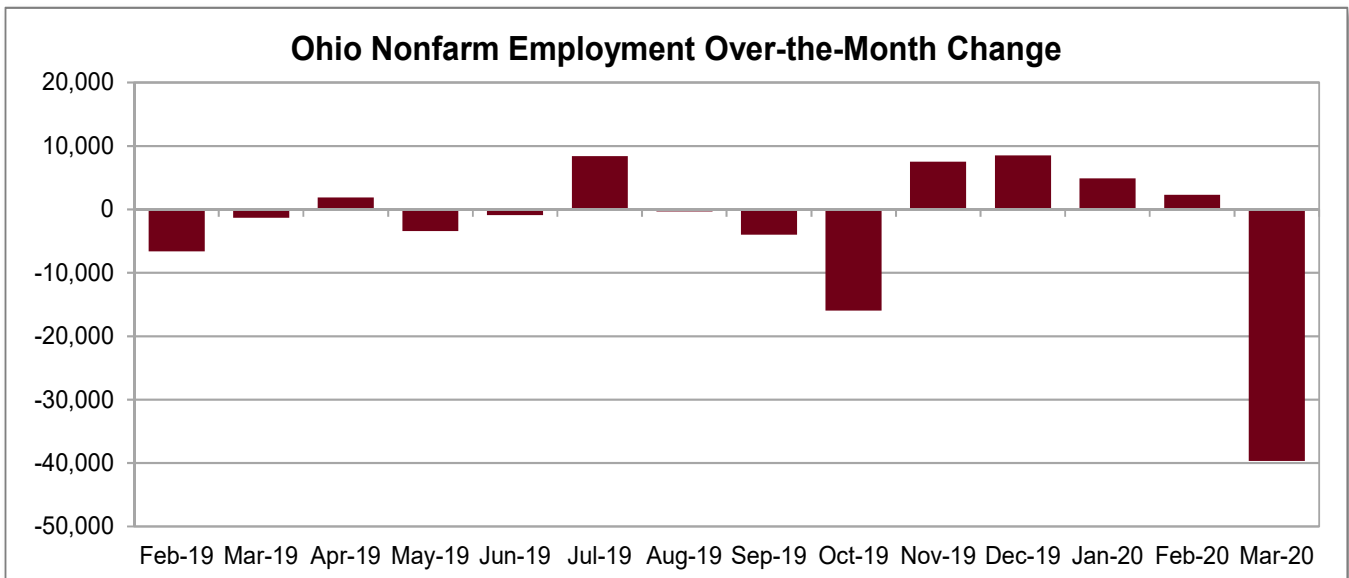
- **In March 2020, 11,500 Ohioans were employed in the mining and logging industry.**

Ohio | **Department of Job and Family Services**

STATEWIDE SHALE-RELATED INDUSTRIES

- From 2011 Q3 to 2019 Q3, employment in core industries increased by 5,655 (77.6 percent). Over the same period, employment in ancillary industries increased by 21,375 (12.3 percent).

- From 2011 Q3 to 2019 Q3, the number of business establishments in the core industries grew by 161 (26.4 percent), while establishments in ancillary industries increased by 1,162 (9.0 percent).

Number of Business Establishments and Employment in Shale-Related Industries (2011 Q3 - 2019 Q3)

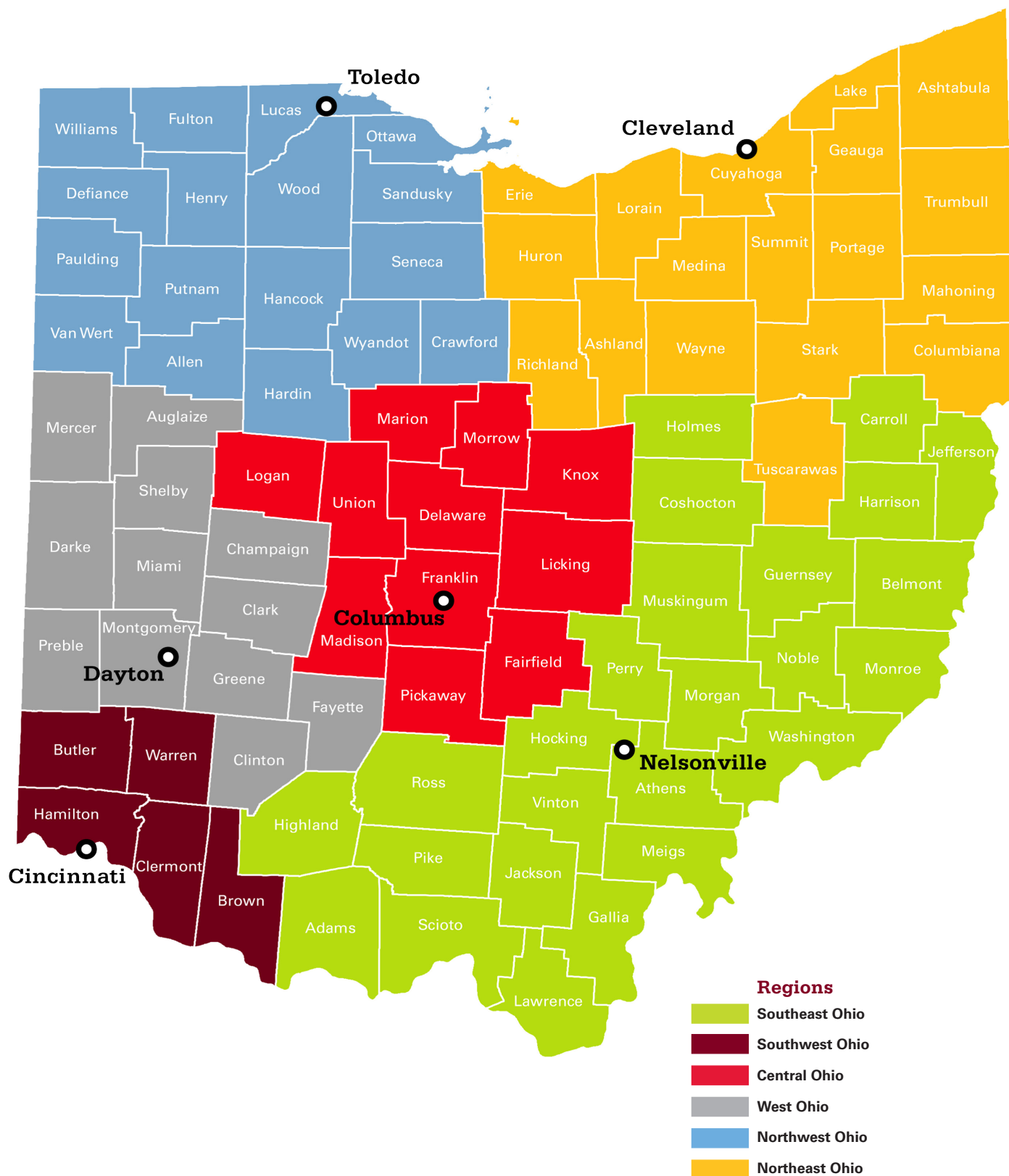| Core Industries		2011 Q3		2019 Q3		Change	
NAICS	Title	Estab.	Empl.	Estab.	Empl.	Estab.	Empl.
2111**	Oil and gas extraction	203	2,918	123	1,170	-80	-1,748
213111	Drilling oil and gas wells	84	628	99	772	15	144
213112	Support activities for oil and gas operations	187	1,353	321	4,620	134	3,267
237120	Oil and gas pipeline construction	100	2,083	183	5,793	83	3,710
486210	Pipeline transportation of natural gas	36	310	45	592	9	282
	Core Industry Totals	**610**	**7,292**	**771**	**12,947**	**161**	**5,655**
Ancillary Industries		2011 Q3		2019 Q3		Change	
NAICS	Title	Estab.	Empl.	Estab.	Empl.	Estab.	Empl.
221112	Fossil fuel electric power generation	83	5,302	87	2,821	4	-2,481
221210	Natural gas distribution	146	3,910	163	5,509	17	1,599
221310	Water supply and irrigation systems	248	6,121	260	5,949	12	-172
221320	Sewage treatment facilities	212	3,859	210	3,890	-2	31
237110	Water and sewer system construction	385	5,611	376	6,568	-9	957
237310	Highway, street, and bridge construction	725	17,435	757	20,605	32	3,170
238912	Nonresidential site preparation contractors	630	5,885	638	7,690	8	1,805
325110	Petrochemical manufacturing	5	355	4	ND	-1	ND
325120	Industrial gas manufacturing	45	760	42	ND	-3	ND
331110	Iron and steel mills and ferroalloy manufacturing	60	10,419	61	8,074	1	-2,345
331210	Iron, steel pipe and tube from purchase steel	54	3,163	38	3,451	-16	288
333131	Mining machinery and equipment manufacturing	12	476	12	382	0	-94
333132	Oil and gas field machinery and equipment	7	141	13	218	6	77
423810	Construction equipment merchant wholesalers	202	2,729	208	3,031	6	302
423830	Industrial machinery merchant wholesalers	1,701	15,506	2,081	19,400	380	3,894
423840	Industrial supplies merchant wholesalers	511	4,909	571	5,923	60	1,014
484110	General freight trucking, local	1,371	12,256	1,468	12,583	97	327
484220	Other specialized trucking, local	1,013	7,571	1,185	9,866	172	2,295
484230	Other specialized trucking, long-distance	291	4,636	359	6,320	68	1,684
531190	Lessors of other real estate property	294	1,018	290	1,077	-4	59
532412	Other heavy machinery rental and leasing	168	1,363	225	2,480	57	1,117
541330	Engineering services	2,308	28,371	2,446	31,301	138	2,930
541360	Geophysical surveying and mapping services	51	272	62	231	11	-41
541380	Testing laboratories	364	6,587	437	6,882	73	295
541620	Environmental consulting services	297	1,766	329	2,134	32	368
562910	Remediation services	189	2,601	218	4,459	29	1,858
811310	Commercial machinery repair and maintenance	1,103	7,417	1,119	9,804	16	2,387
924110	Air, water, and waste program administration	165	6,359	152	6,296	-13	-63
924120	Administration of conservation programs	281	6,723	271	6,830	-10	107
926130	Utility regulation and administration	29	480	30	508	1	28
	Ancillary Industry Totals	**12,950**	**174,001**	**14,112**	**195,376**	**1,162**	**21,375**
	Core Industries and Ancillary Industries Totals	**13,560**	**181,293**	**14,883**	**208,323**	**1,323**	**27,030**
	All Industries Totals	**289,289**	**5,009,939**	**302,146**	**5,460,843**	**12,857**	**450,904**

Source: Quarterly Census of Employment and Wages.
ND - Not Disclosable.
**See page 20 for explanation of 2111.

JOBSOHIO NETWORK REGIONS

Toledo

Cleveland

Williams	Fulton	Lucas			Lake	Ashtabula
Defiance	Henry	Wood	Ottawa	Erie	Cuyahoga	Geauga
			Sandusky	Lorain		Trumbull
Paulding	Putnam		Seneca	Huron	Medina	Summit	Portage	
Van Wert	Allen	Hancock		Ashland	Wayne	Stark	Mahoning
		Wyandot	Crawford	Richland			Columbiana
Mercer	Auglaize	Hardin	Marion	Morrow	Holmes		Carroll	Jefferson
Shelby	Logan	Union	Knox	Coshocton	Tuscarawas	Harrison
Darke	Miami	Champaign	Delaware	Licking	Muskingum	Guernsey	Belmont
Preble	Montgomery	Clark	Franklin			Noble	Monroe
	Greene	Madison		Fairfield	Perry	Morgan	Washington
Butler	Warren	Fayette	Pickaway	Hocking		
Hamilton	Clinton	Ross	Vinton	Athens	Meigs
Clermont	Highland	Pike	Jackson	Gallia	
Brown	Adams	Scioto			Lawrence

Columbus

Dayton

Cincinnati

Nelsonville

Regions
- Southeast Ohio
- Southwest Ohio
- Central Ohio
- West Ohio
- Northwest Ohio
- Northeast Ohio

REGIONAL SHALE-RELATED INDUSTRIES

The JobsOhio Network is a partnership of statewide economic development organizations with deep ties to their business communities. The following charts show trends in shale-related employment for each of the six JobsOhio regions.

Large percentage increases and decreases in employment may be the result of a change in industry classification following a routine NAICS assignment review. Changes in NAICS assignments are typically done with the publication of the first-quarter data.

Core Shale-Related Industries
Percent Employment Change (2011 Q3 - 2019 Q3)
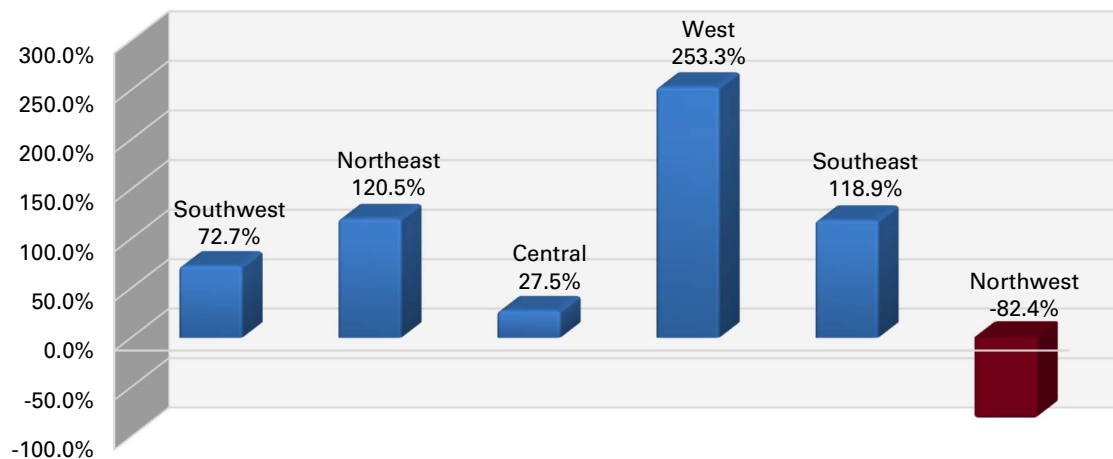
- The largest percent growth in employment for core shale-related industries was in the West region (253.3 percent), followed by the Northeast region (120.5 percent).

Ancillary Shale-Related Industries
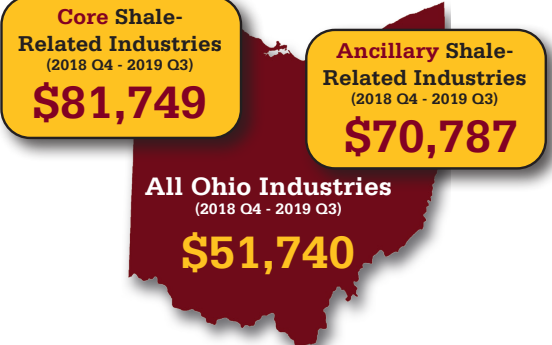## Percent Employment Change (2011 Q3 - 2019 Q3)
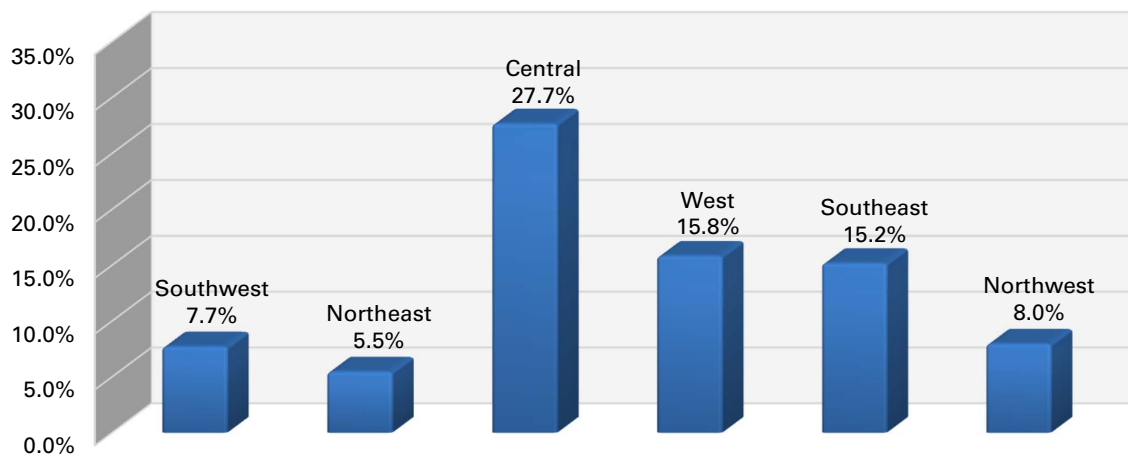
- For ancillary shale-related industries, the largest percent growth in employment was in the Central region (27.7 percent), followed by the West region (15.8 percent).

Source: Quarterly Census of Employment and Wages program, Enhanced Quarterly Unemployment Insurance file.

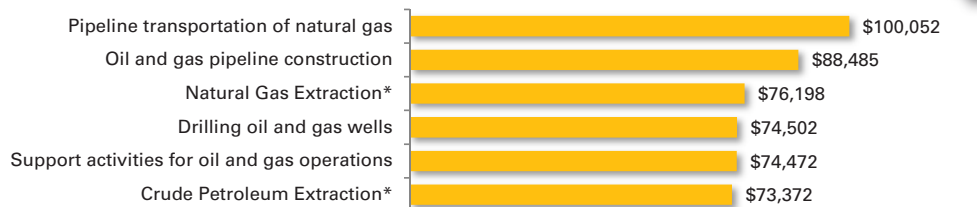# WAGES FOR OHIO SHALE-RELATED CORE AND ANCILLARY INDUSTRIES

- The four-quarter average wage across all industries for 2018 Q4 through 2019 Q4 was $51,740.
- The four-quarter average wage in the core industries was $30,009 greater than the average wage for all industries.
- The four-quarter average wage in the ancillary industries was $19,047 higher than the average wage for all industries.

Large changes in average wages may be the result of a change in industry classification following a routine NAICS assignment review.
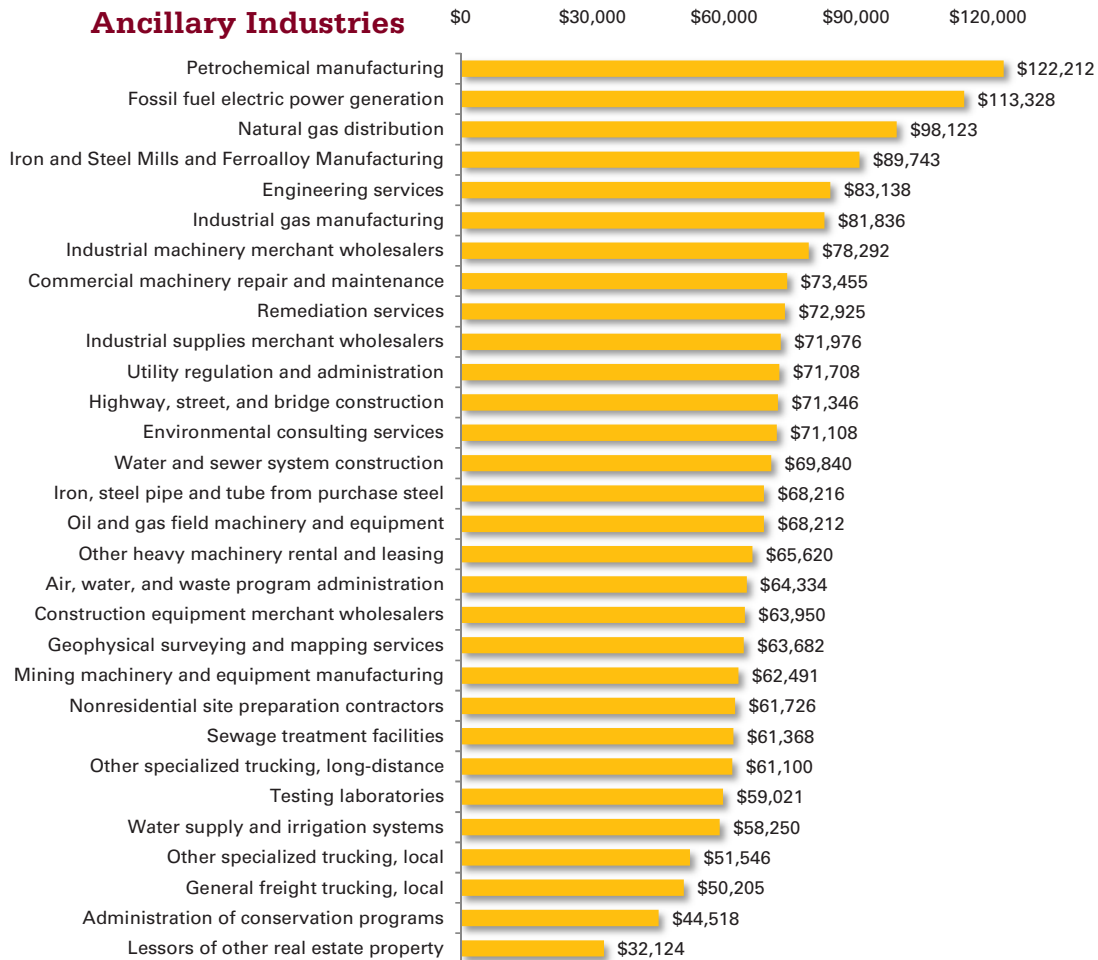
Core Shale-Related Industries
(2018 Q4 - 2019 Q3)
$81,749

Ancillary Shale-Related Industries
(2018 Q4 - 2019 Q3)
$70,787

All Ohio Industries
(2018 Q4 - 2019 Q3)
$51,740

Four-Quarter Average Wage by Industry

Core Industries

Industry	Wage
Pipeline transportation of natural gas	$100,052
Oil and gas pipeline construction	$88,485
Natural Gas Extraction*	$76,198
Drilling oil and gas wells	$74,502
Support activities for oil and gas operations	$74,472
Crude Petroleum Extraction*	$73,372

Ancillary Industries

Industry	Wage
Petrochemical manufacturing	$122,212
Fossil fuel electric power generation	$113,328
Natural gas distribution	$98,123
Iron and Steel Mills and Ferroalloy Manufacturing	$89,743
Engineering services	$83,138
Industrial gas manufacturing	$81,836
Industrial machinery merchant wholesalers	$78,292
Commercial machinery repair and maintenance	$73,455
Remediation services	$72,925
Industrial supplies merchant wholesalers	$71,976
Utility regulation and administration	$71,708
Highway, street, and bridge construction	$71,346
Environmental consulting services	$71,108
Water and sewer system construction	$69,840
Iron, steel pipe and tube from purchase steel	$68,216
Oil and gas field machinery and equipment	$68,212
Other heavy machinery rental and leasing	$65,620
Air, water, and waste program administration	$64,334
Construction equipment merchant wholesalers	$63,950
Geophysical surveying and mapping services	$63,682
Mining machinery and equipment manufacturing	$62,491
Nonresidential site preparation contractors	$61,726
Sewage treatment facilities	$61,368
Other specialized trucking, long-distance	$61,100
Testing laboratories	$59,021
Water supply and irrigation systems	$58,250
Other specialized trucking, local	$51,546
General freight trucking, local	$50,205
Administration of conservation programs	$44,518
Lessors of other real estate property	$32,124

Source: Quarterly Census of Employment and Wages.
* NAICS codes are reviewed and revised every five years to keep the classification system current with changes in economic activities. Due to the 2017 NAICS revision, there is a series break. For more information on the 2017 NAICS revision, please visit https://www.bls.gov/cew/bls_naics/v2/bls_naics_app.htm#tab=transition.

OHIO SHALE-RELATED ONLINE JOB POSTINGS

Statewide Online Job Postings

	2019 Q1	2020 Q1	% Change
Core Industries	144	66	-54.2%
Ancillary Industries	2,813	2,652	-5.7%
Total: ALL Industries	**128,434**	**146,696**	**14.2%**

Regional Online Job Postings

Core and Ancillary Combined	2019 Q1	2020 Q1	% Change
Southwest Ohio	0	0	0.0%
Northeast Ohio	791	720	-9.0%
Central Ohio	646	617	-4.5%
West Ohio	418	443	6.0%
Southeast Ohio	246	128	-48.0%
Northwest Ohio	286	280	-2.1%
Total*	**2,957**	**2,718**	**-8.1%**

Source: Gartner TalentNeuron™. New unique ads only. Data are subject to revision. Not seasonally adjusted.

Statewide Online Job Postings

- Total job postings across all Ohio industries increased in 2020 Q1 compared to 2019 Q1.

- Overall, job postings decreased in core (-54.2 percent) and ancillary (-5.7 percent) shale-related industries.
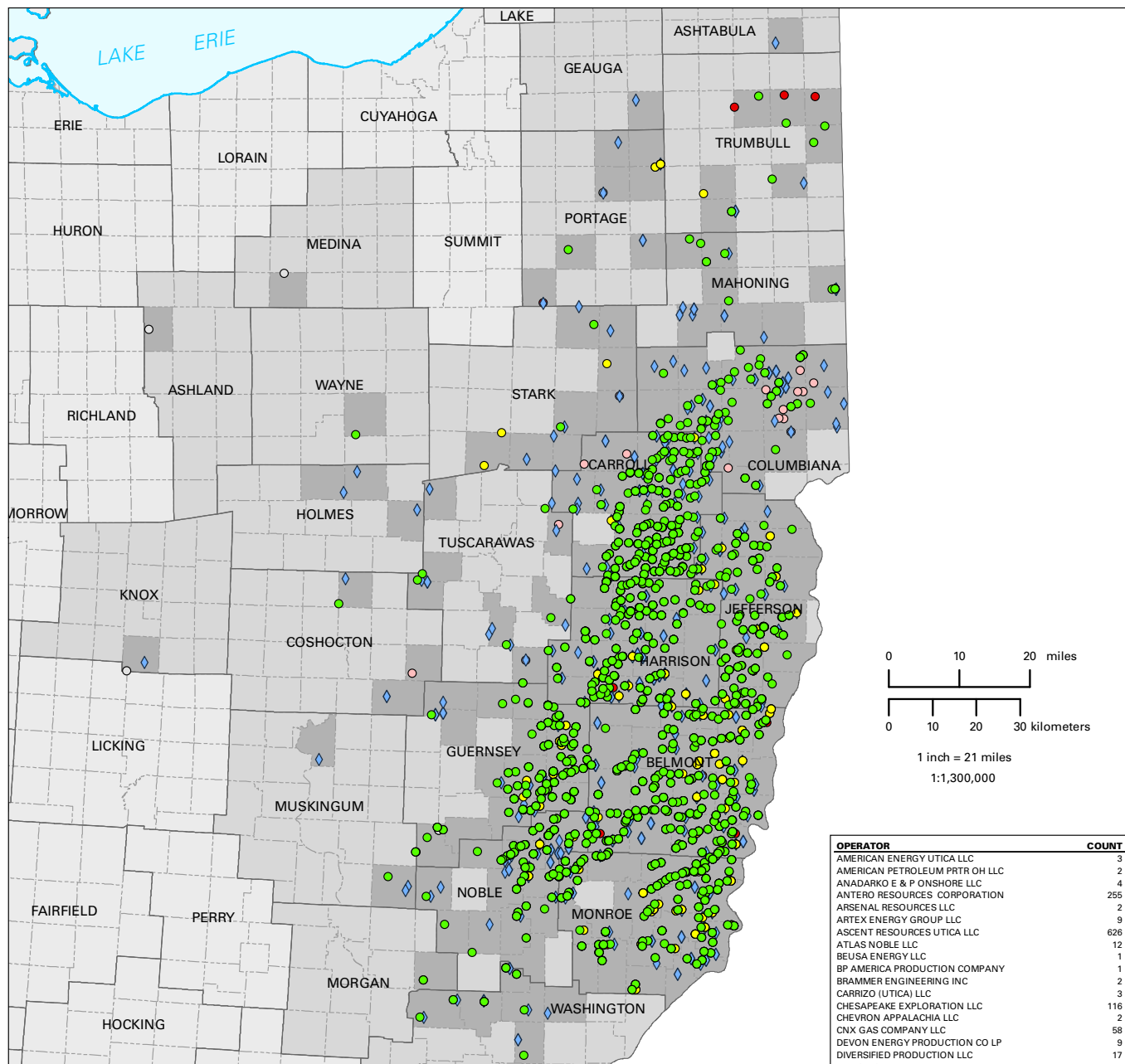
Regional Online Job Postings

- Job postings increased in the West Ohio (6.0 percent) JobsOhio Network Region in 2020 Q1 compared to 2019 Q1.

* Data are not directly comparable to data in reports published prior to 2019 Q3 due to methodological improvements that have become available over time.

* The total includes job ads that may have listed Ohio as the only geographical area. As a result, the sum of the job ads for the regions may be lower, since it does not include ads without a city or metropolitan statistical area specification.

Ohio | **Department of**
Job and Family Services

WELL ACTIVITY STATUS AS OF APRIL 7, 2020

Scale:
0 10 20 miles
0 10 20 30 kilometers
1 inch = 21 miles
1:1,300,000

OPERATOR	COUNT
AMERICAN ENERGY UTICA LLC	3
AMERICAN PETROLEUM PRTR OH LLC	2
ANADARKO E & P ONSHORE LLC	4
ANTERO RESOURCES CORPORATION	255
ARSENAL RESOURCES LLC	2
ARTEX ENERGY GROUP LLC	9
ASCENT RESOURCES UTICA LLC	626
ATLAS NOBLE LLC	12
BEUSA ENERGY LLC	1
BP AMERICA PRODUCTION COMPANY	1
BRAMMER ENGINEERING INC	2
CARRIZO (UTICA) LLC	3
CHESAPEAKE EXPLORATION LLC	116
CHEVRON APPALACHIA LLC	2
CNX GAS COMPANY LLC	58
DEVON ENERGY PRODUCTION CO LP	9
DIVERSIFIED PRODUCTION LLC	17
EAP OHIO LLC	858
ECLIPSE RESOURCES I LP	214
EM ENERGY OHIO LLC	7
ENERVEST OPERATING LLC	20
EQT PRODUCTION COMPANY	2
EQUINOR USA ONSHORE PROPERTIES INC.	42
GEOPETRO LLC	5
GULFPORT APPALACHIA LLC	412
GULFPORT ENERGY CORPORATION	49
HALCON OPERATING COMPANY INC	4
HESS OHIO DEVELOPMENTS LLC	24
HESS OHIO RESOURCES LLC	1
HG ENERGY LLC	2
HILCORP ENERGY COMPANY	62
NORTHWOOD ENERGY CORP	6
PDC ENERGY INC	8
PENNENERGY RESOURCES LLC	40
PIN OAK ENERGY PARTNERS LLC	24
PROTEGE ENERGY III LLC	1
R E GAS DEVELOPMENT LLC	9
RICE DRILLING D LLC	147
SIERRA RESOURCES LLC	3
STATOIL USA ONSHORE PROPERTIES INC	8
SUMMIT PETROLEUM INC	6
SWEPI LP	1
TRIAD HUNTER LLC	32
UTICA RESOURCE OPERATING LLC	36
XTO ENERGY INC.	80
TOTAL	**3,225**

EXPLANATION
Horizontal well status as of 4/4/2020

◆ PERMITTED-(Permitted; Not Drilled; Canceled) (493)
● DRILLED-(Drilling; Well Drilled) (214)
● PRODUCING-(Producing; Plugged Back) (2,482)
● INACTIVE-(Drilled Inactive; Shut in) (18)
● Lost Hole or Final Restoration (11)
○ Dry and Abandoned (3)
○ Plugged and Abandoned (4)

Well permit information from the ODNR Division of Oil and Gas Resources Management

Recommended citation:
Ohio Department of Natural Resources, 2020, Horizontal Utica-Point Pleasant Well Activity in Ohio: Columbus, scale 1:1,300,000, revised 4/7/2020.

KEY OCCUPATIONS IN CORE
SHALE-RELATED INDUSTRIES

The occupations listed in the table below are found within the national staffing patterns of core shale-related industries. While these occupations are not exclusive to the core shale-related industries, the 2018 base employment count within these industries was above 100.

A standard occupation classification (SOC) code is provided for each occupation. For a complete list of terms and definitions, please refer to the Staffing Patterns definition on page 19.

SOC Code	SOC Title	Median Annual Wage[1]	Typical Education, Work Experience, On-the-Job Training (OJT)
17-2171	Petroleum engineers	$82,760	Bachelor's degree
47-2151	Pipelayers	$47,310	No formal educational credential, Short-term OJT
47-3015	Helpers--pipelayers, plumbers, pipefitters, and steamfitters	$30,480	HS/GED, Short-term OJT
47-5011	Derrick operators, oil and gas	$47,630[2]	No formal educational credential, Short-term OJT
47-5012	Rotary drill operators, oil and gas	$45,320	No formal educational credential, Moderate-term OJT
47-5013	Service unit operators, oil, gas, and mining	$49,340	No formal educational credential, Moderate-term OJT
47-5021	Earth drillers, except oil and gas	$43,090	HS/GED, Moderate-term OJT
47-5071	Roustabouts, oil and gas	$35,630	No formal educational credential, Moderate-term OJT
47-5081	Helpers--extraction workers	$36,820	HS/GED, Moderate-term OJT
49-3042	Mobile heavy equipment mechanics, except engines	$54,640	HS/GED, Long-term OJT
49-9098	Helpers--installation, maintenance, and repair workers	$28,620	HS/GED, Short-term OJT
51-8093	Petroleum pump system operators, refinery operators, and gaugers	$66,760	HS/GED, Moderate-term OJT
53-7021	Crane and tower operators	$44,030	HS/GED, 1-5 Years Experience, Moderate-term OJT
53-7032	Excavating and loading machine and dragline operators	$42,580	HS/GED, 1-5 Years Experience, Moderate-term OJT
53-7073	Wellhead pumpers	$39,040	HS/GED, 1-5 Years Experience, Moderate-term OJT

[1]Annual wages have been calculated by multiplying hourly median wage by 2,080 hours.
[2]National wage estimate.
Source: U.S. Bureau of Labor Statistics, Occupational Employment Statistics, May 2018.

IN-DEMAND SHALE-RELATED OCCUPATIONS

The occupations listed below have been identified as in-demand occupations through the Ohio Workforce Information Exchange — Job Forecast initiative as of December 2019. This initiative works directly with employers with at least one Ohio location to identify employers' most in-demand occupations over the next one, three, and five years. While the occupations below are not exclusive to the core shale-related industries, the 2018 base employment count within these industries was above 100.

For more information on the Workforce Information Exchange, please refer to page 20.

SOC Code	SOC Title	Median Annual Wage[1]	Typical Education, Work Experience, On-the-Job Training (OJT)
11-1021	General and operations managers	$96,110	Bachelor's degree, 5+ Years Experience
13-1051	Cost estimators	$60,640	Bachelor's degree, Moderate-term OJT
11-9021	Construction managers	$91,130	Bachelor's degree, Moderate-term OJT
13-2011	Accountants and auditors	$64,630	Bachelor's degree
43-1011	First-line supervisors of office and administrative support workers	$53,930	HS/GED, 1-5 Years Experience
43-3031	Bookkeeping, accounting, and auditing clerks	$38,470	Some college -no degree, Moderate-term OJT
43-6011	Executive secretaries and executive administrative assistants	$56,140	HS/GED, 1-5 Years Experience
43-6014	Secretaries and administrative assistants, except legal, medical, and executive	$35,550	HS/GED, Short-term OJT
43-9061	Office clerks, general	$32,730	HS/GED, Short-term OJT
47-1011	First-line supervisors of construction trades and extraction workers	$64,680	HS/GED, 5+ Years Experience
47-2031	Carpenters	$46,240	HS/GED, Apprenticeship
47-2051	Cement masons and concrete finishers	$46,280	No formal educational credential, Moderate-term OJT
47-2061	Construction laborers	$39,970	No formal educational credential, Short-term OJT
47-2073	Operating engineers and other construction equipment operators	$53,060	HS/GED, Moderate-term OJT
47-2111	Electricians	$52,170	HS/GED, Apprenticeship
47-2152	Plumbers, pipefitters, and steamfitters	$55,330	HS/GED, Apprenticeship
47-2221	Structural iron and steel workers	$60,360	HS/GED, Apprenticeship
49-1011	First-line supervisors of mechanics, installers, and repairers	$63,180	HS/GED, 1-5 Years Experience
49-9041	Industrial machinery mechanics	$51,650	HS/GED, Long-term OJT
49-9071	Maintenance and repair workers, general	$39,830	HS/GED, Moderate-term OJT
51-1011	First-line supervisors of production and operating workers	$59,700	HS/GED, 1-5 Years Experience
51-4121	Welders, cutters, solderers, and brazers	$39,390	HS/GED, Moderate-term OJT
51-9198	Helpers--production workers	$29,970	HS/GED, Short-term OJT
53-3032	Heavy and tractor-trailer truck drivers	$42,970	Post-sec non-degree, Short-term OJT
53-7062	Laborers and freight, stock, and material movers, hand	$28,440	No formal educational credential, Short-term OJT

[1]Annual wages have been calculated by multiplying hourly median wage by 2,080 hours.
Source: U.S. Bureau of Labor Statistics, Occupational Employment Statistics, May 2018.

STATEWIDE SHALE-RELATED EMPLOYMENT DATA

The Quarterly Workforce Indicators (QWI) are a set of economic indicators derived from state administrative records and basic demographic information from the Census Bureau. They can be examined based on geography, industry, gender and age of workers. Data presented are the most recent available. Because QWI data are not seasonally adjusted, the same quarter must be used when analyzing changes over time. This will ensure that seasonal factors are not influencing employment change. Therefore, in the table below and on the following page, 2011 Q1 data is presented with 2019 Q1 data.

The tables below and on the following page show Ohio shale-related employment. "Stable Employment" is an estimate of the number of jobs that were present at the beginning and end of a quarter. "All Hires" is the estimated number of workers who started a job during the quarter; it includes new and recalled employees. "Separations" is the estimated number of workers whose jobs with a given employer ended during a quarter.

Ohio	2011 Q1			2019 Q1		
	Stable Employment	All Hires	Separations	Stable Employment	All Hires	Separations
All industry groups	4,313,377	575,017	545,955	4,682,802	749,802	746,172
2111 Oil and Gas Extraction	2,785	187	88	951	149	119
2131 Support Activities for Mining	2,246	643	462	5,514	1,382	1,309
2371 Utility System Construction	7,607	1,511	1,522	13,865	5,566	4,338
4862 Pipeline Transportation of Natural Gas	315	13	21	566	22	9

Source: U.S. Census Bureau, Longitudinal Employer-Household Dynamics, Quarterly Workforce Indicators.

QWI are available only at the four-digit NAICS level. Consequently, although these industry groups contain some employment from non-shale-related core industries, they provide an indication of labor activity for these shale-related industries.

- Stable jobs, those present at the beginning and end of a quarter, increased in three core shale-related industries from 2011 Q1 to 2019 Q1: support activities for mining, utility system construction, and pipeline transportation of natural gas.

- The job market has significant turnover as demonstrated by the number of hires.

JOBSOHIO NETWORK SHALE-RELATED EMPLOYMENT

	2011 Q1			2019 Q1		
Central Ohio	**Stable Employment**	**All Hires**	**Separations**	**Stable Employment**	**All Hires**	**Separations**
All industry groups	846,595	120,496	112,348	982,107	161,841	165,177
2111 Oil and Gas Extraction	179	10	5	62	13	7
2131 Support Activities for Mining	147	38	21	176	29	22
2371 Utility System Construction	1,548	261	259	3,424	761	753
4862 Pipeline Transportation of Natural Gas	112	6	7	254	10	4
Northeast Ohio						
All industry groups	1,638,227	210,276	198,750	1,719,009	265,006	266,662
2111 Oil and Gas Extraction	609	61	30	488	44	50
2131 Support Activities for Mining	676	81	100	1,142	164	184
2371 Utility System Construction	2,778	679	700	4,127	2,072	1,555
4862 Pipeline Transportation of Natural Gas	87	4	7	89	3	***
Northwest Ohio						
All industry groups	449,117	55,868	58,557	481,612	78,598	77,775
2111 Oil and Gas Extraction	1,551	88	31	***	***	***
2131 Support Activities for Mining	18	0	0	49	7	10
2371 Utility System Construction	1,020	112	174	1,867	823	648
4862 Pipeline Transportation of Natural Gas	29	1	***	33	0	0
Southeast Ohio						
All industry groups	260,483	33,565	31,619	270,841	43,949	41,608
2111 Oil and Gas Extraction	410	21	20	356	37	37
2131 Support Activities for Mining	1,385	519	336	4,094	1,170	1,088
2371 Utility System Construction	572	269	182	1,144	767	635
4862 Pipeline Transportation of Natural Gas	74	***	5	98	***	***
Southwest Ohio						
All industry groups	665,812	98,653	91,319	747,039	124,480	120,355
2111 Oil and Gas Extraction	35	7	***	***	***	***
2131 Support Activities for Mining	***	0	***	***	0	0
2371 Utility System Construction	1,146	113	126	2,079	587	425
4862 Pipeline Transportation of Natural Gas	***	0	***	87	5	***
West Ohio						
All industry groups	453,144	56,159	53,362	482,194	75,927	74,594
2111 Oil and Gas Extraction	***	0	0	***	***	***
2131 Support Activities for Mining	15	5	4	50	12	4
2371 Utility System Construction	543	76	81	1,223	556	323
4862 Pipeline Transportation of Natural Gas	***	0	0	***	0	0

Source: U.S. Census Bureau, Longitudinal Employer-Household Dynamics, Quarterly Workforce Indicators.
*** *Indicates data cannot be disclosed due to confidentiality restrictions or data quality standards.*

Quarterly Workforce Indicators are available only at the four-digit NAICS level. Consequently, although these industry groups contain some employment from non-shale-related core industries, they help provide an indication of labor activity for these shale-related industries.

COUNTY UNEMPLOYMENT RATES IN MARCH 2020
(Not Seasonally Adjusted)
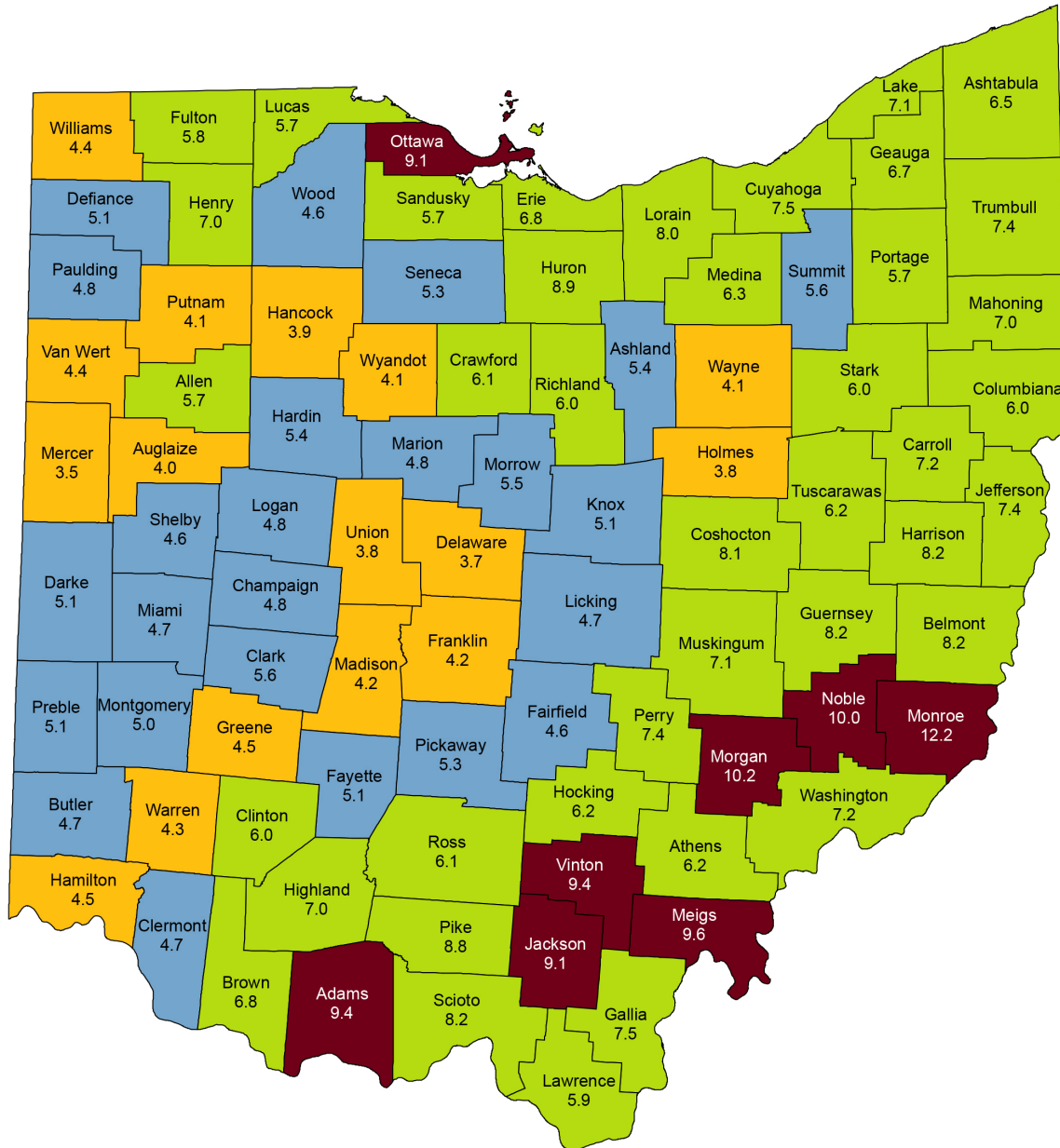
Unemployment Rates

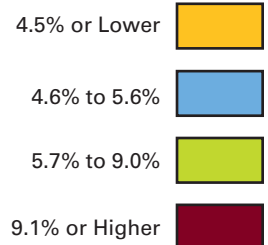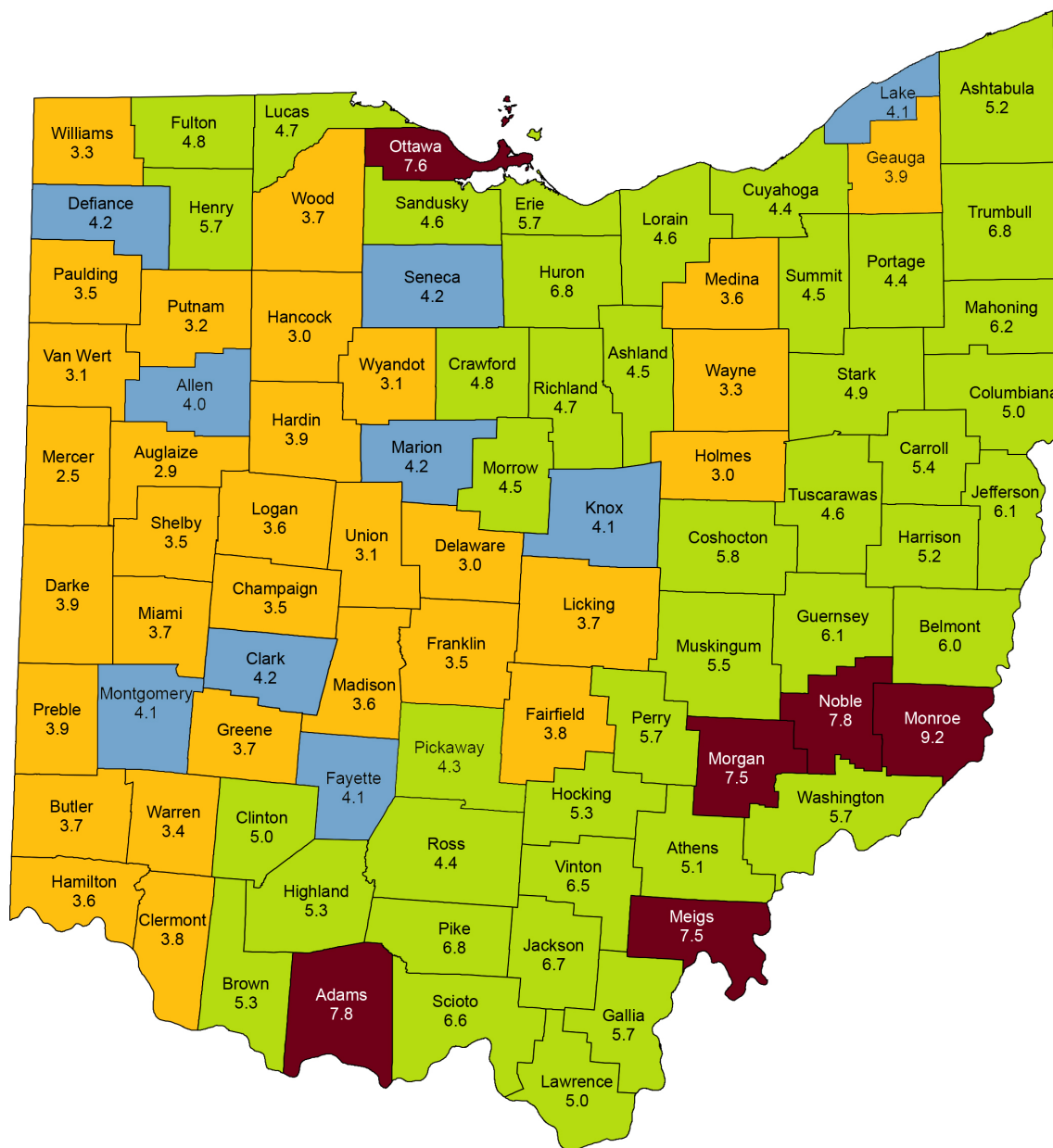|	Not Seasonally Adjusted	Seasonally Adjusted
United States	4.5%	4.4%
Ohio	5.6%	5.5%

Legend:
- 4.5% or Lower
- 4.6% to 5.6%
- 5.7% to 9.0%
- 9.1% or Higher

Ohio | **Department of Job and Family Services**

COUNTY UNEMPLOYMENT RATES IN MARCH 2019
(Not Seasonally Adjusted)

County	Rate
Williams	3.3
Fulton	4.8
Lucas	4.7
Ottawa	7.6
Lake	4.1
Ashtabula	5.2
Defiance	4.2
Henry	5.7
Wood	3.7
Sandusky	4.6
Erie	5.7
Lorain	4.6
Cuyahoga	4.4
Geauga	3.9
Trumbull	6.8
Paulding	3.5
Putnam	3.2
Hancock	3.0
Seneca	4.2
Huron	6.8
Medina	3.6
Summit	4.5
Portage	4.4
Mahoning	6.2
Van Wert	3.1
Allen	4.0
Wyandot	3.1
Crawford	4.8
Ashland	4.5
Richland	4.7
Wayne	3.3
Stark	4.9
Columbiana	5.0
Mercer	2.5
Auglaize	2.9
Hardin	3.9
Marion	4.2
Morrow	4.5
Knox	4.1
Holmes	3.0
Carroll	5.4
Jefferson	6.1
Shelby	3.5
Logan	3.6
Union	3.1
Delaware	3.0
Coshocton	5.8
Tuscarawas	4.6
Harrison	5.2
Darke	3.9
Champaign	3.5
Licking	3.7
Guernsey	6.1
Belmont	6.0
Miami	3.7
Clark	4.2
Madison	3.6
Franklin	3.5
Muskingum	5.5
Noble	7.8
Monroe	9.2
Preble	3.9
Montgomery	4.1
Greene	3.7
Fairfield	3.8
Perry	5.7
Morgan	7.5
Washington	5.7
Butler	3.7
Warren	3.4
Clinton	5.0
Fayette	4.1
Pickaway	4.3
Hocking	5.3
Athens	5.1
Meigs	7.5
Hamilton	3.6
Clermont	3.8
Highland	5.3
Ross	4.4
Vinton	6.5
Pike	6.8
Jackson	6.7
Brown	5.3
Adams	7.8
Scioto	6.6
Gallia	5.7
Lawrence	5.0

Unemployment Rates

	Not Seasonally Adjusted	Seasonally Adjusted
United States	3.9%	3.8%
Ohio	4.2%	4.1%
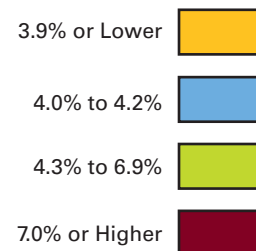
Legend:
- 3.9% or Lower
- 4.0% to 4.2%
- 4.3% to 6.9%
- 7.0% or Higher

DEFINITIONS

OHIO LABOR FORCE STATISTICS*

Source: Ohio Department of Job and Family Services' Bureau of Labor Market Information, Local Area Unemployment Statistics (LAUS)

The labor force and unemployment data are based on the same concepts and definitions as those used for the official national estimates obtained from the Current Population Survey (CPS). The LAUS program measures employment and unemployment on a place-of-residence basis and produces estimates using equations based on regression techniques. This method uses data from several sources, including the CPS, the Current Employment Statistics (CES) program and state unemployment insurance programs. The LAUS program does not produce estimates for any demographic groups.

Employment – A count of all persons who, during the week that includes the 12th day of the month, (a) did any work as paid employees, worked in their own businesses or professions or on their own farm, or worked 15 hours or more as unpaid workers in enterprises operated by members of their families, or (b) were not working but who had jobs from which they were temporarily absent. Each employed person is counted only once, even if the person holds more than one job. Included are the self-employed, unpaid family workers, agricultural workers and private household workers, who are excluded by the CES survey.

Labor Force – The population of people either working or looking for work, or classified as employed or unemployed.

Unemployment – A count of all persons age 16 and older who had no employment during the reference week (the week containing the 12th day of the month), who were available for work (except for temporary illness), and who had made specific efforts to find employment sometime during the four-week period ending with the reference week. This includes those waiting to be recalled to jobs from which they had been laid off.

Unemployment Rate – The number of unemployed workers as a percent of the labor force.

JOB DATA*

Source: Ohio Department of Job and Family Services' Bureau of Labor Market Information, Current Employment Statistics

Each month the CES program surveys about 145,000 national businesses and government agencies to provide detailed industry data on employment, hours, and earnings of workers on non-farm payrolls. This is a collaborative effort between the U.S. Bureau of Labor Statistics (BLS) and the states. CES produces a count of jobs, not of people.

Nonfarm Jobs – The total number of persons on established payrolls employed full- or part-time who received pay for any part of the pay period that includes the 12th day of the month. Temporary and intermittent employees are included, as are any employees who are on paid sick leave, on paid holiday, or who worked during only part of the specified pay period. A striking employee who works only a small portion of the survey period, and is paid, is included as employed. Those on payrolls of more than one establishment are counted in each establishment. Data exclude proprietors, self-employed workers, unpaid family or volunteer workers, farm workers, and domestic workers. Those on layoff, strike or leave without pay for the entire pay period, or who have not yet reported for work, are not counted as employed. Government employment covers only civilian employees.

QUARTERLY WORKFORCE INDICATORS

Source: U.S. Census Bureau

The Quarterly Workforce Indicators are data that can be examined by region, industry, gender and age of workers. These indicators are built on wage records in the unemployment insurance system and information from state Quarterly Census of Employment and Wages (QCEW) data.

*THESE DATA ARE SEASONALLY ADJUSTED. Seasonal adjustment removes changes in employment due to normal seasonal hiring or layoffs (such as holidays, weather, etc.).

DEFINITIONS

QUARTERLY CENSUS OF EMPLOYMENT AND WAGES

**Source: Ohio Department of Job and Family Services'
Bureau of Labor Market Information,
Quarterly Census of Employment and Wages**

Business Establishment – An establishment is the location of a certain economic activity, such as a factory, store, office or mine, which produces goods or services. It is typically at a single physical location and engaged in one, or predominantly one, type of economic activity. An employer may have one or more establishments.

Employment – Employment data include all employment covered under federal and Ohio unemployment insurance laws for each of the three months in a quarter. The employment count represents the number of full- and part-time employees who worked during or received pay for the payroll period including the 12th day of the month. The employment totals for each month are averaged for the quarter employment count. Those on paid vacations or paid sick leave are included. Workers temporarily earning no wages due to labor-management disputes, layoffs or other reasons are not reported as employed. Those on the payroll of more than one employer during the same reference week are reported more than once.

Wages – Wages include total compensation paid during a calendar quarter, including bonuses. Average wages are calculated by dividing total wages for a quarter by average employment in that quarter.

STAFFING PATTERNS

**Source: Ohio Department of Job and Family Services'
Bureau of Labor Market Information**

A staffing pattern is a list of the occupations most commonly found within a particular industry. This information comes from the biennial Long-Term Occupational Employment Projections data.

Annual Median Wage – The annual median wage earned by workers in an occupation, assuming 40 hours of work per week, 52 weeks a year. Wage data is derived from the annual Occupational Employment Statistics survey.

Typical Education, Training and Experience – To assist with career planning, the BLS has determined the typical education needed for entry into an occupation, years of commonly needed work experience in a related occupation, and typical on-the-job training needed to attain competency in the occupation. For definitions of available categories, see **bls.gov/emp/ep_education_tech.htm**.

Typical Education Levels
- Less than high school
- High school diploma or equivalent (HS/GED)
- Postsecondary non-degree award (Post-HS Cert.)
- Associate's degree
- Bachelor's degree
- Master's degree
- Doctoral or professional degree

Work Experience in a Related Occupation
- Five years or more
- One to five years
- Less than one year

Typical On-The-Job (OJT) Training
- Long-term OJT – More than 12 months OJT or combined work experience and formal classroom instruction
- Moderate-term OJT – One to 12 months OJT and informal training
- Short-term OJT – Less than one month OJT

ONLINE JOB POSTINGS

Source: Gartner TalentNeuron™

Gartner TalentNeuron™ provides real-time insight into the employment marketplace through its database of online job ads. Job ads can be classified by industry, occupation, employer, and geographic area. Data are analyzed for employment trends and to forecast economic conditions.

DEFINITIONS

NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (NAICS) CHANGES

NAICS, established in 1997, is reviewed for potential revisions every five years. The latest revision, in 2017, was implemented by BLS in the QCEW program with the release of first quarter 2017 data. As part of this revision, the NAICS code of two core shale-related industries were impacted: NAICS 211111 (Crude Petroleum and Natural Gas Extraction) and NAICS 211112 (Natural Gas Liquid Extraction). The NAICS 2017 structure regrouped those NAICS into 211120 (Crude Petroleum Extraction) and 211130 (Natural Gas Extraction). A portion of the former 211111 was moved to 211120; while 211130 contains all of 211112 and a portion of 211111. These data are comparable at the 4-digit level, as all are contained within 2111 (Oil and Gas Extraction), but they are not comparable at 5- or 6-digit level. Because the employment from year 2011 is not defined in NAICS 2017 codes and year 2017 employment is not defined under old codes, we provide only the 4-digit level data for NAICS 2111 on page 6.

Core Shale-Related Industries (NAICS):

Crude Petroleum Extraction (211120); Natural Gas Extraction (211130); Drilling Oil & Gas Wells (213111); Support Activities for Oil & Gas Operations (213112); Oil & Gas Pipeline & Related Structures Construction (237120); and Pipeline Transportation of Natural Gas (486210).

Ancillary Shale-Related Industries (NAICS):

Fossil Fuel Electric Power Generation (221112); Natural Gas Distribution (221210); Water Supply & Irrigation Systems (221310); Sewage Treatment Facilities (221320); Water & Sewer Line & Related Structures Construction (237110); Highway, Street, and Bridge Construction (237310); Nonresidential Site Preparation Contractors (238912); Petrochemical Manufacturing (325110); Industrial Gas Manufacturing (325120); Iron & Steel Mills & Ferroalloy Manufacturing (3311101); Iron & Steel Pipe & Tube Manufacturing from Purchased Steel (331210); Mining Machinery & Equipment Manufacturing (333131); Oil & Gas Field Machinery & Equipment Manufacturing (333132); Construction and Mining (except Oil Well) Machinery and Equipment Merchant Wholesalers (423810); Industrial Machinery and Equipment Merchant Wholesalers (423830); Industrial Supplies Merchant Wholesalers (423840); General Freight Trucking, Local (484110); Specialized Freight Trucking, Local (484220); Specialized Freight Trucking, Long-Distance (484230); Lessors of Other Real Property (531190); Construction, Mining & Forestry Machinery & Equipment Rental & Leasing (532412); Engineering Services (541330); Geophysical Surveying & Mapping Services (541360); Testing Laboratories (541380); Environmental Consulting Services (541620); Remediation Services (562910); Commercial & Industrial Machinery & Equipment Repair & Maintenance (811310); Administration of Air and Water Resource and Solid Waste Management Programs (924110); Administration of Conservation Programs (924120); and Regulation and Administration of Communications, Electric, Gas, and Other Utilities (926130).

WORKFORCE INFORMATION EXCHANGE

Source: Governor's Office of Workforce Transformation

(workforce.ohio.gov)

The Governor's Office of Workforce Transformation deployed a statewide jobs forecasting tool to the top companies of predefined industry clusters. These companies represent small, medium and large businesses with at least 10 employees and at least one Ohio location. Through the forecasting tool, businesses identify the top five critical, difficult-to-fill job needs over the next one, three and five years. The information from the forecast tool is aggregated with current job postings and occupation projections from ODJFS to better align the in-demand jobs with education and training providers and Ohio's workforce development system.

Mike DeWine, Governor
State of Ohio

Kimberly Hall, Director
Ohio Department of Job and Family Services

April 2020