pH - Field Analysis

Standard Operating Procedure

(SOP)

{Insert Facility name here}

Prepared By: Insert NAME / TITLE	Date
	Date
Approved By: Insert NAME / TITLE	Date
Approved By: Insert NAME / TITLE	Date

Effective Date: mm/dd/yyyy

Revision and Annual Review History

This page documents the annual review and the revisions over time to the SOP. The most recent iteration should be listed in the first row, with consecutive versions following. Signatures may be required for revised documents.

It is a requirement that this be signed annually.

Date of Revision or Annual Review	Page(s)/Section(s) Revised	Revision Explanation

2. Table of Contents

3. Procedures

a. Scope and Applicability

This SOP will outline procedures to conduct field analysis for pH as related to the analysis of wastewater samples.

Individual Reference Methods	
pH	SM 4500 H^+ B – 2011 (or other approved method)

Individual scopes & applications	
pH	This method is used to measure the intensity of the acidic or basic nature of an aqueous solution and is expressed as pH or hydrogen ion activity. pH is one of the most common tests in environmental conditions and can frequently affect other parameters.

b. Summary of Method

Individual Method Summaries	
pH	A sample is collected, and the pH is measured by inserting the calibrated pH and temperature probe into the sample and recording the reading.

c. Definitions

1. CV – Calibration Verification – A buffer that is used to verify the calibration curve. The concentration of buffers may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis.
2. QCS – Quality Control Sample – A buffer of known concentrations that is obtained from a source external to the laboratory and different from the source of calibration buffers ('second source'). The QCS is used to check laboratory performance with externally prepared test materials.
3. DUP – Duplicate – Two aliquots of the same sample taken in the laboratory and analyzed separately with identical procedures. An analysis of a DUP indicates precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.
4. RL – Reporting Limit – The minimum concentration level reported by the laboratory.

5. RPD – Relative Percent Difference – The measure of the precision or reproducibility of an analysis result.
6. DI water – Deionized water – Water that has been through a deionization process and meets ASTM standard for Type I or II water. May substitute distilled water if it meets ASTM standard for Type I or II water.
7. COC – Chain of Custody – An unbroken trail of accountability that ensures the physical security of samples, data, and records.

d. Health & Safety Warning

Analysts should always utilize all appropriate personal protective equipment during analysis. All chemicals should be handled and stored in accordance with their Material Safety Data Sheet (MSDS).

e. Cautions

Instruments and reagent/standards should be stored inside in a dry room that is at a constant temperature and out of direct sunlight (inside a cabinet is preferred). Storing instruments outside in a vehicle could cause damage to the meter and degrade reagents/standards.

f. Interferences

Individual Method Interferences	
pH	pH measurements are affected by temperature and organic material within the sample. Eliminate their interferences by frequently cleaning the probe and report the temperature at which the pH was measured.

g. Personnel Qualifications / Responsibilities

Analysts should be familiar with the requirements established within this SOP and display proficiency with the techniques contained herein.

h. Equipment and Supplies

Equipment Needed	
pH	pH meter, pH probe, temperature probe

Reagents Needed	
pH	DI Water

Standards Needed	
pH	4 buffer, 7 buffer, 10 buffer, CV std, QCS

i. Step by Step Procedure

- **Instrument or Method Calibration and Standardization**:
    - Calibrate all meters daily or before each use following the manufacturer's instructions.
- **Collection and Preservation**
    - All analyses are preserved at $\leq$ 6 ºC without freezing in either glass or plastic.
    - All samples are to be analyzed ASAP (within 15 minutes)

pH

Calibration:

1) Calibrate the meter daily or before each use according to the manufacturer's instructions using the pH 4, 7, and 10 buffers.
2) Verify calibration with analysis of CV.
3) Record data.

Analysis:

1) Rinse the probe thoroughly with the DI water and blot dry.
2) Shake the sample and then place the probe into the sample continuing to gently swirl the bottle.
3) Wait for the pH reading to stabilize and record data.
4) Record the temperature of the sample next to the pH reading in the logbook and on the COC.
5) Rinse the probe thoroughly with the DI water and blot dry.
6) When not in use store the electrode according to the manufacturer's instructions, usually in the electrode storage solution.

j. Data and Records Management

Formula for Calculating Duplicate Relative Percent Difference (RPD)

$$RPD = \frac{|\text{Sample} - \text{Sample Duplicate}|}{(\text{Sample} + \text{Sample Duplicate}) / 2} \times 100$$

Where: Sample = concentration of sample
Sample Duplicate = concentration of duplicate sample

Formula for Calculating Percent Recovery for a Known (% Rec)

$$\% \text{ Rec} = \frac{\text{Analyzed Value}}{\text{True Value}} \times 100$$

- All data must be retained for five (5) years or until the laboratory's next audit, whichever is longer.

4. Quality Control and Quality Assurance Section

QC								
	MB		CV		QCS**		DUP	
	Frequency	Acceptance Criteria *	Frequency	Acceptance Criteria *	Frequency	Acceptance Criteria *	Frequency	Acceptance Criteria
pH	N/A	N/A	Daily	±0.1 SU	Quarterly	5%	1/20***	20% RPD

* May utilize acceptance criteria listed on the manufacturer's certificate of analysis.
** If CV used is from a second source, this satisfies QCS requirement.
*** Duplicates must be performed quarterly of every 20 samples, whichever comes first.

- If the results are outside of the established acceptance range repeat once, if outside the acceptance range the second analysis do not use the meter and investigate the cause of the problem (i.e. user error, expired or degraded buffers, etc).

5. Reference Section

i. 40 CFR 136, Code of Federal Regulations, "Guidelines Establishing Test Procedures for the Analysis of Pollutants"

ii. Standard Methods for the Examination of Water and Wastewater, 22nd Edition