

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES
MISSOURI CLEAN WATER COMMISSION



CONSTRUCTION PERMIT

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

The Honorable Dennis L. Knipp
Mayor of the City of Pilot Grove
213 College Street
Pilot Grove, MO 65276

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.

October 12, 2022
Effective Date

October 13, 2024
Expiration Date

A handwritten signature in black ink that reads "Chris Wieberg".
Chris Wieberg, Director, Water Protection Program

CONSTRUCTION PERMIT

I. CONSTRUCTION DESCRIPTION

The City of Pilot Grove operates two sewage treatment facilities. Both facilities are aerated lagoons followed by lagoon bottom sand filters. The East facility has a permitted design flow of 60,000 gpd and the West is 40,000 gpd. The proposal is to decommission the West facility and redirect its flow to the East facility. The design flow to the East plant will increase to 98,000 gpd. The East lagoon and bottom sand filter will be replaced by a Moving Bed Bioreactor with UV disinfection. The discharge location, to a tributary of Petite Saline Creek, will remain but in a slightly different location on the same stream segment.

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 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.

- ✓ The Department is required to make a “finding of affordability” on the new environmental requirement(s) within the permit; however, due to no costs associated with the new requirement(s) the Department has determined the permit to be affordable based on the eight requirements listed in Section 644.145.4, RSMo. The previous permit for this facility included a finding of affordability which resulted in a schedule of compliance to meet ammonia and E. Coli effluent limits. The seasonal ammonia limits from the 2019

renewal were recalculated as quarterly limits. This modification reflects the implementation of that schedule (see Appendix).

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 consistent with plans and specifications signed and sealed by Refaat Mefrakis, P.E., with MECO Engineering Co, Inc., and as described in this permit.
3. The Department must be contacted in writing prior to making any changes to the 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(11).
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 Northeast Regional Office per 10 CSR 20-7.015(9)(G).
5. The wastewater treatment facility shall be located at least fifty feet (50') from any dwelling or establishment. 10 CSR 20-8.140(C)(2)
6. The wastewater treatment facility shall be located above the twenty-five (25)-year flood level.
7. The wastewater facility structures, electrical equipment, and mechanical equipment shall be protected from physical damage by not less than the one hundred- (100-) year flood elevation per 10 CSR 20-8.140(2)(B). The minimum distance between wastewater treatment facilities and all potable water sources shall be at least three hundred feet (300') per 10 CSR 20-8.140(2)(C)1.
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 <https://dnr.mo.gov/data-e-services/missouri-gateway-environmental-management-mogem>. See <https://dnr.mo.gov/data-e-services/water/electronic-permitting-epermitting> for more information.
9. A United States Army Corps of Engineers (USACE) Clean Water Act Section 404 Department of the Army permit and a Section 401 Water Quality Certification issued by the Department may be required for the activities described in this permit. This permit is

not valid until these requirements are satisfied or notification is provided that no Section 404 permit is required by the USACE. You must contact your local USACE district since they determine what waters are jurisdictional and which permitting requirements may apply. You may call the Department's Water Protection Program, Operating Permits Section at 573-522-4502 for more information. See <https://dnr.mo.gov/water/business-industry-other-entities/permits-certification-engineering-fees/section-401-water-quality> for more information.

10. All construction must adhere to applicable 10 CSR 20-8 (Chapter 8) requirements listed below.

- Unless another distance is determined by the Missouri Geological Survey or by the department's Public Drinking Water Branch, the minimum distance between wastewater treatment facilities and all potable water sources shall be at least three hundred feet (300'). 10 CSR 20-8.140 (2) (C) 1.
- Facilities shall be readily accessible by authorized personnel from a public right-of-way at all times. 10 CSR 20-8.140 (2) (D)
- The outfall shall be so constructed and protected against the effects of flood water, ice, or other hazards as to reasonably ensure its structural stability and freedom from stoppage. 10 CSR 20-8.140 (6) (A)
- All sampling points shall be designed so that a representative and discrete twenty-four (24) hour automatic composite sample or grab sample of the effluent discharge can be obtained at a point after the final treatment process and before discharge to or mixing with the receiving waters. 10 CSR 20-8.140 (6) (B)
- All outfalls shall be posted with a permanent sign indicating the outfall number (i.e., Outfall #001). 10 CSR 20-8.140 (6) (C)
- All wastewater treatment facilities shall be provided with an alternate source of electric power or pumping capability to allow continuity of operation during power failures. 10 CSR 20-8.140 (7) (A) 1.
- Electrical systems and components in raw wastewater or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors that are normally present, shall comply with the NFPA 70 *National Electric Code (NEC)* (2017 Edition), as approved and published August 24, 2016, requirements for Class I, Division 1, Group D locations. 10 CSR 20-8.140 (7) (B)
- An audiovisual alarm or a more advanced alert system, with a self-contained power supply, capable of monitoring the condition of equipment whose failure could result in a violation of the operating permit, shall be provided for all wastewater treatment facilities. 10 CSR 20-8.140 (7) (C)
- No piping or other connections shall exist in any part of the wastewater treatment facility that might cause the contamination of a potable water supply. 10 CSR 20-8.140 (7) (D) 1.
- A means of flow measurement shall be provided at all wastewater treatment facilities. 10 CSR 20-8.140 (7) (E)
- Effluent twenty-four (24) hour composite automatic sampling equipment shall be provided at all mechanical wastewater treatment facilities and at other facilities where necessary under provisions of the operating permit. 10 CSR 20-8.140 (7) (F)

- Adequate provisions shall be made to effectively protect facility personnel and visitors from hazards. The following shall be provided to fulfill the particular needs of each wastewater treatment facility:
 - Fencing. Enclose the facility site with a fence designed to discourage the entrance of unauthorized persons and animals; 10 CSR 20-8.140 (8) (A)
 - Gratings over appropriate areas of treatment units where access for maintenance is necessary; 10 CSR 20-8.140 (8) (B)
 - First aid equipment; 10 CSR 20-8.140 (8) (C)
 - Posted “No Smoking” signs in hazardous areas; 10 CSR 20-8.140 (8) (D)
 - Appropriate personal protective equipment (PPE); 10 CSR 20-8.140 (8) (E)
 - Portable blower and hose sufficient to ventilate accessed confined spaces; 10 CSR 20-8.140 (8) (F)
 - 10 CSR 20-8.140 (8) (G) Portable lighting equipment complying with NEC requirements. See subsection (7)(B) of this rule;
 - 10 CSR 20-8.140 (8) (H) Gas detectors listed and labeled for use in NEC Class I, Division 1, Group D locations. See subsection (7)(B) of this rule;
 - Appropriately-placed warning signs for slippery areas, non-potable water fixtures (see subparagraph (7)(D)3.B. of this rule), low head clearance areas, open service manholes, hazardous chemical storage areas, flammable fuel storage areas, high noise areas, etc.; 10 CSR 20-8.140 (8) (I)
 - Provisions for local lockout/tagout on stop motor controls and other devices; 10 CSR 20-8.140 (8) (L)
 - Provisions for an arc flash hazard analysis and determination of the flash protection boundary distance and type of PPE to reduce exposure to major electrical hazards shall be in accordance with NFPA 70E Standard for Electrical Safety in the Workplace (2018 Edition), as approved and published August 21, 2017. 10 CSR 20-8.140 (8) (M)

- Where two (2) or more mechanically cleaned bar screens are used, the design shall provide for taking the largest unit out-of-service without sacrificing the capability to handle the average design flow. Where only one mechanically cleaned screen is used, it shall be sized to handle the design peak instantaneous flow. 10 CSR 20-8.150 (4) (B)

- Provisions for location and safety of comminutors shall be in accordance with screening devices,
 - Manually cleaned channels shall be protected by guard railings and deck gratings with adequate provisions for removal or opening to facilitate raking. 10 CSR 20-8.150 (4) (A) 3. A. (I)
 - Mechanically cleaned channels shall be protected by guard railings and deck gratings. 10 CSR 20-8.150 (4) (A) 3. A. (II)
 - Mechanical equipment shall have adequate removal enclosures to protect facility personnel against accidental contact with moving parts and to prevent dripping in multi-level installations. 10 CSR 20-8.150 (4) (A) 3. B. (I)
 - A positive means of locking out each mechanical device shall be provided. 10 CSR 20-8.150 (4) (A) 3. B. (II)
 - An emergency stop button with an automatic reverse function shall be located in close proximity to the mechanical device. 10 CSR 20-8.150 (4) (A) 3. B. (III)

- Electrical systems and components in raw wastewater or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors that are normally present, shall comply with the NFPA 70 National Electric Code (NEC) (2017 Edition), as approved and published August 24, 2016, requirements for Class I, Division 1, Group D locations. 10 CSR 20-8.140 (7) (B)
- Effective flow splitting devices and control appurtenances (*e.g.* gates and splitter boxes) shall be provided to permit proper proportioning of flow and solids loading to each settling unit, throughout the expected range of flows. 10 CSR 20-8.160 (2) (B)
- Overflow weirs shall be readily adjustable over the life of the structure to correct for differential settlement of the tank. 10 CSR 20-8.160 (3) (C) 1.
- Walls of settling tanks shall extend at least six inches (6") above the surrounding ground surface and shall provide not less than twelve inches (12") of freeboard. 10 CSR 20-8.160 (3) (E)
- Safety features shall appropriately include machinery covers, life lines, handrails on all stairways and walkways, and slip resistant surfaces. For additional safety follow the provisions listed in 10 CSR 20-8.140(8). 10 CSR 20-8.160 (5) (A)
- The design shall provide for convenient and safe access to routine maintenance items such as gear boxes, scum removal mechanism, baffles, weirs, inlet stilling baffle areas, and effluent channels. 10 CSR 20-8.160 (5) (B)
- For electrical equipment, fixtures, and controls in enclosed settling basins and scum tanks, where hazardous concentrations of flammable gases or vapors may accumulate, follow the provisions in 10 CSR 20-8.140(7)(B). The fixtures and controls shall be conveniently located and safely accessible for operation and maintenance. 10 CSR 20-8.160 (5) (C)
- Moving Bed Bioreactor (MBBR). A MBBR secondary treatment system shall provide upstream preliminary treatment units capable of—
 - Screening to reduce pass-through and suspended solids; 10 CSR 20-8.180 (8)(A)
 - Grit removal; 10 CSR 20-8.180 (8)(B) and
 - Oil and grease removal. 10 CSR 20-8.180 (8)(C)
- The UV dosage shall be based on the design peak hourly flow, maximum rate of pumpage, or peak batch flow. 10 CSR 20-8.190 (5) (A) 1.
- If no flow equalization is provided for a batch discharger, the UV dosage shall be based on the peak batch flow. 10 CSR 20-8.190 (5) (A) 2.
- The UV system shall deliver the target dosage based on equipment derating factors and, if needed, have the UV equipment manufacturer verify that the scale up or scale down factor utilized in the design is appropriate for the specific application under consideration. 10 CSR 20-8.190 (5) (A) 3.
- The UV system shall deliver a minimum UV dosage of thirty thousand microwatt seconds per centimeters squared (30,000 $\mu\text{W} \cdot \text{s}/\text{cm}^2$). 10 CSR 20-8.190 (5) (A) 4.

- Open channel UV systems. The combination of the total number of banks shall be capable of treating the design peak hourly flow, maximum rate of pumpage, or peak batch flow. 10 CSR 20-8.190 (5) (B) 1.
- The UV system must continuously monitor and display at the UV system control panel the following minimum conditions:
 - The relative intensity of each bank; 10 CSR 20-8.190 (5) (C) 1. A.
 - The operational status and condition of each bank; 10 CSR 20-8.190 (5) (C) 1. B.
 - The ON/OFF status of each lamp in the system; 10 CSR 20-8.190 (5) (C) 1. C.
and
 - The total number of operating hours of each bank. 10 CSR 20-8.190 (5) (C) 1. D.
- The UV system shall include an alarm system. Alarm systems shall comply with 10 CSR 20-8.140(7)(C). 10 CSR 20-8.190 (5) (C) 2.

11. Upon completion of construction:

- A. The City of Pilot Grove will become the continuing authority for operation and maintenance of these facilities;
- B. Submit an electronic copy of the as built's 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)(N). When the facility applies for their next operating permit renewal, they will be expected to include an updated facility description on their application.

IV. REVIEW SUMMARY

1. CONSTRUCTION PURPOSE

The Pilot Grove East Treatment facility will undergo a major renovation with Moving Bed Bioreactor replacing the lagoons and increased flow from the discontinued West facility. Disinfection will be by ultraviolet irradiation. The existing sand filters will be removed and one sand filter converted to new sludge storage lagoon. The existing lagoon will be converted into wet weather flow equalization basin.

2. FACILITY DESCRIPTION

The City of Pilot Grove operates two sewage treatment facilities. Both facilities are aerated lagoons followed by lagoon bottom sand filters. The East facility has a permitted design flow of 60,000 gpd and the West is 40,000 gpd. The proposal is to decommission the West facility and redirect its flow to the East facility. The design flow to the East plant will increase to 98,000 gpd. The East lagoon and bottom sand filter will be replaced by a Moving Bed Bioreactor. The discharge location, to a tributary of Petite Saline Creek, will remain but in a slightly different location on the same stream segment.

This construction will involve removing or repurposing the lagoons and installing a moving bed bioreactor with UV disinfection.

The Pilot Grove East WWTF is located at 8296 Belair Road, Pilot Grove, in Cooper County, Missouri. The facility will have a design average flow of 98,000 gpd and serves a population equivalent of approximately 700 people.

3. COMPLIANCE PARAMETERS

The proposed project is required to meet final ammonia limits of as established in Operating Permit MO-0093076.

4. ANTIDegradation

The Department has reviewed the antidegradation report for this facility and issued the Water Quality and Antidegradation Review dated May 2022.

5. REVIEW of MAJOR TREATMENT DESIGN CRITERIA

- Flow Equalization – The existing lagoon will be converted into a flow equalization chamber.
- Manual Coarse Bar Screen – The manual coarse bar screen will have clear bar spacings of 1 inch and be positioned at an angle of 45 degrees from the horizontal to allow for manual raking of the screen.
- Moving Bed Biofilm Reactor (MBBR) – Installation of two MBBR capable of treating a design average flow of 98,000 gpd and a peak flow of 300,000 gpd. Each MBBR has a BOD removal reactor that is 12' x 8' x 12' with 10' sidewater depth for a volume of 7,181 gallons and two nitrification reactors that are 7' x 8' x 12' with 10' sidewater depth for a volume of 4,189 gallons. The hydraulic retention time at design flow is 6 hours. The BOD removal reactors will be filled approximately 42% and the nitrification reactors 28% with high surface area media. Aeration is by means of two positive displacement blowers capable of supplying 270 scfm to the medium bubble drop diffusers. The effluent from the MBBR will flow by gravity to the clarifier.
- Final Clarifier – The final clarifier will have a settling volume of 7,330 gallons and a detention time of 2 hours. A surface skimmer is provided to remove grease and floatables. An adjustable v-notch weir provides 75 lf of skimming surface. The clarified effluent will flow by gravity to the disinfection system.
- Sludge Storage Basin – The existing sand filter to the east will be converted to a sludge digestion basin. The dimensions will remain the same. Total depth is 7 ft. The area at water elevation is approximately 5,900 ft² and the depth at this elevation will be 5 ft. The contractor will be responsible for removing

and disposing of the sand filter media and embankment material, as indicated on revised Sheet 9 of the plans.

A synthetic liner will be installed in the sludge storage basin. It will be a 0.75 mm (30 mil) or greater high density polyethylene (HDPE) geomembrane and have a density of 0.932 g/ml or higher [10 CSR 20-8.200(4)(C)3].

- Open Channel Ultraviolet (UV) – An open channel, gravity flow, low pressure high intensity UV disinfection system capable of treating a peak flow of 98,000 gpd while delivering a minimum UV intensity of 30 mJ/cm² with an expected ultraviolet transmissivity of 65% or greater. The single open channel UV system consists of two banks in series with 1 module per bank and 4 lamps per module. The disinfected effluent will flow by gravity through flow measurement equipment and to Outfall No. 001.

6. OPERATING PERMIT

Operating permit MO-0093076 will require a modification to reflect the construction activities. The modified operating permit was public noticed from July 15 to August 14, 2022. Submit the Statement of Work Completed to the Department in accordance with 10 CSR 20-6.010(5)(N) and request the operating permit modification be issued.

V. NOTICE OF RIGHT TO APPEAL

If you were adversely affected by this decision, you may be entitled to an appeal before the Administrative Hearing Commission (AHC) pursuant to Section 621.250 RSMo. To appeal, you must file a petition with the AHC within 30 days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC. Any appeal should be directed to:

Administrative Hearing Commission
U.S. Post Office Building, Third Floor
131 West High Street, P.O. Box 1557
Jefferson City, MO 65102-1557
Phone: 573-751-2422
Fax: 573-751-5018
Website: <https://ahc.mo.gov>

Bern Johnson, Associate Engineer
Engineering Section
bern.johnson@dnr.mo.gov

Chia-Wei Young, P.E.
Engineering Section
chiawei.young@dnr.mo.gov

APPENDIX – COST ANALYSIS FOR COMPLIANCE:

**Missouri Department of Natural Resources Water Protection Program
Cost Analysis for Compliance
(In accordance with RSMo 644.145)**

**Pilot Grove East Wastewater Treatment Facility, Permit Renewal City of Pilot Grove
Missouri State Operating Permit #MO-0093076**

Section 644.145 RSMo requires the Department of Natural Resources (Department) 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 does not dictate that the permittee will upgrade their facility, or how the permittee will comply with new permit requirements. The results of this analysis are used to determine an adequate compliance schedule for the permit that may mitigate the financial burden of new permit requirements.

New Permit Requirements

The permit requires compliance with new effluent limitations for *E. coli* which may require the design, construction, and operation of a different treatment technology. Additionally, the previous permit’s affordability analysis for compliance with Ammonia limits is being reevaluated in this analysis. The cost assumptions in this analysis anticipate complete replacement of the existing treatment facility. For this analysis, the Department has selected the mechanical treatment technology that could be the most practical solution to meet the new requirements for the community as well as cost estimates to convert the facility into a no-discharge land application system.

Flow and Connections

The size of the facility evaluated for upgrades was chosen based on the permitted design flow. If significant population growth is expected in the community, or if a significant portion of the flow is due to inflow and infiltration, then the flows and resulting estimated costs used in a facility plan prepared by a consulting engineer may differ. The number of connections was reported by the permittee on the Financial Questionnaire.

Flow Evaluated: 98,000 gallons per day		
Connection Type	Total City of Pilot Grove Connections	Pilot Grove East Connections
Residential and Commercial	279*	190

*Costs are divided amongst the City of Pilot Grove; therefore, the total number of connections were used in this analysis.

Data Collection for this Analysis

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 Department’s website (<http://dnr.mo.gov/forms/780-2511-f.pdf>) is a required attachment to the permit renewal application. If the financial questionnaire is not submitted with the renewal application, the Department sends a request to complete the form with the welcome correspondence. If certain data was not provided by the permittee to the Department and the data is not obtainable through readily available sources, this analysis will state that the information is “unknown”.

Eight Criteria of 644.145 RSMo

The Department must consider the eight (8) criteria presented in subsection 644.145 RSMo to evaluate the cost associated with newpermit requirements.

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

Criterion 1 Table. Current Financial Information for the City of Pilot Grove	
Current Monthly User Rates per 5,000 gallons*	\$58.75
Municipal Bond Rating (if applicable)	Unknown
Bonding Capacity**	Unknown
Median Household Income (MHI) ¹	\$39,105
Current Annual Operating Costs (excludes depreciation)	\$12,220
Current Outstanding Debt for the Facility	\$0
Amount within the Current User Rate Used toward Payments on Outstanding Debt Related to the Current Wastewater Infrastructure	\$0

* User Rates were reported by the permittee on the Financial Questionnaire

** General Obligation Bond capacity allowed by constitution: Cities = up to 20% of taxable tangible property; Sewer districts or villages = up to 5% of taxable tangible property

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

The cost estimates located within this document are for the construction of a brand new treatment facility or system that is the most practical to facilitate compliance with new permit requirements.

Cost Estimate Assumptions:

- Total Present Worth includes a five percent interest rate to construct and perform annual operation and maintenance of the new treatment plant over the term of the loan, which is 20 years for the mechanical plant option and 30 years for the land applicationoption.
- Capital Cost includes design, construction, inspection, and contingency costs from CapdetWorks.
- Operation and maintenance (O&M) includes operations, maintenance, materials, chemical, and electrical costs for the facility on an annual basis. It includes items that are expected to be replaced during operations, such as pumps and is estimated between 15%and 45% of the user rate.
- Estimated user costs per 5,000 gallons per month are calculated using equations that account for debt retirement and annualizedoperation and maintenance costs over the life of the treatment facility. Estimated user costs are not added to the community’s current user rate because they estimate total replacement of the facility.

Mechanical Plant Pollution Control Option Cost Estimates:

For the mechanical plant option, the Department has utilized costs for a MBBR which were submitted via a facility plan. Treatment technologies were selected that meet the following monthly average effluent limits:

- Total Ammonia Nitrogen of 0.6 mg/L
- Biochemical Oxygen Demand (BOD₅) of 18 mg/L
- Total Suspended Solids (TSS) of 18 mg/L

Sludge handling and sludge treatment are included in the capital, operations, maintenance, and present worth cost estimations. Newsampling costs are also included in the following cost estimations.

Criterion 2A Table. Estimated Costs for Mechanical Plant Pollution Control Option		
(1)	Estimated Total Present Worth	\$3,101,719
	Estimated Capital Cost*	\$1,915,000
	Estimated Annual Cost of Operation and Maintenance	\$53,232
	Estimated Annual Cost of New Sampling Requirements	\$87
	Estimated Monthly User Cost	\$41.58
(2)	Current Monthly Debt Retirement Amount Per User	\$0
(3)	Total Monthly User Cost	\$41.58
	Total Monthly User Cost as a Percent of Median Household Income ²	1.28%

* Capital costs listed takes into consideration partial grant funding associated with the project.

Land Application Pollution Control Option Cost Estimates:

Costs are estimated for the land application option as a range. The cost estimate on the low end of the range assumes that the community will not have to construct or purchase additional land for a new storage basin. The cost estimate on the high end of the range assumes the purchase of additional land and the construction of a new storage basin. Four regions divided by highways have been established to estimate the minimum storage time required and the amount of land necessary for land application within Missouri. The cost of land has been estimated based on county averages. The regions are north of Highway 36, between Highways 36 and 50, between Highways 50 and 60, and south of Highway 60. For communities that are divided by highways, the region selected is where the majority of the county resides. More or less land may be required than what was estimated based on site-specific considerations such as streams, sinkholes, severe slopes, or roads. A no-discharge facility, of which land application is the most common form, is required to be demonstrated as infeasible before a discharging system may be constructed per 10 CSR 20- 6.010(4)(A)5.B. Where land is available, land application should be considered as a pollution control option because of the lower cost associated with construction and O&M over a longer term. Also, a no-discharge system ensures lessened regulatory impact as a result of changes made to water quality standards.

New sampling costs are also included in the following cost estimations. If the community decides to install a land application system, the new sampling requirements will only be permitted until the facility completes upgrades, which would eliminate the discharge.

Criterion 2B Table. Estimated Costs for Land Application Pollution Control Option		
(1)	Land Required	42.3 acres to 46.5 acres
	Estimated Total Present Worth	\$1,681,087 - \$1,997,117
	Estimated Capital Cost	\$1,109,693 - \$1,225,235
	Estimated Annual Cost of Operation and Maintenance	\$37,170 - \$50,212
	Estimated Annual Cost of New Sampling Requirements	\$87
	Estimated Monthly User Cost*	\$32.69 - \$38.83
(2)	Current Monthly Debt Retirement Amount Per User	\$0
(3)	Total Monthly User Cost	\$32.69 - \$38.83
	Total Monthly User Cost as a Percent of Median Household Income ³	1.00% - %1.19

*The estimated user rate of \$32.69 - \$38.83 is lower than the current user rate of \$58.75. The current user rate of \$58.75 will be used to complete this analysis as it is unlikely that the user rate will decrease after upgrading the facility.

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

An investment in wastewater treatment will provide several social, environmental, and economic benefits. Improved wastewater provides benefits such as avoided health costs due to water-related illness, enhanced environmental ecosystem quality, and improved natural resources. The preservation of natural resources has been proven to increase the economic value and sustainability of the surrounding communities. Maintaining Missouri's water quality standards fulfills the goal of restoring and maintaining the chemical, physical, and biological integrity of the receiving stream; and, where attainable, it achieves a level of water quality that provides for the protection and propagation of fish, shellfish, wildlife, and recreation in and on the water.

Total Ammonia Nitrogen Treatment

Ammonia can be toxic to aquatic life. Fish may suffer a loss of equilibrium, hyperexcitability, increased respiratory activity and oxygen uptake, and increased heart rate. At extreme ammonia levels, fish may experience convulsions, coma, and death. Native fish and other native aquatic life are extremely important to Missouri's ecosystem. They contribute essential nutrients to the streams, rivers, lakes, pond other waters in which they inhabit. Freshwater ecosystems are important for human survival, in that it provides a majority of people's drinking water. Also, a pristine freshwater ecosystem with an abundance of aquatic life can increase the community's overall income of revenue. Revenue to businesses and sales tax revenue is increased as the natural amenity will attract fisherman and tourism to the area. Fish and other aquatic life also provide a source of low cost sustenance for the people within the surrounding communities. Final water quality-based effluent limits for total ammonia nitrogen is a requirement of this permit. A schedule of compliance is given with the final limits so that the permittee has time to secure funding and update their treatment plant, if necessary. Further information can be found in the Water Protection Program fact sheet titled "Changes to the Water Quality Standard for Ammonia" at <http://dnr.mo.gov/pubs/pub2481.htm>.

The construction and installation of land application is another option that has been evaluated within this document. The Missouri State Operating Permit for a land application system does not contain discharge effluent limits as there is no potential to cause an excursion of water quality standards. Therefore, a land application system is of value to the permittee when considering costs associated with O&M, and future regulatory changes.

Disinfection

E. coli is a species of bacteria that normally live in the intestines of humans and warm-blooded animals. While some strains of *E. coli* are harmless, there are several strains that can cause severe diarrhea, abdominal cramps, and severe kidney failure. The people most susceptible to these consequences are young children, the elderly, and those with weakened immune systems. The receiving stream that this facility discharges to contains the WBC-B designated use to protect human health in accordance with Water Quality Standards (10 CSR 20-7.031) and the Clean Water Act. The disinfection of wastewater effluent benefits human health by reducing exposure to disease-causing bacteria, such as *E. coli*, and viruses and reducing health care costs to those infected by contaminated water. The construction and installation of a disinfection system at the treatment facility will protect human health as well as meet water quality standards.

(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 has reported that they have no outstanding debt for the current wastewater collection and treatment systems.

(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.
 - A schedule of compliance will be provided based on the results of this cost analysis. The schedule

of compliance is provided to ensure that the entity has time to reasonably plan for compliance with the new permit requirements. The time provided ensures the entity has time to hire an engineer, develop facility plans, hold community meetings, seek an appropriate funding source, and construct the facility. This analysis has determined the community may endure a medium financial burden; therefore, a longer schedule of compliance has been established to allow for the permittee to adequately plan toward compliance. If it is determined by the permittee that a longer schedule of compliance is necessary due to financial reasons, please contact the Department and request modification of the compliance schedule.

- An integrated plan may be an appropriate option if the community needs to meet other environmental obligations as well as the new requirements within this permit. The integrated plan needs to be well thought out with specific timeframes built into the management plan in which the municipality can reasonably commit. The plan should be designed to allow the municipality to meet Clean Water Act obligations by maximizing infrastructure improvement dollars through the appropriate sequencing of work. For further information on how to develop an integrated plan, please see the Department publication, “Missouri Integrated Planning Framework,” at <http://dnr.mo.gov/pubs/pub2684.htm>.
- If the permittee can demonstrate that the proposed pollution controls result in substantial and widespread economic and social impact, they may use Factor 6 of the Use Attainability Analysis (UAA) 40 CFR 131.10(g)(6) in the form of a variance. This process is completed by determining the treatment type with the highest attainable effluent quality that would not result in a socio-economic hardship. For more information on variance requests, please visit the Department’s water quality standards webpage at <https://dnr.mo.gov/env/wpp/permits/wqs-variances.htm>.

The following table characterizes the current overall socioeconomic condition of the community as compared to the overall socioeconomic condition of Missouri. The following information was compiled using the latest U.S. Census data.

Criterion 5 Table. Socioeconomic Data ^{1, 4-8} for the City of Pilot Grove

No.	Administrative Unit	Pilot Grove City	Missouri State
1	Population (2017)	656	6,075,300
2	Percent Change in Population (2000-2017)	-9.3%	8.6%
3	2017 Median Household Income (in 2018 Dollars)	\$39,105	\$52,801
4	Percent Change in Median Household Income (2000-2017)	-17.3%	-7.7%
5	Median Age (2017)	49.9	38.4
6	Change in Median Age in Years (2000-2017)	8.0	2.3
7	Unemployment Rate (2017)	4.3%	5.8%
8	Percent of Population Below Poverty Level (2017)	15.8%	14.6%
9	Percent of Household Received Food Stamps (2017)	15.5%	12.2%
10	(Primary) County Where the Community Is Located	Cooper County	

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

The community incurred some major infrastructure projects such as street resurfacing and water runoff collection. Also, the city has a Department approved facility plan for an MBBR system and has secured grant and loan funding for the project.

- (7) **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 following table characterizes the community's overall financial capability to raise the necessary funds to meet the new permit requirements.

Criterion 7A Table. Financial Capability Indicator

Indicators	Strong (3 points)	Mid-Range(2 points)	Weak (1 point)	Score
Bond Rating Indicator	Above BBB or Baa	BBB or Baa	Below BBB or Baa	NA
Overall Net Debt as a % of Full Market Property Value	Below 2%	2% - 5%	Above 5%	NA
Unemployment Rate (2017)	Beyond 1% below Missouri average of 5.8%	± 1% of Missouri average of 5.8%	Beyond 1% above Missouri average of 5.8%	3
2017 Median Household Income (in 2018 Dollar)	Beyond 25% above Missouri MHI (\$52,801)	± 25% of Missouri MHI (\$52,801)	Beyond 25% below Missouri MHI (\$52,801)	1
Percent of Population Below Poverty Level (2017)	Beyond 10% below Missouri average of 14.6%	± 10% of Missouri average of 14.6%	Beyond 10% above Missouri average of 14.6%	2
Percent of Household Received Food Stamps (2017)	Beyond 5% below Missouri average of 12.2%	± 5% of Missouri average of 12.2%	Beyond 5% above Missouri average of 12.2%	2
Property Tax Revenues as a % of Full Market Property Value	Below 2%	2% - 4%	Above 4%	NA
Property Tax Collection Rate	Above 98%	94% - 98%	Below 94%	2
Total Average Score (Financial Capability Indicator)	--	--	--	2.0

The **Financial Capability Indicator** and the **Residential Indicator** are considered jointly in the Financial Capability Matrix to determine the financial burden that could occur from compliance with the new requirements of the permit.

- Financial Capability Indicator (from Criterion 7): 2.0
- Mechanical Plant Residential Indicator (from Criterion 2): 1.28%
- Land Application Residential Indicator (from Criterion 2): 1.00% - 1.19%

Criterion 7B Table. Financial Capability Matrix

Financial Capability Indicator	Residential Indicator (User Rate as a % of MHI)		
	Low (Below 1%)	Mid-Range (1.0% to 2.0%)	High (Above 2.0%)
Weak (Below 1.5)	Medium Burden	High Burden	High Burden

Mid-Range (1.5 – 2.5)	Low Burden	Medium Burden	High Burden
Strong (Above 2.5)	Low Burden	Medium Burden	High Burden

- Resulting Financial Burden for Mechanical Plant: Medium Burden
- Resulting Financial Burden for Land Application: Medium Burden

(8) An assessment of any other relevant local community 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.

Based on the assessment tool, the City of Pilot Grove has been determined to be a category 5 community. This means that the City of Pilot Grove is predicted to be stable over time.

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 upgrade the facility and construct new control technologies. The Department has considered the eight (8) criteria presented in subsection 644.145 RSMo to evaluate the cost associated with the new permit requirements.

The Department finds that a land application system is the most practical and affordable option for the City of Pilot Grove. However, the City is pursuing the option to upgrade to an MBBR treatment facility because of its high quality effluent and ease of operation.

In accordance with 40 CFR 122.47(a)(1) and 10 CSR 20-7.031(11), compliance must occur as soon as possible; therefore, based on this analysis, the permit holder has received an **eight (8)** year schedule of compliance for the design and complete construction of the MBBR facility. The following suggested milestones can be used by the permittee as a timeline toward compliance with new permit requirements. Once the permit holder’s engineer has completed facility design with actual costs associated with permit compliance, it may be necessary for the permit holder to request additional time within the schedule of compliance. The Department is committed to review all requests for additional time in the schedule of compliance where adequate justification is provided.

Suggested Milestones during the remainder of the 8 Year Schedule of Compliance

Year	Milestone(s)
5	Obtain a Construction Permit
6	Construction
7	Construction
8	Complete construction

The Department is committed to reassessing the cost analysis for compliance at renewal to determine if the initial schedule of compliance will accommodate the socioeconomic data and financial capability of the community at that time. Because each community is unique, the Department wants to make sure that each community has the opportunity to consider all options and tailor solutions to best meet their needs. The Department understands the economic challenges associated with achieving compliance, and is committed to using all available tools to make an accurate and practical finding of affordability for Missouri communities. If the community is interested in the funding options available to them, please contact the Financial Assistance Center for more information.

<http://www.dnr.mo.gov/env/Wpp/srf/index.html>

This determination is based on readily available data and may overestimate the financial impact on the community. The community’s facility plan that is submitted as a part of the construction permit process includes a discussion of community details, what the community can afford, existing obligations, future growth potential, an evaluation of options available to the community with cost information, and a discussion on no-discharge alternatives. The cost information provided through the facility plan process, which is developed by the community and their engineer, is more comprehensive of the community’s individual factors in relation to selected treatment technology and costing information.

References

1. (A) 2017 MHI in 2017 Dollar: United States Census Bureau. United States Census Bureau. 2013-2017 American Community Survey 5-Year Estimates, Table B19013: Median Household Income in the Past 12 Months (in 2017 Inflation-Adjusted Dollars). http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_17_5YR_B19013&prodType=table. 2000 MHI in 1999 Dollar: (1) For United States, United States Census Bureau (2003) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-2-1 Part 1. United States Summary, Table 5. Work Status and Income in 1999: 2000, Washington, DC. <https://www.census.gov/prod/cen2000/phc-2-1-pt1.pdf>. (2) For Missouri State, United States Census Bureau (2003) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-2-27, Missouri, Table 10. Work Status and Income in 1999: 2000, Washington, DC. <https://www.census.gov/prod/cen2000/phc-2-27-pt1.pdf>.

(B) 2018 CPI, 2017 CPI and 1999 CPI: U.S. Department of Labor Bureau of Labor Statistics (2018) Consumer Price Index - All Urban Consumers, U.S. City Average. All Items. 1982-84=100. http://data.bls.gov/timeseries/CUUR0000SA0?data_tool=Xgtable.

(C) 2017 MHI in 2018 Dollar = 2017 MHI in 2017 Dollar x 2018 CPI / 2017 CPI; 2000 MHI in 2018 Dollar = 2000 MHI in 1999 Dollar x 2018 CPI / 1999 CPI.

(D) Percent Change in Median Household Income (2000-2017) = (2017 MHI in 2018 Dollar - 2000 MHI in 2018 Dollar) / (2000 MHI in 2018 Dollar).

2. $(\$70.09/(\$39,105/12))100\% = 2.15\%$ (mechanical)

3. $(\$32.69/(\$39,105/12))100\% = 1.00\%$ and $(\$38.83/(39,105/12))100\% = 1.19\%$ (land application)

4. (A) Total Population in 2017: United States Census Bureau. 2013-2017 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_17_5YR_B01003&prodType=table. (B) Total Population in 2000: (1) 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. <https://www.census.gov/prod/cen2000/phc-1-1-pt1.pdf>. (2) 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. <http://www.census.gov/prod/cen2000/phc-2-27-pt1.pdf>.

(C) Percent Change in Population (2000-2017) = (Total Population in 2017 - Total Population in 2000) / (Total Population in 2000).

5. (A) Median Age in 2017: United States Census Bureau. 2013-2017 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_17_5YR_B01002&prodType=table.
- (B) Median Age in 2000: (1) 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>. (2) 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 (2000-2017) = (Median Age in 2017 - Median Age in 2000).
6. United States Census Bureau. 2013-2017 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_17_5YR_B23025&prodType=table.
7. United States Census Bureau. 2013-2017 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_17_5YR_S1701&prodType=table.
8. United States Census Bureau. 2013-2017 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_17_5YR_B22003&prodType=table.