Lead & Copper Water Quality Parameters

Routine Quality Control Requirements

Pb&Cu WQP

§141.89 Analytical methods.

a) Analyses for lead, copper, pH, conductivity, calcium, alkalinity, orthophosphate, silica, and temperature shall be conducted with the methods in §141.23(k)(1).

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Who can perform the analyses for water quality parameters?

141.89(a)(1) Analyses for alkalinity, calcium, conductivity, orthophosphate, pH, silica, and temperature may be performed by any person acceptable to the State. ….

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EPA Manual for the Certification of Laboratories Analyzing Drinking Water (5th Edition)

Chapter 4 Section 5.2- *Analytical Methods Analyses Approved by the State*

"Measurements for turbidity, pH, temperature, disinfectant residual, calcium, orthophosphate, silica, alkalinity, and conductivity need not be made in certified laboratories but may be performed by any persons acceptable to the State. However approved methodology must be used. The State should institute a quality assurance program to assure validity of data from these measurements."

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In order for a "person acceptable to the State" to analyze for these parameters:

- Approved EPA methods under the Safe Drinking Water Regulations
- The associated Quality Assurance and Quality Control information for the method used must be followed.

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The list of EPA Approved Methods for these parameters can be found by going to eCFR.gov

Title 40 – Protection of Environment

Volume 23/Part 141

Subpart C- Monitoring and analytical requirements

141.23 - Inorganic chemical sampling and analytical requirements

(h)(1) Table of analytical methods

Go back to Subpart C

Appendix A to Subpart C - Table "Alternative Testing Methods for Contaminants Listed at 40CFR 141.23 (k) (1)"

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Pb&Cu WQP

After a Pb and/or Cu ALE :

Within the 6 month period in which it occurs water system must conduct Water Quality Parameter Sampling at the POE (source water sampling) and certain DS locations (# based on population).

WQP parameters required:

- pH
- Alkalinity
- Orthophosphate (if applicable)
- Silica (if applicable)
- Calcium
- Conductivity
- Water temperature

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Pb&Cu WQP

After installation of corrosion control, entry points to the distribution system (POE) will require monitoring no less frequently than every 2 weeks

for the WQPs that are applicable to your water system:

- pH
- Alkalinity
- Dosage rate/concentration if alkalinity is adjusted as CCT
- Orthophosphate (residual)
- Silica (residual)

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Pb&Cu WQP

After installation of corrosion control

WQP sampling of taps will be required every 6 months

For those WQPs applicable to the water system:

- pH
- Alkalinity
- Calcium
- Orthophosphate (residual)
- Silica (residual)

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Pb&Cu WQP

After the NJDEP establishes the specific parameter values needed for optimal corrosion control, those WQPs listed below that apply to your specific OCCT plan need to be monitored at the POE no less frequently than once every two weeks:

- pH
- Alkalinity
- Dosage rate/concentration if alkalinity adjusted for CCT
- Orthophosphate dosage rate and residual
- Silica dosage rate and residual

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Pb&Cu WQP

After the NJDEP establishes the specific parameter values needed for optimal corrosion control, those WQPs listed below that apply to your specific OCCT plan require WQP sampling every 6 months at the taps:

- pH
- Alkalinity
- Calcium
- Orthophosphate
- Silica

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Pb&Cu WQP

Analyze Immediately Parameters:

Temperature

pH

must be analyzed within 15 minutes

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Pb&Cu WQP

Temperature

Measured using temperature monitoring devices

- Must be graduated in at least 0.5 °C increments
- Glass thermometers must not have any separation of the liquid column
- Must be verified over the range used with a NIST certified thermometer annually for a glass thermometer and quarterly for all others.

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Pb&Cu WQP

pH

Whether using a field pH meter or collecting a grab sample for analysis at an on site laboratory, the instrumentation used must conform with the EPA approved method requirements and NJDEP OQA regulations.

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pH can be measured with:

- Portable/Field pH meters & Benchtop pH meters (non-continuous)
- Online pH meters (continuous)

pH Methods - Electrometric

- EPA Methods: 150.1
- EPA Methods: 150.2 (online method)
- ASTM Methods: D1293-95, 99
- Standard Methods: 4500-H B, 4500-H B-00

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Equipment Requirements for Portable/Field & Benchtop pH meters :

- Must provide accuracy of at least 0.1 pH units
- Must require a minimum of 2 standards for calibration
- Must provide a % slope or efficiency readout
- Must be digital readout (no needle meters)
- Must have temperature compensation

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QA/QC Requirements for pH using either a field or benchtop pH meter:

Calibration:

- Performed with buffers of pH 4.0, 7.0 and 10.0. Daily calibration with 2 buffers that bracket the expected pH but are at least 3 pH units apart.
- Slope of calibration must be 92% to 102% to be acceptable (usually calculated by meter upon completion of calibration)
- Calibration must be immediately verified with a buffer (suggest 7.0) and must be within ±0.1 pH unit of the known value. This is considered a "**Calibration Check**".

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Pb&Cu WQP

QA/QC Requirements for pH using either a field or benchtop pH meter continued:

A **Calibration Check** is a verification of the calibration and is performed:

- Immediately after a full calibration.
- Every three hours thereafter until analysis is completed for the day. In this case it would be considered as a "**drift check**". The drift check values must be ±0.2 pH units of the known values.

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QA/QC for Continuous or Online pH Meters

EPA 150.2 is a method specific to continuous monitoring.

Equipment Requirements for online pH Meters:

- Must be equipped with automatic or fixed temperature compensation (very important)
- Must be equipped with digital readout and recorders. No circular chart recorders.
- Must have an alarm function
- Must read to accuracy of 0.01 pH units
- Adhere to the apparatus requirements in EPA 150.2

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Pb&Cu WQP

QA/QC for Continuous or Online pH Meters

- May have either immersion type electrodes or flow through type electrodes.
- Based on the ability to remove the electrodes, daily calibration can be performed using either direct calibration or indirect calibration.

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QA/QC for Continuous or Online pH Meters

Direct Calibration (When the immersion type or flow through type electrodes are easily removed from the mounting)

- Calibrate daily using a minimum of 2 buffers bracketing the expected pH and which are approximately 3 pH units or more apart.
- Repeat calibration adjustments using fresh portions of the 2 buffer solutions until readings are within 0.05 pH units of the buffer value.

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Pb&Cu WQP

QA/QC for Continuous or Online pH Meters

Indirect calibration (When the immersion type or flow through type electrodes are not easily removed from the mounting)

- At least once a day collect a grab sample as close to the electrodes as possible. Analyze immediately using a laboratory / portable pH meter
- Adjust the calibration of the continuous analyzer
- Take the temperature (°C) of the sample and record.

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QA/QC for Continuous or Online pH Meters

Indirect calibration is allowed on a daily basis however, every month a direct calibration should be performed.

(A direct calibration using 2 buffers should have been performed before placing the unit in service.)

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QA/QC for Continuous or Online pH Meters

- **Note !!!! Specifically for Flow Through Electrodes**
- Flow-through type electrodes may result in offset errors due to the velocity of the sample flowing through the flow through electrode.
- Record the readings before adjusting. Measure flow rate and record. Adjust meter and record new reading.

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Orthophosphate

- Collected as unfiltered with no acidification.
- Analyzed without digestion or hydrolysis
- Reported as "orthophosphate as P"
- Hold time for orthophosphate is 48 hours

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EPA Approved Methods for Orthophosphate:

Colorimetric, Automated Ascorbic Acid

- EPA 365.1
- Standard methods 4500 P F, 4500 P F-99

Colorimetric, Ascorbic acid single reagent

- ASTM D515-88 A
- Standard Methods 4500-P E, 4500-P E-99

continued

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EPA Approved Methods for Orthophosphate (continued)

Colorimetric Phosphomolybdate

- Other I-1601-85
- Other I - 2601-90
- Other I - 2598-85

Ion Chromatography

- EPA 300.0, 300.1
- ASTM D4327-97, 03, 11
- Standard Methods 4110B, 4110B-00

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Orthophosphate
Minimum Routine QA/QC Requirements

1. **Calibration:**
   - 5 calibration standards
   - Curve must have a correlation coefficient of 0.995 or greater.
   - Must be verified with a **mid level calibration check** immediately after calibration and after measuring every 10 samples.
   - **Mid level calibration check** must have recovery of 90-110%
2. **Method Blank** must be non detect
3. **Sample Duplicates:**
   - Must be analyzed every 20 samples
   - Must have a relative percent difference of less than 20%.

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Pb&Cu WQP

Alkalinity & Conductivity & Calcium & Silica

- Cannot be performed in the field

Persons Acceptable to the State:

1) Technician possessing the credentials listed in OQA regulations

Or

2) Person trained by a person with above credentials and that has successfully performed an initial demonstration of capability (IDC).

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Pb&Cu WQP

Alkalinity

Collection

- Plastic or glass
- Should be kept cool around 4 °C

Analysis

- Although hold time is 14 days, the sample should be analyzed as soon as possible

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EPA Approved Methods for alkalinity:

Titrimetric

- ASTM D1067-92, 02 B, 06 B, 11 B
- Standard Methods 2320B, 2320B-97

Electrometric Titration

- Proprietary or Other I-1030-85

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Pb&Cu WQP

Alkalinity QA/QC

1) **Method Blank**

- Prior to analysis of samples and after every 20 samples
- Must be less than 1 mg/L to be acceptable.

2) **Low Level and High Level Check Standards** (If the approximate value of the water is known one of the two check standards can be omitted.)

- Prior to analysis of samples and after every 20 samples
- Acceptance criteria is 80-120% recovery.

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Other Alkalinity QA/QC :

- pH meter being used must be calibrated and verified daily.
- Temperature compensation must be verified quarterly.
- Titrating solutions must be standardized

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Conductivity

Collection

- Plastic or glass
- Should be kept cool around 4 °C

Analysis

- Although hold time is 28 days, the sample should be analyzed as soon as possible

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Conductivity (or Conductance)

EPA Approved Methods:

- SM 2510B
- ASTM D1125-95A

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Conductivity:

Equipment Requirements of Conductivity Meter

- Has automatic temperature sensor (capable of temperature compensation)
- Accuracy of measuring within 1% or 1 umho/cm whichever is greater
- Platinium (Pt) electrodes or is calibrated using a meter with Pt electrodes

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Conductivity:
QA/QC Requirements

- Initial 5 point calibration curve with KCL of various concentrations to cover range
- Use one KCL standard whenever specific conductance measurements are made.
- Cell constant must be determined annually recording the calculations in a log book.

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Calcium

- Collected in either plastic or glass
- Sample must be acidified with concentrated nitric acid to pH < 2 either in the field or as soon as possible when received by the laboratory.
- Hold time is 6 months

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Calcium
EPA Approved Methods for Calcium:

EDTA titrimetric

- ASTM D511-93, 03 A
- Standard Methods 3500-Ca D, Ca B, -97

Atomic Absorption

- ASTM D511-93, 03 B
- Standard Methods 3111B, B-99

(continued)

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EPA Approved Methods for Calcium (continued)

Inductively Coupled Plasma

- EPA 200.7
- Standard Method 3120B, B-99

Ion Chromatography

- ASTM D6919-03, 09

Axially viewed ICP Atomic Emission Spectrometry

- EPA 200.5 Revision 4.2

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Calcium
Minimum Routine QC Requirements
For 3500-Ca EDTA Titrimetric Method

- Method Blank :Must be less than ½ of the reporting limit
- Laboratory Fortified Blank : 85-115% recovery.
- Check standards of different concentrations (purchased from different manufacturer) to be analyzed prior to samples. Must be within 10% of known value.

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Pb&Cu WQP

Silica

- Use plastic for sample collection. Do not use glass.
- Sample should be kept cool (around 4 °C) during transit to laboratory
- Hold time is 28 days

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Pb&Cu WQP

Silica

EPA Approved methods for silica:

Molybdosilicate
- Standards Methods 4500-Si D, 4500-SiO2 C, 97

Heteropoly blue
- Standard Methods 4500-Si E, 4500 SiO2 D, -97

Colorimetric
- ASTM D859-94, 00, 05, 10

Automated for Molybdate-reactive Silica
- Standard Methods 4500-Si F, 4500 SiO2 E, -97

continued……

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Silica

EPA Approved methods for silica (continued):

Inductively Coupled Plasma
- EPA 200.7
- Standard Methods 3120B, -99

Axially viewed ICP Atomic Emission Spectrometry
- EPA 200.5 Revision 4.2

Colorimetric, Molybdate Blue
- Other I-1700-85

Automated-segmented Flow
- Other I-2700-85

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Pb&Cu WQP

Silica
Minimum Routine QC Requirements

1) Calibration:
- Daily with at least 5 calibration standards.
- Curve must have a correlation coefficient of 0.995 or greater.
- Must be verified with a mid level calibration check immediately after calibration and every 10 samples thereafter.
- Mid level calibration check must have recovery of 90-110%

2) Method Blank:
- After every 10 samples
- Must be non detect

3) Sample Duplicates:
- Analyzed every 20 samples
- Must have a relative percent difference of less than 20%.

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Pb&Cu WQP

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