STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MISSOURI CLEAN WATER COMMISSION

CONSTRUCTION PERMIT

The Missouri Department of Natural Resources hereby issues a permit to:

City of Puxico
Attn: Rick McLean, Mayor
PO Box 441
Puxico, MO 63960

for the construction of (described facilities):

See attached.

Permit Conditions:

See attached.

Construction of such proposed facilities shall be in accordance with the provisions of the Missouri Clean Water Law, Chapter 644, RSMo, and regulation promulgated thereunder, or this permit may be revoked by the Department of Natural Resources (Department).

As the Department does not examine structural features of design or the efficiency of mechanical equipment, the issuance of this permit does not include approval of these features.

A representative of the Department may inspect the work covered by this permit during construction. Issuance of a permit to operate by the Department will be contingent on the work substantially adhering to the approved plans and specifications.

This permit applies only to the construction of water pollution control components; it does not apply to other environmentally regulated areas.

September 7, 2018
Effective Date

Edward B. Galbraith, Director, Division of Environmental Quality

September 6, 2020
Expiration Date

Chris Wieberg, Director, Water Protection Program

CONSTRUCTION PERMIT

I. CONSTRUCTION DESCRIPTION

Construction of approximately 260 linear feet of six inch PVC forcemain to reroute the influent to existing Cell #2; dividing this cell into two with a baffle wall and adding a diffused aeration system and installing a floating insulated cover to convert into a LemTec Biological Treatment Process system consisting of a complete mix cell followed by a settling zone, and a polishing reactor; an ultraviolet (UV) disinfection system capable of treating a peak flow of 500,000 gallons per day; valve to shut off the effluent and utilize the lagoon cell for temporary storage in case the UV system is out of service; 3 - 25 horsepower blowers; a v-notch weir; an emergency generator; and necessary valves, piping, and appurtenances to make a complete and usable treatment system.

A closure plan for existing Cells #1 and 3 will need to be submitted to the Southeast Regional Office for review and approval prior to closure activities.

This project will also include general site work appropriate to the scope and purpose of the project and all necessary appurtenances to make a complete and usable wastewater treatment facility.

II. COST ANALYSIS FOR COMPLIANCE

Pursuant to Section 644.145, RSMo, when issuing permits under this chapter that incorporate a new requirement for discharges from publicly owned combined or separate sanitary or storm sewer systems or publicly owned treatment works, or when enforcing provisions of this chapter or the Federal Water Pollution Control Act, 33 U.S.C. 1251 et seq., pertaining to any portion of a publicly owned combined or separate sanitary or storm sewer system or [publicly owned] treatment works, the Department of Natural Resources shall make a "finding of affordability" on the costs to be incurred and the impact of any rate changes on ratepayers upon which to base such permits and decisions, to the extent allowable under this chapter and the Federal Water Pollution Control Act. This process is completed through a cost analysis for compliance. Permits that do not include new requirements may be deemed affordable.

The Department is required to determine "findings of affordability" because the permit applies to a **combined or separate sanitary sewer system for a publically-owned treatment works.**

Cost Analysis for Compliance - The Department has made a reasonable search for empirical data indicating the permit is affordable. The search consisted of a review of Department records that might contain economic data on the community, a review of information provided by the applicant as part of the application, and public comments received in response to public notices of this draft permit. If the empirical cost data was used by the permit writer, this data may consist of median household income, any other ongoing projects that the Department has knowledge, and other demographic financial information that the community provided as contemplated by Section 644. 145.3. See **APPENDIX – COST ANALYSIS FOR COMPLIANCE**.

III. CONSTRUCTION PERMIT CONDITIONS

The permittee is authorized to construct subject to the following conditions:

1. This construction permit does not authorize discharge.

2. All construction shall be in accordance with the plans and specifications submitted by S.H. Smith & Company on February 15, 2018.

3. The Department must be contacted in writing prior to making any changes to the approved plans and specifications that would directly or indirectly have an impact on the capacity, flow, system layout, or reliability of the proposed wastewater treatment facilities or any design parameter that is addressed by 10 CSR 20-8, in accordance with 10 CSR 20-8.110(8).

4. State and federal law does not permit bypassing of raw wastewater, therefore steps must be taken to ensure that raw wastewater does not discharge during construction. If a sanitary sewer overflow or bypass occurs, report the appropriate information to the Department’s Southeast Regional Office per 10 CSR 20-7.015(9)(E)2.

5. The wastewater treatment facility shall be located at least fifty feet (50’) from any dwelling or establishment.

6. The wastewater treatment facility shall be located above the twenty-five (25)-year flood level.

7. Wastewater treatment facility shall not be located within one hundred feet (100'), and preferably three hundred feet (300') of any water well or water supply structure.

8. In addition to the requirements for a construction permit, 10 CSR 20-6.200 requires land disturbance activities of 1 acre or more to obtain a Missouri state operating permit to discharge stormwater. The permit requires best management practices sufficient to control runoff and sedimentation to protect waters of the state. Land disturbance permits will only be obtained by means of the Department's ePermitting system available online at dnr.mo.gov/env/wpp/epermit/help.htm. See dnr.mo.gov/env/wpp/stormwater/sw-land-disturb-permits.htm for more information.

9. A United States (U.S.) Army Corps of Engineers (COE) permit (404) and a Water Quality Certification (401) issued by the Department or permit waiver may be required for the activities described in this permit. This permit is not valid until these requirements are satisfied. If construction activity will disturb any land below the ordinary high water mark of jurisdictional waters of the U.S. then a 404/401 will be required. Since the COE makes determinations on what is jurisdictional, you must contact the COE to determine permitting requirements. You may call the Department's Water Protection Program at 573-751-1300 for more information. See dnr.mo.gov/env/wpp/401/ for more information.

10. A full closure plan shall be submitted to the Department's Southeast Regional Office for review and approval. In accordance with 10 CSR 20-6.010(12), the closure plan must meet the requirements outlined in Standard Conditions Part III of the Missouri State Operating Permit No. MO- 0055158. Closure shall not commence until the submitted closure plan is approved by the Department.

11. Upon completion of construction:

    A. The City of Puxico will become the continuing authority for operation, maintenance, and modernization of these facilities;

    B. Submit an electronic copy of the as builts if the project was not constructed in accordance with previously submitted plans and specifications; and

    C. Submit the enclosed form Statement of Work Completed to the Department in accordance with 10 CSR 20-6.010(5)(D) and request the operating permit modification be issued.

IV. REVIEW SUMMARY

1. CONSTRUCTION PURPOSE

The facility cannot meet the ammonia effluent limitations in the operating permit. The facility also has occasional violations of the BOD_5 effluent limitations. The proposed effluent limitations are expected to be met with the upgraded wastewater treatment system.

2. FACILITY DESCRIPTION

The existing wastewater treatment system is a three-cell aerated lagoon. The first two cells are aerated with a quiescent third cell. The facility had a design flow of 131,000 gallons per day. This upgrade will also expand the design flow of the facility to 175,000 gallons per day.

It is proposed to close the existing first and third cells. The second cell will be converted into a Lemna system by putting in a 30 mils minimum baffle to split this into a 594,660 gallon complete mix cell with 36 – 18 cubic feet per minute diffusers and a 1,665,050 gallon settling zone with 25 – 9 cubic feet per minute diffusers followed by a 7.5 feet by 37.5 feet by 13 feet deep fixed film nitrification reactor containing 5 – 6 feet by 6 feet by 8 feet Lemna polishing reactors and 5 – 9 cubic feet per minute diffusers. The system will be aerated by 3 -25 horsepower blowers – each designed for 459 cubic feet per minute. The lagoon will have a floating modular cover of 2 -40 mil HDPE geomembranes encapsulating insulation to provide heat retention, odor elimination, and prevent algae growth.

Disinfection is the process of removal, deactivation, or killing or pathogenic microorganisms. The open channel, gravity flow, low pressure, high intensity UV disinfection system is capable of treating a peak flow of 700,000 gallons per day while delivering a minimum UV intensity of 30 mJ/cm^2 with an expected ultraviolet transmissivity of 65% or greater. The single channel UV system consists of two modules – each with six lamps. The wastewater treatment facility has a backup generator for emergency operation of the disinfection system. The facility will also maintain spare parts including two lamps, two quartz sleeves, two O-rings, and two wiper rings.

The Puxico WWTF is located at 435 South Highway 51, Puxico, in Stoddard County, Missouri. The upgraded facility has a design average flow of 175,000 gpd and serves a population equivalent of approximately 1750 people.

3. COMPLIANCE PARAMETERS

The final effluent limits the project is required to meet are established in Operating Permit MO-0055158 as:

EFFLUENT PARAMETER(S)	UNITS	FINAL EFFLUENT LIMITATIONS		
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE
Flow	MGD	*		*
Biochemical Oxygen Demand$_5$	mg/L		25	20
Total Suspended Solids	mg/L		25	20
E. coli (Note 1)	#/100mL		1,030	206
Ammonia as N (Apr 1 – Sep 30) (Oct 1 – Mar 31)	mg/L	 4.0 6.7		 1.0 2.1
Oil & Grease	mg/L	15		10

Additionally, the City experiences high inflow and infiltration.

4. ANTIDEGRADATION

The Department has reviewed the antidegradation report for this facility and issued the Water Quality and Antidegradation Review dated June 20, 2018, due to the expansion of the design flow.

5. REVIEW of MAJOR TREATMENT DESIGN CRITERIA

The existing second cell will be divided into a complete mix cell and a settling cell utilizing a baffle wall. This cell will also have a Lemtec Modular Cover System, which provides insulation, odor elimination, and algae control. This cover system is composed of individual casings of closed-cell insulation sealed between two sheets of durable geomembrane.

The complete mix cell will have a surface area of 7,950 square foot at the five foot depth. Utilizing the ten foot operating depth, this provides a volume of 594,660 gallons and a detention time of 3.4 days in the complete mix cell. This cell will have 36 high rate diffusers – each providing 18 scfm.

The settling cell will have a surface area of 22,260 square foot at the five foot depth. Utilizing the ten foot operating depth, this provides a volume of 1,665,050 gallons and a detention time of 9.5 days in the settling cell. This cell will have 25 low rate diffusers – each providing 9 scfm.

The Lemna Nitrification reactor standard cube unit sizing is six feet by six feet by eight foot with a density rate of 68 square feet per cubic foot or a total density of 19,584 square feet per cube. For 175,000 gallons per day, 90,813 square feet of media is recommended. With 19,584 square feet per cube, five cubes are recommended. The cubes will be placed in a 7.5 by 37.5 by 10 feet deep reactor that provides a detention time of 2.9 hours. This reactor will have 5 low rate diffusers – each providing 9 scfm.

The system will be provided with three – 25 horsepower blowers – each designed for a minimum of 459 scfm.

Disinfection – Disinfection is the process of removal, deactivation, or killing or pathogenic microorganisms.

- Open Channel Ultraviolet (UV) – An open channel, gravity flow, low pressure high intensity UV disinfection system capable of treating a peak flow of 700,000 gpd while delivering a minimum UV intensity of 30 mJ/cm^2 with an expected ultraviolet transmissivity of 65% or greater. The single open channel UV system consists of one bank with two modules and six lamps per module. The disinfected effluent will flow by gravity through a v-notch weir and to Outfall No. 001. The facility has a valve to stop flow to the disinfection system to make any necessary repairs.

6. OPERATING PERMIT

Operating permit MO-0055158 will require a modification to reflect the construction activities. The modified Puxico WWTF, MO-0055158, was successfully public noticed from July 27 to August 27, 2018 with no comments received. Submit the Statement of Work Completed to the Department in accordance with 10 CSR 20-6.010(5)(D) and request the operating permit modification be issued.

Keith Forck
Engineering Section
keith.forck@dnr.mo.gov

APPENDIX – COST ANALYSIS FOR COMPLIANCE:

Puxico WWTF, Permit Renewal
City of Puxico
Missouri State Operating Permit #MO-0055158

Section 644.145 RSMo requires the Department of Natural Resources (DNR) to make a "finding of affordability" when "issuing permits under" or "enforcing provisions of" state or federal clean water laws "pertaining to any portion of a combined or separate sanitary sewer system for publicly-owned treatment works."

This cost analysis is based on data available to the Department as provided by the permittee and data obtained from readily available sources. For the most accurate analysis, it is essential that the permittee provides the Department with current information about the City's financial and socioeconomic situation. The financial questionnaire available to permittees on the DNR website (http://dnr.mo.gov/forms/780-2511-f.pdf) should have been submitted with the permit renewal application. If it was not received with the renewal application, the Department sent a request to complete it with the welcome letter.

The Department is required to issue a permit with final effluent limits in accordance with 644.051.1.(1) RSMo, 644.051.1.(2) RSMo, and the Clean Water Act. The practical result of this analysis is to incorporate a compliance schedule into the permit in order to mitigate adverse impact to distressed populations resulting from new costs for the wastewater treatment facility.

Residential Connections:	319
Commercial Connections:	68
Industrial Connections:	0
Total Connections for this facility:	387

New Permit Requirements:

The permit requires compliance with new quarterly monitoring requirements for total nitrogen and total phosphorus.

Anticipated Costs Associated with Complying with the New Requirements:

The following table outlines the estimated costs of the new permit requirements listed above:

New Requirement	Frequency	Estimated Cost	Estimated Annual Costs
Total Phosphorus sampling	Quarterly	$24	$96
Total Nitrogen sampling	Quarterly	$73	$292
		TOTAL	**$388**

This estimated, annual cost, if financed through user fees, might cost each household an extra $0.10[1] per month. A community sets their user rates based on several factors. The percentage of the current user rate that is available to cover new debt is unknown to the Department.

(1) A community's financial capability and ability to raise or secure necessary funding;

The current monthly user rate is $40.42. Due to the minimal cost associated with this new permit requirement, the Department anticipates the City of Puxico has the means to raise $388 annually.

(2) Affordability of pollution control options for the individuals or households at or below the median household income level of the community;

Estimated Costs for New Permit Requirements:

Median Household Income (MHI) for the City of Puxico:	$37,647
Estimated total annual cost:	$388
Estimated monthly cost per household:	$0.10
Estimated monthly cost per household as a percent of MHI[2]:	0.003%
Estimated resulting user rate per household per month:	$40.52
Estimated resulting user rate as a percent of MHI[3]:	1.3%

Due to the minimal cost associated with this new requirement, the Department anticipates an extremely low to no rate increase will be necessary that could impact individuals or households of the community.

(3) An evaluation of the overall costs and environmental benefits of the control technologies;

Metals Limits and Monitoring

Metals dissolve in water and are easily absorbed by fish and other aquatic organisms. Small concentrations can be toxic because metals undergo bioconcentration, which means that their concentration in an organism is higher than in water. Metal toxicity produces adverse biological effects on an organism's survival, activity, growth, metabolism, or reproduction. Metals can be lethal or harm the organism without killing it directly. Adverse effects on an organism's activity, growth, metabolism, and reproduction are examples of sub-lethal effects.

In order for a metal to be toxic, it needs to enter the body of the exposed organism and interact with the surface or interior of cells. The pathways by which this happens includes diffusion into the bloodstream via the gills and skin, as fish become exposed by drinking water or eating sediments contaminated with the metal, or eating other animals or plants that became exposed to the metal. Humans become exposed to metals via analogous pathways: diffusion into the bloodstream via the lungs and skin, drinking contaminated water, and eating contaminated food.

Nutrient Monitoring

Nutrients are mineral compounds that are required for organisms to grow and thrive. Of the six (6) elemental macronutrients, Nitrogen and Phosphorus are generally not readily available and limit growth of organisms. Excess nitrogen and phosphorus will cause a shift in the ecosystem's food web. Once excess nitrogen and phosphorous are introduced into a waterbody, some species' populations will dramatically increase, while other populations will not be able to sustain life. Competition and productivity are two factors in which nutrients can alter aquatic ecosystems and the designated uses of a waterbody. For example, designated uses, such as drinking water sources and recreational uses become impaired when algal blooms take over a waterbody. These blooms can cause foul tastes and odors in the drinking water, unsightly appearance, and fish mortality in the waterbody. Some algae also produce toxins that may cause serious adverse health conditions such as liver damage, tumor promotion, paralysis, and kidney damage. The monitoring requirements for Nitrogen and Phosphorus have been added to the permit to provide data regarding the health of the receiving stream's aquatic life. A healthy ecosystem is beneficial as it provides reduced impacts on human and aquatic health as well as recreational opportunities.

Stormwater Pollution Prevention Plan

Stormwater runoff is water from rain or snowmelt that does not immediately infiltrate into the ground and flows over or through natural or man-made storage or conveyance systems. When undeveloped areas are converted to land uses with impervious surfaces such as buildings, parking lots, and roads, the natural hydrology of the land is altered and can result in increased surface runoff rates, volumes, and pollutant loads. Stormwater runoff picks up industrial pollutants and typically discharges them directly into nearby waterbodies or indirectly via storm sewer systems. Runoff from areas where industrial activities occur can contain toxic pollutants (e.g., heavy metals and organic chemicals) and other pollutants such as trash, debris, and oil and grease, when facility practices allow exposure of industrial materials to stormwater. This increased flow and pollutant load can impair waterbodies, degrade biological habitats, pollute drinking water sources, and cause flooding and hydrologic changes to the receiving water, such as channel erosion. Industrial facilities typically perform a portion of their activities in outdoor areas exposed to the elements. This may include activities such as material storage and handling, vehicle fueling and maintenance, shipping and receiving, and salt storage, all of which can result in pollutants being exposed to precipitation and capable of being carried off in stormwater runoff. Also, facilities may have performed industrial activities outdoors in the past and materials from those activities still remain exposed to precipitation. In addition, accidental spills and leaks, improper waste disposal, and illicit connections to storm sewers may also lead to exposure of pollutants to stormwater.

A SWPPP is a written document that identifies the industrial activities conducted at the site, including any structural control practices, which the industrial facility operator will implement to prevent pollutants from making their way into stormwater runoff. The SWPPP also must include descriptions of other relevant information, such as the physical features of the facility, and procedures for spill prevention, conducting inspections, and training of employees. The SWPPP is intended to be a "living" document, updated as necessary, such that when industrial activities or stormwater control practices are modified or replaced, the SWPPP is similarly revised to reflect these changes.

Whole Effluent Toxicity (WET) test

The WET Test is a quantifiable method of determining if discharge from a facility may be causing toxicity to aquatic life by itself or in combination with receiving stream water. WET tests are required under 10 CSR 20-6.010(8)(A)4 to be performed by specialists properly trained in conducting the test according to 40 CFR 136. This test will help ensure that the existing permit limits are providing adequate protection for aquatic life.

(4) Inclusion of ongoing costs of operating and maintaining the existing wastewater collection and treatment system, including payments on outstanding debts for wastewater collection and treatment systems when calculating projected rates:

The community did not provide the Department with information, nor could it be found through readily available data.

(5) An inclusion of ways to reduce economic impacts on distressed populations in the community, including but not limited to low and fixed income populations. This requirement includes but is not limited to:

(a) Allowing adequate time in implementation schedules to mitigate potential adverse impacts on distressed populations resulting from the costs of the improvements and taking into consideration local community economic considerations.
(b) Allowing for reasonable accommodations for regulated entities when inflexible standards and fines would impose a disproportionate financial hardship in light of the environmental benefits to be gained.

Socioeconomic Data[4-9]: The following table characterizes the current overall socioeconomic condition of the community as compared to the overall socioeconomic condition of the State of Missouri. The following information was compiled using the latest U.S. Census data.

No.	Administrative Unit	Puxico City	Missouri State
1	Population (2016)	880	6,059,651
2	Percent Change in Population (2000-2016)	-23.1%	8.3%
3	2016 Median Household Income (in 2017 Dollars)	$37,647	$50,417
4	Percent Change in Median Household Income (2000-2016)	27.5%	-5.9%
5	Median Age (2016)	41.8	38.3
6	Change in Median Age in Years (2000-2016)	10.9	2.2
7	Unemployment Rate (2016)	8.8%	6.6%
8	Percent of Population Below Poverty Level (2016)	20.2%	15.3%
9	Percent of Household Received Food Stamps (2016)	27.6%	13.0%
10	(Primary) County Where the Community Is Located	Stoddard County	

An assessment of other community investments and operating costs relating to environmental improvements and public health protection;

The community did not report any other investments relating to environmental improvements.

(6) An assessment of factors set forth in the United States Environmental Protection Agency's guidance, including but not limited to the "Combined Sewer Overflow Guidance for Financial Capability Assessment and Schedule Development" that may ease the cost burdens of implementing wet weather control plans, including but not limited to small system considerations, the attainability of water quality standards, and the development of wet weather standards;

The new sampling requirements associated with this permit will not impose a financial burden on the community, nor will the new requirements require the City of Puxico to seek funding from an outside source.

(7) An assessment of any other relevant local community economic condition.

The community did not report any other relevant local economic conditions.

The Department contracted with Wichita State University to complete an assessment tool that would allow for predictions on rural Missouri community populations and future sustainability. The purpose of the study is to use a statistical modeling analysis in order to determine factors associated with each rural Missouri community that would predict the future population changes that could occur in each community. A stepwise regression model was applied to 19 factors which were determined as predictors of rural population change in Missouri. The model established a hierarchy of the predicting factors which allowed the model to place a weighted value on each of the factors. A total of 745 rural towns and villages in Missouri received a weighted value for each of the predicting factors. The weighted values for each town / village were then added together to determine an overall decision score. The overall decision scores were then divided into five categories and each town was assigned to a different categorical group based on the overall decision score.

The categorical groups were developed from the range of overall scores across all rural towns and villages within Missouri. The range covers 1,191 score points (-245 to 946).

Based on the assessment tool, the City of Puxico has been determined as a category (1) community. This means that the City of Puxico could potentially face more challenging socioeconomic circumstances over time and may have significant declines in population in the future. If your community experiences a decline in population which results in the inability to secure the necessary funding to meet the new requirements within this permit, please contact the Department.

Conclusion and Finding

As a result of new regulations, the Department is proposing modifications to the current operating permit that may require the permittee to increase monitoring. The Department identified the actions for which cost analysis for compliance is required under Section 644.145 RSMo.

The Department estimates the cost for quarterly nitrogen and phosphorus monitoring is $388 per year. Should these additional costs be financed through user fees, it may require an increase in user fees 0.003% of the community's MHI.

The Department considered the eight (8) criteria presented in subsection 644.145, RSMo when evaluating the cost associated with the relevant actions. Taking into consideration these criteria, this analysis examined whether the above referenced permit modifications affects the ability of an individual customer or household to pay a utility bill without undue hardship or unreasonable sacrifice in the essential lifestyle or spending patterns of the individual or household. As a result of reviewing the above criteria, the Department hereby finds that the action described above may result in a low burden with regard to the community's overall financial capability and a low financial impact for most individual customers/households; therefore, the new permit requirements are affordable.

References:

1. (($388/319)/12 months) =$0.10
2. ($0.10/($37,647/12))*100% = 0.003%
3. ($40.52/($37,647/12))*100% = 1.3%
4. (A) 2016 MHI in 2016 Dollar: United States Census Bureau. 2012-2016 American Community Survey 5-Year Estimates, Table B19013: Median Household Income in the Past 12 Months (in 2016 Inflation-Adjusted Dollars). http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_5YR_B19013&prodType=table.
   (B) 2000 MHI in 1999 Dollar: U.S. Census Bureau (2002) 2000 Census of Population and Housing, Summary Population and Housing Characteristics, PHC-1-27, Missouri, Table 2. Age and Sex: 2000, Washington, DC. http://www.census.gov/prod/cen2000/phc-2-27-pt1.pdf.
   (C) 2017 CPI, 2016 CPI and 1999 CPI: For United States, United States Bureau of Labor Statistics (2017) Consumer Price Index - All Urban Consumers, United States City Average. All Items. 1982-84=100. http://data.bls.gov/timeseries/CUUR0000SA0?data_tool=Xgtable. For Missouri State: United States Bureau of Labor Statistics (2017) Consumer Price Index - All Urban Consumers, Midwest Urban Areas, All Items. 1982-84=100. http://data.bls.gov/timeseries/CUUR0200SA0?data_tool=Xgtable.
   (D) 2016 MHI in 2017 Dollar: 2016 MHI in 2016 Dollar x 2017 CPI /2016 CPI; 2000 MHI in 2017 Dollar: 2000 MHI in 1999 Dollar x 2017 CPI /1999 CPI.
   (E) Percent Change in Median Household Income (2000-2016) = (2016 MHI in 2017 Dollar - 2000 MHI in 2017 Dollar) / (2000 MHI in 2017 Dollar).
5. (A) Total Population in 2016: United States Census Bureau. 2012-2016 American Community Survey 5-Year Estimates, Table B01003: Total Population - Universe: Total Population. http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_5YR_B01003&prodType=table.
   (B) Total Population in 2000: U.S. Census Bureau (2002) 2000 Census of Population and Housing, Summary Population and Housing Characteristics, PHC-1-27, Missouri, Table 2. Age and Sex: 2000, Washington, DC. http://www.census.gov/prod/cen2000/phc-2-27-pt1.pdf.

(C) Percent Change in Population (2000-2016) = (Total Population in 2016 - Total Population in 2000) / (Total Population in 2000).

6. (A) Median Age in 2016: United States Census Bureau. 2012-2016 American Community Survey 5-Year Estimates, Table B01002: Median Age by Sex - Universe: Total population. http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_5YR_B01002&prodType=table.
   (B) Median Age in 2000: For United States, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-1-1 Part 1. United States Summary, Table 1. Age and Sex: 2000, Washington, DC., Page 2. https://www.census.gov/prod/cen2000/phc-1-1-pt1.pdf. For Missouri State, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Population and Housing Characteristics, PHC-1-27, Missouri, Table 2. Age and Sex: 2000, Washington, DC., Pages 64-92. http://www.census.gov/prod/cen2000/phc-2-27-pt1.pdf.
   (C) Change in Median Age in Years (2000-2016) = (Median Age in 2016 - Median Age in 2000).
7. United States Census Bureau. 2012-2016 American Community Survey 5-Year Estimates, B23025: Employment Status for the Population 16 Years and Over - Universe: Population 16 years and Over. http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_5YR_B23025&prodType=table.
8. United States Census Bureau. 2012-2016 American Community Survey 5-Year Estimates, Table S1701: Poverty Status in the Past 12 Months. http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_5YR_S1701&prodType=table.
9. United States Census Bureau. 2012-2016 American Community Survey 5-Year Estimates, Table B22003: Receipt of Food Stamps/SNAP in the Past 12 Months by Poverty Status in the Past 12 Months for Households - Universe: Households. http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_5YR_B22003&prodType=table.