



*Guidance WQD-001
August 2017*

GUIDANCE

Pilot Study for Treatment System Design

This guidance document is intended to provide general information to assist the utility in the development of a suitable and appropriate pilot study protocol. This document is intended to be used for guidance purposes only. The responsible engineer and the sponsoring utility are ultimately responsible for the proper selection and implementation of the pilot study. The Department of Environmental Quality (DEQ) has a Variance Committee (OAC: 626-3-8 and OAC: 656-3-7) to review processes or equipment not specifically covered by the standards in Chapters 626 and 656 provided the permittee requests a variance. This document is intended to provide an outline for the utility to prepare the technology document and backup information for DEQ review of the variance request.

Approval by the DEQ, of the pilot study protocol and pilot study report must precede the submittal of an engineering report. Approval of the pilot study report or the proposed site-specific, full-scale design criteria shall not be construed as approval by the DEQ for construction of the treatment system. Construction of the treatment system may not begin until the DEQ had reviewed and approved the engineering plans and specifications and a construction permit has been issued.

Definitions

Pilot Study – a small-scale experiment or set of observations undertaken to decide how or whether to launch a full-scale project.

Abbreviations

DEQ – Department of Environmental Quality

GAC – Granular activated carbon

O&M – Operations and maintenance

P&ID – Process and instrumentation diagram

QA/QC – Quality assurance/quality control

VOC – Volatile organic compound

WQD – Water Quality Division

Applicable OAC Sections

None

Pilot Study Objectives

The objectives of the proposed pilot study must be clearly stated with the goal to obtain all of the information that will be required in the pilot study report and by the engineer to design the proposed technology for the site-specific parameters. The performance evaluation of the

proposed technology should be based on the assessment through the site-specific testing to cover the following:

- Treatment performance measured as effluent concentrations for specific wastewater quality parameter under a normal range of influent conditions;
- Treatment performance measured by removal efficiencies for specific wastewater quality parameter under a normal range of influent conditions, including performance reliability and changes;
- Operations and maintenance (O&M) performance measured by appropriate O&M indicator parameters such as residuals generation, operational issues, labor requirements, ease of operations, and other factors deemed critical by the engineer for the proposed technology.

Pilot Study Duration

The pilot study must be conducted during a season that represents adverse operating conditions for a full-scale site-specific treatment system. The pilot unit must be operated under site-specific conditions to cover a typical twelve (12) month duration when the influent conditions are representative variations expected under real conditions. Study durations of less than 12 months must be properly justified and will be subject to DEQ acceptance. A longer duration study (more than 12 months) may be appropriate depending on the technology being considered or to address other considerations such as public perception and public acceptance. Individual example protocols may be available upon request.

DEQ Notification and Approval Process

A responsible official of the utility or its engineer must notify the DEQ of the proposed pilot study at least 60 calendar days prior to the start of the study. The pilot study protocol must be submitted and approved by DEQ Water Quality Division (WQD) prior to beginning the pilot study. It is recommended that a meeting with DEQ WQD staff be conducted to review and receive input prior to start of the pilot study.

Pilot Study Operation

The pilot study must be performed by competent personnel of the engineer or the sponsoring utility. The study must be overseen by a professional engineer licensed in the State of Oklahoma.

Pilot Study Protocol Submittal

The pilot study protocol submittal must be prepared under the direction of a professional engineer licensed in the State of Oklahoma. The protocol must address the following as applicable:

1. Study Objectives
 - a. Describe the proposed pilot plan objectives, goals, and expectations
 - b. Summarize the hydraulic flow characteristics and influent quality variations of the source that is used for the pilot study
 - c. Summarize any pretreatment requirements for the study. Any level of pretreatment proposed for the pilot plant study must be equivalent to that which will be provided at the site-specific, full-scale system.
2. Description of Technology
 - a. Provide the manufacturer name, model number, and description of the proposed technology.
 - b. Discuss operational principles of the technology, including its current and prior use in similar applications.
 - c. Discuss the existing treatment train and its relation to the proposed treatment technology's solids and liquid trains.
 - d. Provide the description and function of each component of the proposed technology.
 - e. Provide specifications, manufacturer literature, technology fact sheets, and other relevant information.
3. Operational Requirements
 - a. Summarize the range of usable operating parameters (flow, concentrations, and other variables) for the proposed technology.
 - b. Address pretreatment needs and requirements.
 - c. Address the impact of seasonal influent quality changes on the performance of the proposed technology.
4. Technical Specifications and Design Criteria
 - a. Provide technical specifications for each component of the proposed technology
 - b. If the proposed technology dimensioning is based on a kinetic or other mathematical model, include the model and the specific values/parameters used.
 - c. Provide component scaling rules and prescribed design and operational application limits for scaling up the project.
5. Pilot Plant Design
 - a. Provide a description of the proposed pilot plant setup including each component sizing and its relationship to adjacent units. Include any pretreatment processes.
 - b. Provide a process schematic and/or process and instrumentation diagram (P&ID) of the proposed pilot plant setup.
 - c. Provide engineering specifications and drawings, as applicable
 - d. Provide site photographs of the pilot plant setup.

6. Testing
 - a. Summarize the testing protocol, and address the quality assurance/quality control (QA/QC) plan.
 - b. Outline sampling procedures, analytical procedures, data management, and reporting.
 - c. Summarize the results collected. Include raw data and other relevant information as appendices to the report.
7. By-products and Residuals
 - a. Provide a list and concentrations of observed/known by-products formed by the proposed technology. As applicable, include the relationships between influent quality and resulting by-product concentrations.
 - b. Summarize the types of residuals produced during the treatment and provide assessment of the proposed input and output ranges.
 - c. Include residual production and management requirements.

Final Report

The final pilot study report must be prepared and sealed by an engineer licensed in the State of Oklahoma. The report must address the following as applicable:

1. Results and their interpretation
 - a. Summarize the flows, influent characteristics, and loadings.
 - b. Compare achieved results with expected performance.
 - c. Compare the real conditions of utilization with the design criteria (such as hydraulic loadings, organic loading, pollutant loading, and retention time).
 - d. Graph the performance results showing the variable correlation and confidence intervals.
 - e. Provide any other results that could be useful for interpreting the results.
2. Summary
 - a. State whether the pilot study results met the study objectives.
 - b. Summarize the proposed design criteria for the technology based on the pilot study results with due considerations for addressing influent variability and unknowns.
 - c. Identify any specific operational considerations.
 - d. Summarize any other relevant findings and issues with the proposed technology.

References

1. Protocol for the verification of Wastewater Treatment technologies, NSF International, US EPA, April 2001.
2. Performance Validation Procedure for the Domestic Wastewater Treatment Technologies, September 2014, MDDELCC, Quebec, Canada.
3. Generic Protocol for the Verification of Ballast Water Treatment Technology, EPA/600/R-10/146, September, 2010.
4. ICR Manual for Bench- and Pilot-Scale Treatment Studies, EPA 814/B-96-003. April 1996.
5. David L. Haas and Kim W. Fox, Evaluation of Wastewater Treatment Processes through Pilot Studies, Proceedings of the 1991 Georgia Water Resources Conference, March 19-20, 1991.
6. Guidance for the Proposed Granular Activated Carbon (GAC) Filtration System for Volatile Organic Compound (VOC) Removal Pilot Study Report.
7. Guidance for Proposed Membrane Filtration System Pilot Study Report.
8. Guidance for Proposed Ion Exchange System for Nitrate Removal Pilot Study Reports.