



Sampling Procedures, Testing & Reporting Basic Water



Sampling Procedures, Testing & Reporting

Basic Water

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Introduction

Public water systems (PWSs) in New Mexico are required to have comparable, consistent, and legally defensible drinking water quality compliance data. These are reported as required by: Safe Drinking Water Act (SDWA), New Mexico Drinking Water Regulations NMAC 20.7.10, and Federal regulations 40 CFR 141-143.

Labs are essential to water utilities because they ensure public health, verify treatment performance, and provide legally defensible data.

Water Supply Operator vs Water Sampling Technician

New Mexico has two licenses that allow drinking water sampling. They are not the same and they do not have the same authority.

♣ **Water Supply Operator (WSO)**

- ♣ Licensed to operate the drinking water system
- ♣ Can collect compliance samples
- ♣ Can perform operational testing
- ♣ Can adjust treatment
- ♣ Can interpret results
- ♣ Can sign MORs
- ♣ Can issue public notifications
- ♣ Responsible for regulatory compliance
- ♣ Responsible for the accuracy of sampling done by others

♣ **Water Sampling Technician (WST)**

- ♣ Limited license for sampling only
- ♣ Can collect compliance samples
- ♣ Can complete chain of custody
- ♣ Can deliver samples to the lab
- ♣ Can perform basic field parameters
- ♣ Cannot operate the system
- ♣ Cannot adjust treatment
- ♣ Cannot interpret compliance results
- ♣ Cannot sign MORs
- ♣ Cannot issue public notifications
- ♣ Not responsible for regulatory compliance

Key Point

Both licenses can collect compliance samples. Only the Water Supply Operator is responsible for the results, reporting, and follow-up.



Today's Goals

Today's class will focus on Sampling Procedure, Testing, and Reporting from the Need-to-Know (NTK) Sampling & Reporting criteria for Water Supply Level 1 & 2 operators.

Lead and Copper, Disinfection and SDWA are covered in other classes.

Sampling Procedure

- Location
- How to sample
- Paperwork
- Types of sampling

Testing

- On-site operational testing
- Off-site compliance testing
- EPA-approved methods
- Understanding results & required actions

Reporting

- Required timelines
- MOR submission
- Record keeping
- Documentation of system performance

Compliance vs Operational

Compliance

Collected for regulatory requirements. Analyzed by certified laboratories using EPA approved methods. Used to determine compliance, report legally defensible data, and trigger public notifications when needed.

◆ Examples:

- | | | |
|------------------|-------------------|---------------------------------------|
| ◆ Total coliform | ◆ Lead and copper | ◆ Fluoride |
| ◆ Nitrate | ◆ DBPs | ◆ VOCs and SOC's |
| ◆ Nitrite | ◆ Arsenic | ◆ Turbidity for surface water systems |

◆ Characteristics:

- | | |
|--------------------------------------|---------------------------------|
| ◆ Correct bottles and preservatives. | ◆ Certified lab analysis. |
| ◆ Strict sampling protocols. | ◆ Required reporting timelines. |
| ◆ Chain of custody. | |



Operational

Collected on site by operators to monitor treatment and system performance.

Used for daily process control, chemical adjustments, troubleshooting, and operational decisions.

◆ Examples:

- | | | |
|---------------------|--------------------|------------------------------|
| ◆ Chlorine residual | ◆ Dissolved oxygen | ◆ Chemical feed adjustments |
| ◆ pH | ◆ Turbidity checks | ◆ Filter checks |
| ◆ Temperature | ◆ Jar testing | ◆ Distribution system checks |

◆ Characteristics:

- | | |
|------------------------------|---|
| ◆ Performed in house. | ◆ Results guide operations, not regulatory reporting. |
| ◆ Field meters and probes. | ◆ Proper sampling technique still required. |
| ◆ No certified lab required. | |

Why It Matters

Sampling and testing matter because we need a consistent, standardized way to monitor system performance, protect public safety, and support environmental health.

Reporting matters because we need a reliable way to communicate system conditions to the public, agencies, and each other in a timely manner.

Representative sampling matters because it reflects the entire system, not just one location.

Preservation matters because samples must change as little as possible to remain true to process conditions.

Reporting timelines matter because water is always moving and changing, and timely reporting keeps data accurate and maintains public confidence.

Samples & Sampling Procedures

Introduction

Sampling Procedures are the SOPs on:

- | | | |
|------------------------------|---------------------------|---------------------|
| ◆ Where to get a sample | ◆ Representative sampling | |
| ◆ Equipment needed | ◆ Preservation | ◆ Grab vs composite |
| ◆ How to avoid contamination | ◆ Chain of custody | |

The NM Water Conservation Fee of 3 cents per 1000 gallons is collected from each public water system in order to fund sample collection and testing and training for all public water supply operators



Location

The sampling points should be identified by a **sampling plan** that ensures samples are taken from all major parts of the system, so the entire system is represented. Small systems must have at least two sample sites in the system:

- ◆ One point where water enters the distribution system
- ◆ Another at a customer's faucet

As the size of the system increases, the minimum number of samples required each month also increases. Samples should be taken at regular intervals during the month.

Operational testing samples should be included in the sampling plan, along with the type, location, and frequency. Groundwater wells and storage tanks have specific sampling requirements and should be included in the sampling plan. Surface water sources (lakes, rivers, streams) also have specific raw and treated sampling requirements and must be included in the sampling plan.

Even the best sampling plan can only indicate that the system was safe at the time it was sampled and only at the sites where samples were taken.

Sample Site Location Examples

- ◆ Entry point to the distribution system
- ◆ Source water wells (raw and treated)
- ◆ Storage tanks (inlet, outlet, turnover points)
- ◆ Distribution system representative taps
- ◆ Surface water sources (lakes, rivers, streams: raw and treated)
- ◆ Fire hydrants
- ◆ Dead-end mains
- ◆ High water age areas
- ◆ Pressure zones
- ◆ Booster stations
- ◆ Treatment plant effluent
- ◆ Customer taps used for compliance sampling
- ◆ Chemical feed locations
- ◆ Areas with past violations or complaints

Grab vs Composite Sampling

Grab samples are taken at one point in the system at one point in time.

Composite samples are assembled from multiple grab samples collected over a specified period of time.

Grab Sample

- ◆ A sample taken at a point in the process, at a point in time
- ◆ Only represents what was happening at that time and place
- ◆ DO, temperature, turbidity, pH, Chlorine residual, and several other parameters
- ◆ Testing **must begin within 15 minutes**

Timed Grab (Composite) Sample:

- ◆ A single sample assembled from aliquots of several separate grab samples taken periodically throughout a specified period of time
- ◆ Measures some aspect of the process over a specified time frame (hours, days, etc.)



The Flow-weighted or Flow Proportional Composite Sample:

- ◆ Most reliable and most indicative of the process stream.
- ◆ Begins with a series of grab samples taken at evenly-spaced times throughout a 24-hour period
- ◆ Samples are stored in a sample refrigerator (4°C) until they are to be assembled into a single, composite sample after the 24-hour sampling period has ended

Flow-weighted Composite Sample Formula & Calculation

The composite sample is made up of portions that are proportional in volume to the flow rate at the time that each grab was taken. Calculate each portion using the formula below:

$$Portion_{mL} = \frac{Grab\ Q_{MGD} \times Final\ V_{mL}}{Avg.\ Q_{MGD} \times \#of\ grab\ samples}$$

Since the number of grab samples is the number you divide by to calculate the average, the bottom becomes just the sum (Σ) of the grab flows.

$$Q_{Total} = \Sigma_{MGD}$$

As the final volume does not change, nor the sum of the grab flows, you can create a composite factor (f)

$$Comp.\ factor(f) = V_{Total} \div Q_{Total}$$

So, the new formula is:

$$mL_t = Q_t \times f$$

Where t = time of the grab

Practical Application

Using the flow volumes at grab times and formulas on the previous page, calculate the aliquots of a 6-part proportional composite sample having a final volume of 1,000 mL.

Total = 1000 mL	Mid: 6.4 MGD	8 AM: 9.4 MGD	4 PM: 8.4 MGD
6 aliquots	4 AM: 4.3 MGD	Noon: 7.6 MGD	8 PM: 8.0 MGD

$$Q_{Total} = \Sigma_{MGD} = 6.4 + 4.3 + 9.4 + 7.6 + 8.4 + 8.0 = \underline{44.1\ MGD}$$

$$f = V_{Total} \div Q_{Total} = 1000 \div 44.1 = \underline{22.68}$$

$$mL_t = Q_t \times f$$

$$mL_{mid} = 6.4 \times 22.68 = 145.152 = \boxed{145.2\ mL}$$

$$mL_{4am} = 4.3 \times 22.68 = 97.524 = \boxed{97.5\ mL}$$

$$mL_{8am} = 9.4 \times 22.68 = 213.192 = \boxed{213.2\ mL}$$

$$mL_{noon} = 7.6 \times 22.68 = 172.368 = \boxed{172.4\ mL}$$

$$mL_{4pm} = 8.4 \times 22.68 = 190.512 = \boxed{190.5\ mL}$$



$$mL_{8pm} = 8.0 \times 22.68 = 181.440 = \boxed{181.4 \text{ mL}}$$
$$Q_{Total} = \Sigma_{MGD} = 145.2 + 97.5 + 213.2 + 172.4 + 190.5 + 181.4 = \boxed{1000.2 \text{ MGD}}$$

Representative Sampling

Representative sampling means collecting samples in a way that reflects the entire system, not just one point. Water is always moving, mixing, and changing, so a single location can never tell the whole story unless it is chosen correctly. A system may have multiple treatment units, wells, tanks, or pressure zones. One unit may pass a test while another fails, but both flow into the same line.

The sample taken at the combined point represents the *actual water delivered* to customers.

In larger systems, there may be several combined points. What passes in **Zone A** may fail in **Zone B**, even though the water leaving the plant passed, because each zone has independent storage, pressure, and booster stations.

Consistency in sampling technique is critical. Different operators can produce different results from the same system if they don't follow proper procedures.

Example: Operator A samples correctly at a customer's tap and the result passes. Operator B grabs the customer's garden hose lying in the mud and the result fails. The water wasn't unsafe. The *sampling method* was. Improper technique can trigger unnecessary boil water notices, enforcement actions, and public panic.

Representative Sampling Rules:

- | | | |
|---------------------|--|---|
| ◆ Use sample taps | ◆ No pre-flushing unless the rule requires it | ◆ No sampling at edges |
| ◆ No hoses | | ◆ No sampling next to chemical injection ports. |
| ◆ No swivel faucets | ◆ No "operator convenience taps" (shop sinks, lab faucets, hydrants unless designated) | ◆ Sample at the most mixed layer. |
| ◆ No aerators | | |
| ◆ No hot water | | |

Equipment

Core Sampling Equipment

- | | | |
|----------------------------|-----------------------------------|--------------------|
| ◆ Sample bottles | ◆ Sampling poles | ◆ Field notebook |
| ◆ BacT bottles and reagent | ◆ Cooler with ice | ◆ Clean sample tap |
| ◆ Expandable plastic jugs | ◆ Gloves | ◆ Flashlight |
| ◆ Sampling buckets | ◆ Labels & Chain of custody forms | |

Optional but common

- | | |
|--|---|
| ◆ Clean rinse water for equipment | ◆ Paper towels for drying exterior of bottles |
| ◆ Brush, cloth or alcohol wipes for cleaning sample taps | ◆ Permanent marker for labeling |
| ◆ Small trash bag for used gloves and wipes | ◆ Zip bags for separating bottles in cooler |



The objective in collection of any sample is to collect a small volume of material that can be transported to the laboratory while still accurately representing the material being sampled. Sampling requires special care because it is the source of legally verifiable data.

Sampling must follow the Standard Methods table for preservation, container type, and hold times for the test being performed. Samples must have proper labeling, seals and/or tamper security tape, and include a chain of custody form.

Preservation

For samples other than grab required samples, preservation is necessary until the sample can be analyzed. Holding times following the same reasoning as for grab samples, to prevent degradation.

The method used for the analysis should list the container type, preservation method, and hold time and should be verified before sampling. Operators can find the information in Standard Methods for Examination of Water and Wastewater similar to the one on this page.

Most samples are refrigerated or kept cool with ice/icepacks (Cooling to $\leq 6^{\circ}\text{C}$ usually @ 4°C) until the analysis begins. Be very careful not to FREEZE the sample. Some samples require preservation or removal of a chemical (chlorine residuals) before testing. Examples include sodium thiosulfate for chlorinated samples, acidification with a $\text{pH} < 2$ using nitric acid (HNO_3) for metals like lead & copper, and zero headspace for VOCs. Holding times are the maximum time allowed to hold preserved samples for analysis. Analysis must be started before the holding time listed, otherwise the sample is invalidated.

Sample Containers, Preservation and Holding Times for Regulated Parameters

Parameter/Method	Preservative	Sample Holding Time	Extract Holding Time and Storage Conditions	Suggested Sample Size	Type of Container
Metals (except Hg)	HNO_3 $\text{pH} < 2$	6 months		1 L	Plastic or Glass
Mercury	HNO_3 $\text{pH} < 2$	28 days		100 mL	Plastic or Glass
Alkalinity	Cool, 4°C	14 days		100 mL	Plastic or Glass
Asbestos	Cool, 4°C	48 hours		1 L	Plastic or Glass
Chloride	none	28 days		100 mL	Plastic or Glass
Residual Disinfectant	none	immediately		200 mL	Plastic or Glass
Color	Cool, 4°C	48 hours		100 mL	Plastic or Glass
Conductivity	Cool, 4°C	28 days		100 mL	Plastic or Glass
Cyanide	Cool, 4°C , Ascorbic acid (if chlorinated), NaOH $\text{pH} > 12$	14 days		1 L	Plastic or Glass
Fluoride	none	1 month		100 mL	Plastic or Glass
Foaming Agents	Cool, 4°C	48 hours			
Nitrate (chlorinated)	Cool, 4°C non-acidified	14 days		100 mL	Plastic or Glass

Avoiding Contamination

Sampling contamination can cause false positives, enforcement actions, and public alarm. Proper technique ensures samples represent the system, not the sampler.



Before Sampling

- ◆ Wash hands or change gloves before handling bottles.
- ◆ Use **new, sterile bottles** for each sample.
- ◆ Inspect bottles for cracks, missing caps, or compromised seals.
- ◆ Keep bottles sealed until immediately before filling.
- ◆ Avoid touching the inside of caps or bottle necks.
- ◆ Use **only designated sample taps**:
 - ◆ No hoses
 - ◆ No swivel faucets
 - ◆ No aerators
- ◆ Flush the tap long enough to clear stagnant water (per lab or rule guidance).
- ◆ Disinfect the tap with alcohol wipes or flame if required for BacT sampling.

During Sampling

- ◆ Hold bottles near the base, not the rim.
- ◆ Do not rinse bottles unless instructed by the lab.
- ◆ Fill bottles to the indicated line → avoid overfilling or underfilling.
- ◆ Keep caps off only as long as necessary.
- ◆ Avoid splashing or touching the bottle mouth to the tap.
- ◆ For BacT bottles, **do not remove or rinse the thiosulfate**.
- ◆ Maintain sample temperature and integrity → place directly in cooler with ice.

After Sampling

- ◆ Seal bottles immediately.
- ◆ Wipe exterior moisture before labeling.
- ◆ Place bottles upright in cooler; separate with zip bags if needed.
- ◆ Apply **tamper-evident seal tape** to cooler (*"DON'T ACCEPT IF THIS SEAL BROKEN"*).
- ◆ Complete **Chain of Custody** form before leaving the site.
- ◆ Transport samples promptly → avoid heat, sunlight, or freezing.

Key Reminder

Contamination doesn't just mean bacteria; it includes fingerprints, dust, chlorine, and improper handling. The goal is to deliver a sample that represents the system, not the sampler.



Shipping Samples

For samples shipped to off-site laboratories, additional precautions ensure integrity and legal defensibility.

Before shipping

- ◆ Confirm the laboratory's instructions.
- ◆ They may provide bottles, containers, CoC forms, or labeling requirements.
- ◆ Verify hold times and transit times; overnight shipping is preferred.
- ◆ Each sample must have a completed Chain of Custody (CoC) form.

Packaging

- ◆ Use leak-proof, sturdy coolers or shipping boxes.
- ◆ Pack bottles upright with absorbent padding and ice packs.
- ◆ Place paperwork (CoC, lab forms) in a zip-lock bag taped to the inside lid to prevent water damage.
- ◆ Seal the cooler with tamper-evident tape labeled "DON'T ACCEPT IF THIS SEAL BROKEN."
- ◆ Add "FRAGILE/HANDLE WITH CARE" labels and where appropriate hazard labels.
- ◆ Tape all outer boxes closed with shipping or strapping tape.
- ◆ Clearly label sender and receiving laboratory addresses.

When using USPS, register the package and request a return receipt. When using a courier, retain the bill of lading as part of the CoC documentation.

Labels

Every sample must be traceable and identifiable. Labels should include:

- ◆ Who collected the sample
- ◆ When it was collected (date and time)
- ◆ How it was collected (grab or composite)
- ◆ Where it was collected (location or sample point)
- ◆ What type of sample and analysis are requested
- ◆ Seal integrity, if applicable

Type of Water	:
Sampling Point No.:	
Sampling Done for :	Chemical Analysis/TOC
Date of sampling	:
Time of Sampling	:
Sampling Done By :	
Sign and Date	:
Format No.:	

Use waterproof labels and permanent markers. Ensure all information matches the CoC form.



Chain of Custody Records (CoC)

Facility Name

CHAIN-OF-CUSTODY RECORD

Project Manager or Client Contact:			Preservative (Y/N)	Number of Containers	Type of Analyses Requested										Shaded area for lab use only:		
Address/Phone:															Sample check-in:		
Contact Name/Phone:															DO _____		
Project Number: _____ Project Name: _____															T _____		
Page _____ of _____ Sample Location: _____															pH _____		
Date	Time	Sample Identification/Station														Collection Method	Log Number
Sampled by: (signature)			Date/Time:	Relinquished by: (signature)			Date/Time:	Received by: (signature)			Date/Time:						
Received by: (signature)			Date/Time:	Received by: (signature)			Date/Time:	Received by: (signature)			Date/Time:						

A CoC is an accurate written legal record to track the possession, handling, and location of samples and data from collection through reporting. A proper CoC will answer the following 6 questions about the “life” of a sample:

- ♣ What (the type of sample i.e. Drinking water, soil, wastewater)
- ♣ Where (the location)
- ♣ When (date and time)
- ♣ How (grab/composite & deviations)
- ♣ Why (what analysis)
- ♣ Who (signatures)



Internal COC							
Sample ID	Analyst	Out		Analysis	Location	In	
		Date	Time			Date	Time
AT110001-AT110020	RH	01/01/11	10:00	TSS	WET CHEM BENCH	01/01/11	11:00
AT1100040-AT110060	PG	01/01/11	14:00	VOC	GC/MS ROOM	01/02/11	08:00
AT110001-AT110020	RH	01/02/11	08:00	ALK	REF# 1	01/04/11	16:00

Both on-site and off-site facilities require a Chain of Custody Record. For on-site, the CoC can be part of the bench sheet if the operator performs the sampling and analysis. It can also be a logbook if all required information is entered. Copies must be maintained by both the sampling facility, the transporter, and the receiving lab.

Common Mistakes

These are the errors that most often lead to invalid drinking water samples, lab rejections, or compliance violations.

- ◆ Wrong tap
- ◆ Wrong bottle
- ◆ Wrong preservative
- ◆ Wrong temperature
- ◆ Wrong time
- ◆ Wrong label

Other mistakes operators should try to avoid are:

- ◆ Sampling too close to turbulence; solids or debris enter the bottle.
- ◆ Sampling from hoses, swivel faucets, or taps with aerators.
- ◆ Sampling before proper flushing.
- ◆ Touching the inside of the bottle or cap.
- ◆ Rinsing the bottles removing preservatives.
- ◆ Using non-sterile bottles, opening sterile bottles too early, or improper type of bottle.
- ◆ Forgetting thiosulfate bottles for chlorinated samples.
- ◆ Overfilling BacT bottles, diluting or rinsing out sodium thiosulfate.
- ◆ Letting samples warm up; must remain at or below 10°C.
- ◆ Not documenting chlorine residual at the time of sampling.
- ◆ Not delivering BacT samples to the lab within required hold time.
- ◆ Not matching sample labels to the CoC form.

Sampling Procedure for BacT's

1. Prepare the Sterile Bottle

- Use only NMED-provided sterile BacT bottles containing sodium thiosulfate.
- Store bottles in a cool, dry place until needed
- Do **not** rinse or open the bottle before sampling
- Sodium thiosulfate neutralizes chlorine; a small white powder may be visible



2. Select an Appropriate Sampling Point

- a. Choose a sanitary, low-use tap free of attachments.
- b. Avoid kitchen sinks, outdoor faucets, or dripping taps
- c. Remove hoses, vacuum breakers, aerators, or any attachments
- d. Select a faucet used **least** to avoid plumbing contamination

3. Flush the Line

- a. Ensure the water represents the distribution system, not the building plumbing.
- b. Open the tap and let water run for several minutes
- c. Flushing clears stagnant water and brings in water from the main

4. Collect the Sample

- a. Maintain sterility and avoid contamination during collection.
- b. Remove the cap without touching the inside of the cap or bottle
- c. Do **not** aerate or splash water onto the outside of the bottle
- d. Fill carefully to the **shoulder** (≥ 100 mL) → do **not** overfill
- e. Leave an air bubble for mixing at the lab
- f. Never set the cap down; replace immediately after filling

5. Label and Store the Sample

- a. Proper identification and temperature control are required for valid results.
- b. Mark the bottle clearly for identification
- c. Refrigerate samples immediately after collection
- d. Keep samples cold until delivered to the lab (≤ 30 hours)

6. Key Points for BacT Sampling

- a. Use only sterile NMED bottles with thiosulfate
- b. Choose a sanitary, low-use tap with no attachments
- c. Flush several minutes to clear plumbing
- d. Maintain sterility: no touching, no splashing, no overfilling
- e. Fill to the shoulder; leave an air bubble
- f. Label immediately and refrigerate
- g. Deliver to the lab promptly to avoid SDWA violations

Special Samples (Caveat for BacT Sampling)

Not all BacT samples are compliance samples. Some are collected for operational or verification purposes. These must be clearly identified so they **do not count as violations** if they test positive.

Special samples include:

- | | |
|------------------------|---|
| ◆ New water lines | ◆ Wells that have been disinfected |
| ◆ Repaired water lines | ◆ Any investigative or troubleshooting sample |



How to mark them:

- ◆ Check “**Special Sample**” on the sample form
- ◆ Use the **Remarks** line to identify the type of sample (e.g., “new line,” “post-repair,” “post-chlorination,” “investigative sample”)

This prevents accidental compliance hits and ensures the sample is processed correctly by the lab.

Testing

Introduction

Testing is performed on-site by operators and off-site by accredited laboratories. Compliance testing is performed by certified labs using EPA-approved methods. All compliance testing **must use EPA-approved methods** and be analyzed by labs accredited by EPA and NMED. Operational testing is performed on-site using field meters and probes.

Most operational testing is performed by Level 3 and Level 4 operators. However, some operational testing using direct read instruments, such as pH, chlorine residual, and temperature, can be done by Level 2 operators. Testing includes:

- ◆ The EPA-approved method used to analyze the sample
- ◆ How the testing is performed
- ◆ What the results indicate and what actions may be required

Facility Types & Testing Responsibilities

Testing responsibilities depend on whether the facility uses an on-site lab or an off-site accredited laboratory.

Off-site laboratories

- ◆ Must be accredited and approved by EPA and NMED
- ◆ Perform compliance testing using EPA-approved methods
- ◆ Handle chemistry, metals, DBPs, VOCs/SOCs, and other regulated parameters
- ◆ Most New Mexico systems rely on off-site labs and are required to do so for BacT compliance
- ◆ Operators collect and ship samples; labs perform analysis

On-site laboratories

- ◆ Must follow National Environmental Laboratory Accreditation Program (NELAP) standards
- ◆ Do **not** have to be accredited unless performing compliance chemistry
- ◆ Very few on-site labs in New Mexico
- ◆ Most on-site labs are certified only for microbial testing (BacT)
- ◆ Operators or on-site analysts perform operational testing and limited compliance testing



Operator licensing considerations

- ◆ Certain testing methods require specific operator levels
- ◆ Most solution chemistry and process control testing is performed by Level 3 & Level 4 operators
- ◆ Lead and Copper (corrosion control) treatment is strictly Level WS4
- ◆ Level 2 operators may collect and ship compliance samples
- ◆ Level 1 operators may collect and ship samples **only if they hold a Water Sampling Technician license**

Testing method requirements

All testing, *on-site or off-site*, must follow:

- ▶ EPA-approved methods
- ▶ Proper sampling techniques
- ▶ Safety procedures
- ▶ Equipment identification and certification
- ▶ Documentation requirements
- ▶ Proficiency testing and QA/QC standards

Process control vs compliance

- ◆ Process control uses probes, test kits, and instrumentation
- ◆ Compliance testing follows strict regulatory methods under SDWA and NMED-DWB
- ◆ Compliance parameters are uniform nationwide

Compliance vs Operational Testing

Compliance testing is required by regulation and must be performed using EPA-approved methods by certified labs. These are the samples required for SDWA compliance, reporting legally defensible data, determining regulatory compliance, and triggering public notifications if needed. These include, but are not limited to total coliform rule samples, nitrate, nitrite, lead, copper, disinfection by-products (DBPs – TTHM/HAA5), arsenic, volatile organic compounds (VOCs), synthetic organic compounds (SOCs), fluoride, turbidity (for surface water systems).

Compliance testing must follow strict sampling protocols and must use correct bottles, use proper preservative method, and honor hold time limits. Compliance samples must maintain chain of custody, be analyzed by certified labs, and must be reported within regulatory deadlines or timelines.

Operational testing is performed by operators on-site to monitor treatment processes, adjust operations, and ensure the system is functioning properly. These are the samples required for daily process control, treatment adjustments, chemical dosing, troubleshooting, and operational decision-making. Some examples include chlorine residual (DPD), pH, temperature, dissolved oxygen (DO), turbidity (non-compliance checks), jar testing, chemical feed adjustments, filter performance checks, and distribution system checks.



Operational testing is performed in-house or on-site and does not require certified labs. It primarily uses field meters, probes, and colorimeters. The results guide operations, not regulatory reporting, but it still must follow good sampling practices, QA/QC protocols, and safety precautions.

Other Types of Testing

Confirmatory, repeat sampling, and triggered source sampling (GWR) are other types of testing usually triggered by a failed testing result.

Confirmatory testing is used when a compliance sample result is questionable or unexpected. It verifies whether the original result was accurate. It is used when a sample fails and the operator suspects contamination, a result is inconsistent with system conditions, a lab requests confirmation, and when NMED requests confirmation. Confirmatory testing needs the samples to be collected as soon as possible from the same location as the original sample, using the same method, bottle type, and same chain of custody requirements. It's main purpose is to confirm or rule out a violation

Repeat Sampling testing is required when a compliance sample fails or triggers additional monitoring. Repeat sampling testing is required when a total coliform sample is positive, a nitrate sample exceeds the MCL, a turbidity sample exceeds the limit, a lab reports a sample error, and when a sample is invalidated. It must follow rule timelines, use correct bottles and preservatives, be collected at required locations, be submitted to a certified lab. The results are used to determine the next actions required.

Triggered Source Sampling (GWR) is automatically activated when a routine distribution sample is positive for total coliforms and other conditions exist. It is required when a routine distribution sample is positive for total coliform, the system uses groundwater, the system did not provide 4-log disinfection at the entry point and is under the Ground Water Rule. When these conditions are met, additional source sampling is automatically triggered to ensure public health protection. A triggered source sample must be collected at each groundwater source, collected within the required timeframe (usually 24 hours), and analyzed by a certified laboratory. Triggered Source Sampling is used to determine whether the groundwater source itself is contaminated, and the results determine what corrective actions the system must take.

Methodologies

EPA and NMED are particular about which testing methods are used. Suppliers and chemical companies are always trying to improve methods and speed the processes up. Just because they say they are 'EPA Compliant' does NOT mean they are EPA approved. Violations are handed down for using methods not approved and reported data is nullified. For both on-site and off-site labs, the methodologies must come from the Code of Federal Regulation lists, which are updated (at most quarterly) as new methods are approved, and older methods are retired. For water, the approved methods are listed in 40 CFR 141.121 Subpart C - <https://www.ecfr.gov/current/title-40/part-141/subpart-C>



Understanding Maximum Contaminant Levels (MCLs)

MCLs are the **highest allowable concentrations** of regulated contaminants in drinking water under the Safe Drinking Water Act (SDWA). MCLs are established by EPA and enforced by NMED to protect public health, ensure safe drinking water, determine compliance, and trigger public notifications when exceeded.

MCLs apply to **compliance testing only**, not operational testing. Compliance samples must be collected correctly, use EPA-approved methods, be analyzed by certified labs, follow proper chain of custody, meet holding times and preservation requirements. MCLs define **pass/fail limits** for:

- ◆ Total Coliform ◆ Arsenic ◆ DBPs (TTHM/HAA5) ◆ Metals
- ◆ Nitrate/Nitrite ◆ Fluoride ◆ VOCs/SOCs ◆ Turbidity (SWS)

When in doubt, check the record:

40 CFR 141 Subpart F - Maximum Contaminant Levels Goals (MCLGs)

<https://www.ecfr.gov/current/title-40/part-141/subpart-F>

or the tables for National Primary Drinking Water Regulations

<https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations>

Other table terms include Maximum Residual Disinfectant Level (MRDL) and Treatment Technique (TT). Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million (PPM).

Water List of Primary Contaminants with Maximum Contaminant Levels (MCL) Table

INORGANIC CONTAMINANT	MCL (mg/L)	INORGANIC CONTAMINANT	MCL (mg/L)
Antimony	0.006	Lead	0.015 Action level**
Arsenic	0.01	Mercury	0.002
Asbestos	7,000,000 Fibers/L	Nitrate (as N)	10
Barium	2.0	Nitrite (as N)	1
Beryllium	0.004	Selenium	0.05
Cadmium	0.005	Thallium	0.002
Chromium (total)	0.1	Total Nitrate/Nitrite (as N)	10
Copper	1.3 Action level	Turbidity	0.3 NTU in 95% of samples
Cyanide (as free cyanide)	0.2		1 NTU maximum
Fluoride	2.0 Secondary MCL*		
	4.0 Violation		

*See Fluoride slide; discontinued 2000s

**Lead Drops to 0.01 effective November 01, 2027

Nickel appears in some older operator manuals because it was monitored under UCMR 1 and considered for future regulation. It does not have an EPA MCL and is not part of the National Primary Drinking Water Regulations.



Receiving Samples

For analysts and operators receiving samples that were not collected by themselves. This applies mainly to operational samples submitted to the lab being performed by an operator or on-site lab analyst.

Operators *can* collect and ship samples. Operators *do not* usually receive shipped samples. The exception to this rule is an operator who holds a lab certification or license. When samples arrive at the lab or facility, the analyst must verify that they are acceptable for testing.

All checks must be completed before the sample is processed.

Verify sample and paperwork

- ◆ Compare each sample to the Chain of Custody
- ◆ Confirm sample IDs match the CoC
- ◆ Sign and date the “received by” section

Check sample integrity

- ◆ Confirm tamper tape is intact, if required
- ◆ Inspect bottles for cracks, leaks, or broken seals
- ◆ Verify correct bottle type and preservative

Record required information

- ◆ Temperature at receipt
- ◆ Date and time collected
- ◆ Sample location
- ◆ Collector name
- ◆ Any field data provided

Verify compliance with method requirements

- ◆ Correct preservation
- ◆ Correct hold time
- ◆ Correct container
- ◆ Correct labeling

Rejection criteria

- ◆ A sample may be rejected if
- ◆ The bottle is broken or leaking
- ◆ The seal is missing or compromised
- ◆ The temperature is outside required limits
- ◆ The hold time has expired
- ◆ The wrong preservative or bottle type was used
- ◆ The sample does not match the CoC

Quality Control (QC) & Quality Assurance (QA)

QC and QA are part of the testing environment and ensure that results are accurate, reliable, and defensible. The purpose of QC/QA is to ensure operator accuracy, detects meter drift, prevents false high/low readings, supports reliable operational decisions, and confirms instruments respond correctly **after calibration and during use.**

QC vs QA

QC = Operator checks

- ◆ Duplicates
- ◆ Blanks
- ◆ Meter verification

QA = Laboratory controls

- ◆ Method validation
- ◆ Proficiency testing
- ◆ Certified standards (prepared)



*Operators perform **QC**, not **QA***

Calibration & Standards

- ▲ Calibration uses **traceable standards**
- ▲ QC confirms calibration was successful
- ▲ QC does **not** involve preparing standards

Duplicates

- ▲ Two measurements from the same sample
- ▲ Should be close
- ▲ Used for turbidity, chlorine, pH, conductivity

Blanks

- ▲ DI water or known clean water
- ▲ Should read zero/baseline
- ▲ Confirms meter is not contaminated

Equipment

Testing requires specific equipment to analyze samples accurately and maintain sample integrity from receipt through reporting.

Sample Containers & Preservatives

- ▲ Correct bottle type for each parameter
- ▲ Preservatives required for analysis (thiosulfate, nitric acid, etc.)
- ▲ Bottles must remain sealed until testing
- ▲ Coolers used to maintain $\leq 6^{\circ}\text{C}$ until analysis

Chain of Custody

- ▲ Required for all samples submitted for analysis
- ▲ Must match sample labels and receiving documentation
- ▲ Tracks sample handling from collection through testing

Field Meters & Instruments

- ▲ Used for operational testing and process control:
- ▲ Chlorine meters (DPD colorimeters)
- ▲ pH meters

Meter Verification

- ▲ Check meter against a known standard
- ▲ Before first use each day
- ▲ After unusual readings
- ▲ After battery changes or probe cleaning

Not Compliance QC

- ▲ Field QC is operational only
- ▲ Certified labs perform full QA/QC for compliance samples
- ▲ Operator QC supports **process control**, not regulatory reporting

- ▲ Turbidity meters
- ▲ Conductivity meters
- ▲ DO meters
- ▲ Temperature probes

Reagents

- ▲ DPD reagents for chlorine
- ▲ Buffer solutions for pH
- ▲ Calibration standards
- ▲ Turbidity standards
- ▲ Conductivity standards

Calibration & Field QC

- ▲ Daily calibration or verification before first use
- ▲ Use blanks, standards, and duplicates as required
- ▲ Document calibration and QC checks
- ▲ Replace reagents before expiration



Equipment for On-site Testing Labs

Operators perform process control testing in small on-site labs using bench-scale equipment and basic analytical instruments.

Bench-Scale / Jar Testing Equipment

- ♣ Used for coagulation, flocculation, and chemical dose optimization:
 - ♣ Jar test apparatus (multiple paddles)
 - ♣ Beakers and graduated cylinders
 - ♣ Pipettes and droppers
 - ♣ pH and alkalinity test kits
 - ♣ Turbidity meter
 - ♣ Stopwatch or timer

Spectrophotometry & Colorimetry

- ♣ Used for operational chemistry and process control:
 - ♣ Spectrophotometer or colorimeter
 - ♣ Reagent pillows or ampoules
 - ♣ Calibration standards
 - ♣ Cuvettes and sample cells
 - ♣ Wavelength selection controls
- ♣ Common parameters:
 - ♣ Fluoride
 - ♣ Iron/Manganese
 - ♣ Phosphate
 - ♣ Nitrate (screening only)
 - ♣ Chlorine (DPD)
 - ♣ Color

Local Bacteriological Testing (where certified)

- ♣ Only for systems with certified on-site microbiology labs:
 - ♣ Incubator
 - ♣ Autoclave
 - ♣ Sterile BacT bottles
 - ♣ Membrane filtration apparatus
 - ♣ Petri dishes and growth media
 - ♣ UV lamp for colony confirmation

*(Most NM systems do **not** have certified on-site BacT labs.)*

Fluoride Testing Equipment

- ♣ Used in fluoridated systems or systems monitoring natural fluoride:
 - ♣ Fluoride ion-selective electrode (ISE)
 - ♣ Calibration buffers
 - ♣ Total ionic strength adjustment buffer (TISAB)
 - ♣ pH meter
 - ♣ Magnetic stirrer

General Lab Equipment

- ♣ Used across all operational testing:
 - ♣ Analytical balance
 - ♣ Thermometer or temperature probe
 - ♣ Conductivity meter
 - ♣ DO meter
 - ♣ Glassware (beakers, flasks, cylinders)
 - ♣ Wash bottles
 - ♣ Distilled or deionized water
 - ♣ PPE (gloves, goggles, lab coat)



Safety & QA/QC

- ◆ Daily calibration or verification
- ◆ Proper reagent storage
- ◆ Cleaning and maintenance of lab instruments
- ◆ Expiration date checks
- ◆ Documentation of results

Direct Read:

An instrument that gives you the value and no calculations are necessary. Some examples include pH meter (no units), Dissolved Oxygen Probe (DO), mg/L, Temperature, °F or °C, and Chlorometer (Chlorine) mg/L. All direct read instruments must perform a calibration check prior to sampling every day before first use.

Be aware that not all procedures are approved by the EPA or NMWWA. EPA compliant DOES NOT mean approved. When in doubt, check the record. 40 CFR 141

Subpart C – Monitoring and Analytical Requirements.

<https://www.ecfr.gov/current/title-40/chapter-I/subchapter-D/part-141/subpart-C>

Equipment Certification

Meters, probes, thermometers, and analytical instruments must be checked, calibrated, and certified to ensure accurate and legally defensible results.

Certification

Instruments often come with a **manufacturer certification**. Certification can and should be **renewed annually**. This applies to equipment such as thermometers, incubators, ovens, water baths, and balances.

Logbooks

Each instrument should have its **own logbook**. Logbooks record maintenance, repairs, calibration dates, verification checks, issues or failures.

Equipment/Instrument Calibration

Calibration is the process of checking an instrument against a **known standard** to ensure accurate readings. Operators must calibrate or verify instruments **daily** using approved standards. Follow the **instrument manual** and recommended calibration procedures. Use **verified, traceable standards** (buffers, turbidity standards, chlorine standards, conductivity standards, certified weights), and replace standards when expired or contaminated.

Important: Preparation and verification of standards (normality checks, titrant standardization, reagent verification, etc.) are performed by **accredited laboratories** or operators who hold **laboratory analysis certifications or licenses**. These tasks are **not** part of operator duties. Equipment used daily (thermometers, incubators, ovens) must have **consistent records** to verify proper operation.



Calibration Requirements & Steps for Certain Equipment

Calibration frequency depends on the instrument and test being performed. Check with the equipment manual for calibration instructions and the method for the test being performed. Inspect membranes, probes, surface areas, storage solutions and batteries for cracks, dirt, fingerprints, low levels, etc. and replace where applicable. Record ALL calibration results where applicable.

Calibrated before EACH use pH meters, DO probes, colorimeters, desktop spectrophotometers, and balances.

Calibrated or verified daily turbidity meters, conductivity meters, chlorine meters (DPD), and temperature probes.

Recording Calibrations must be entered on bench sheets, equipment notebooks, and digital logs (if available). The records must show the standard used, result, date and time, and operator initials/signature.

pH Meters → Use **three buffer solutions**: 4.0, 7.0, 10.0 at the required temperature (usually 20°C). Follow the meter instructions (usually 2-point or 3-point calibration). Replace buffers monthly or when contaminated. Record in logbook.

Temperature Probes → Verify against a **NIST-traceable thermometer**. Record differences in logbook.

Chlorine Meters (DPD) → Verify using a **chlorine standard** (commercial OR prepared). Some plants prepare a **4.0 mg/L potassium permanganate standard**. Reading must match the standard within acceptable tolerance. Record in log book.

Turbidity Meters → Verify with **formazin** or **polymer standards**. Use 0 NTU, 1 NTU, and 10 NTU standards (depending on meter; see manual). Standards must be replaced before expiration. Record results on bench sheet or log book.

Conductivity Meters → Calibrate with a known **conductivity standard** (e.g., 447 $\mu\text{S}/\text{cm}$). Rinse probe with DI water before and after. Record differences in logbook.

DO Probes/Meters → Zero calibration using **sodium sulfite solution** or air calibration (100% saturation). Replace membranes as needed.

Colorimeters / Spectrophotometers → Verify wavelength using **certified standards**. HACH gel standards are **not valid** for EPA compliance. Use blanks to account for turbidity. Record in log book.

Balances → Must be checked using **at least two certified weights**. Using one weight near the **low end** of the balance range and one weight near the **high end** of the balance range. Used to check for **drift** and **linearity**. Record both readings in the logbook. If readings fall outside acceptable tolerance, **take balance out of service** and notify supervisor



Basic Water Testing Procedures

Chlorine Measurement

Total Residual Chlorine (TRC) = Free Chlorine (FCR) + Combined Chlorine (CCR)

Colorimetric test as Free or Total chlorine in mg/L

Field = operational

Lab = compliance

Entry point + distribution testing required

Testing must begin within 15 min of sampling

Amperometric Titration

Mainly used in laboratories

Equipment costs and training prohibitive

H₂S and methane will interfere

Colorimetric DPD

Most commonly used for testing

Laboratories use desktop spectrographs with matching cells

Pocket Colorimeters used in field operations

Free Chlorine (DPD 1)

Color: Pink (light → magenta)

Range: 0–10 mg/L (some up to 20 mg/L)

Used for most water testing

Total Chlorine (DPD 1 + DPD 3)

Color: Pink (light → magenta)

Range: 0–6 mg/L (most meters max out here)

Flash of dark color → high residual (>5 mg/L)

Used when chloramines are present

Process

Daily **calibration check** before first use

Use **blank** for turbidity

Inspect cells (dirt, scratches, cracks)

Fill cell to **10 mL**

Zero with blank

Add DPD

Wait reaction time

Read sample

Record result

Temperature Measurement

Basics

Required at entry point + distribution complaints

Affects pH, chlorine, DO, corrosion

Field = operational

Often measured with **DO or pH probe**

Testing must begin within 15 min of sampling

Use clean **plastic or glass** bottles

Verification

Compare to **NIST-traceable thermometer**

Record difference

Daily check recommended

Process

Immerse probe or aim infrared gun at center of sample

Wait for stable reading

Record temperature

Operator Notes

Temperature must be measured immediately

Must be performed when receiving samples in lab

Avoid metal containers (heat transfer changes reading)

Warm water lowers chlorine

Cold water increases DO

Temperature changes indicate tank turnover issues



pH Measurement

Basics

Measures acidity/alkalinity
Required at **entry point + distribution**
Field = operational
Lab = compliance
Temperature affects pH reading → **must measure at sample temperature**
Testing must begin within 15 min of sampling

Calibration

2-point or 3-point calibration
Buffers: **4.0 / 7.0 / 10.0**
Adjust buffers to proper temperature (20°C)
Replace buffers **monthly** or if contaminated
Daily calibration before first use
Rinse probe with DI water

Process

Inspect probe (cracks, salt bridge, dryness)
Fill beaker with sample
Rinse probe → blot dry
Immerse probe, slow stir if needed
Wait for stable reading
Record pH & Temperature
Clean probe after use

Operator Notes

pH must be measured immediately
No cooling
Use **clean plastic or glass** bottles
Avoid acid-washed bottles for field pH
pH drift = recalibrate
Temperature probe must be working
Do not store probe dry
Replace probe when response slows

Turbidity Measurement

Basics

Measures water clarity (NTU)
Required for **surface water** systems
Entry point + filter effluent
Distribution only for complaints
Field = operational
Lab = compliance

Hold Time & Bottles

Analyze immediately
If delayed: hold at $\leq 6^{\circ}\text{C}$ and test within **24 hours**
Use **clean plastic or glass** bottles
Avoid scratched or cloudy bottles (affects NTU)
Do not shake sample → creates bubbles

Calibration / Verification

Standards: **0 NTU, 1 NTU, 10 NTU**
Replace standards before expiration
Daily verification before first use
Use **matched cells**

Process

Inspect cells (clean, unscratched)
Fill cell → avoid bubbles
Wipe with lint-free cloth
Insert into meter
Read NTU
Record result

Operator Notes

Bubbles = false high
Dirty cells = false high
Filter spikes indicate breakthrough
Surface water operators must monitor turbidity closely



Conductivity Measurement

Basics

Measures dissolved ions ($\mu\text{S}/\text{cm}$)
Entry point + operational checks
Used for blending, corrosion, tank turnover
Field = operational

Hold Time & Bottles

Best measured **immediately**
If delayed: hold at $\leq 6^{\circ}\text{C}$ and test within **24 hours**
Cooling **allowed** (does not change dissolved ions)
Use clean **plastic or glass** bottles
Avoid scratched, dirty, or contaminated bottles

Calibration

Standard: **447 $\mu\text{S}/\text{cm}$**
Daily calibration
Rinse probe with DI

Process

Fill beaker
Rinse probe $\rightarrow$ blot
Immerse probe
Wait for stable reading
Record result

Operator Notes

High conductivity = high dissolved solids
Sudden changes indicate source blending issues

Dissolved Oxygen (DO)

Basics

Mainly for **groundwater wells**
Indicates oxidation potential
Temperature affects DO $\rightarrow$ **must measure at sample temperature**
Field = operational
Testing must begin within 15 min of sampling

Calibration

Follow manufacture's instructions
Elevation and barometric pressure affect calibration $\rightarrow$ **must be accounted for**
Zero with sodium sulfite
Air calibration (100% saturation)
Replace membranes as needed

Process

Rinse probe
Immerse in sample
Wait for stable reading
Record DO & temperature

Operator Notes

Analyze immediately
Do NOT cool (temperature changes DO solubility)
Use **narrow-mouth** bottles to reduce oxygen loss
Avoid bubbles when collecting sample
Avoid scratched or dirty bottles
Low DO $\rightarrow$ iron/manganese issues
High DO $\rightarrow$ corrosion potential



Fluoride

Basics

Entry point testing
Field = operational
Lab = compliance

Methods

SPADNS Colorimetric (operator method)

Original color: Red

Color change: **More fluoride = lighter color**

“Fluoride bleaches the SPADNS dye”

ISE (Ion-Selective Electrode)

(lab/compliance)

No color change

Requires **TISAB** buffer

The **SPADNS reaction** and **ISE electrode** both shift with temperature, so the **instrument** must be calibrated and used at a stable temperature.

Calibration

Daily calibration
Standards required
Temperature affects reading must be stable
Follow manufacturer instructions

Hold Time & Bottles

Analyze immediately

If delayed: hold at $\leq 6^{\circ}\text{C}$ and test within **24 hours**

Cooling **allowed** (fluoride does not volatilize)

Use clean **plastic or glass** bottles

Avoid acid-washed bottles for field SPADNS testing

Avoid dirty or contaminated bottles

Process (SPADNS)

Prepare sample
Add reagents (SPADNS)
Wait reaction time
Read result
Record fluoride & temperature

Process (ISE)

Add TISAB buffer
Immerse electrode
Wait for stable reading
Record fluoride & temperature

Operator Notes

Overfeed = violation

Operator Notes

Underfeed = ineffective

Keep chemicals fresh

SPADNS is **screening only**

ISE is **compliance**

Older manuals may list **0.2 mg/L** as a recommended minimum for fluoridation systems

the old “*optimal range*” was **0.7–1.2 mg/L** depending on climate

NOT an EPA regulatory limit

NOT in 40 CFR 141

Originated from pre-EPA Public Health

Service guidance

NM & CA **no longer use** 0.2 mg/L



Metals (Operator Screening & Compliance)

Basics

Metals (arsenic, chromium, copper, lead, etc.)
require **lab compliance testing**
Operator kits = **screening only**
Field tests help operators adjust treatment, not
meet compliance
Compliance metals use EPA-approved lab
methods

Sample Requirements

Preserve to pH < 2 using nitric acid (HNO₃)
Use clean **plastic or glass bottles**
Not light-sensitive
Not temperature-sensitive
Long hold times (varies by method)
Avoid contamination from DI or tap water

Operator Screening (Field Kits)

Colorimetric kits for iron, manganese, copper
Spectrophotometers for iron, manganese

Operator Screening (Field Kits)

Colorimetric kits for iron, manganese, copper
Screening only → not valid for compliance
Temperature affects reaction and absorbance
Reagents must be fresh

Compliance Testing (Lab)

ICP-MS / ICP-OES (EPA 200 series)
Accredited lab required
Chain-of-custody required
Field kits **not** EPA-approved for compliance

Operator Notes

Metals **MUST** be pH < 2
Wrong reagent = wrong test
Dirty or scratched cells = bad readings
Screening helps operators adjust treatment, not
meet regulatory limits

Nitrates & Nitrites (Operator Screening & Compliance)

Basics

Acute contaminant → immediate health risk
Must be tested at entry point
Field tests = **screening only**
Compliance requires EPA-approved lab
methods

Sample Requirements

No acid
Chill to ≤ 6°C immediately
48-hour hold time
Use clean plastic or glass bottles
Not light-sensitive
Temperature affects stability

Operator Screening (Field Kits)

Colorimetric kits for nitrate
Spectrophotometers for nitrate/nitrite

Operator Screening (Field Kits)

Screening only → not valid for compliance
Reaction time matters
Reagents must be fresh

Compliance Testing (Lab)

Ion Chromatography (IC) (EPA 300 series)
Accredited lab required
Chain-of-custody required
Field kits **not** EPA-approved for compliance

Operator Notes

Nitrates **MUST** be chilled
Nitrites degrade quickly
Wrong reagent = wrong test
Screening helps operators adjust treatment, not
meet regulatory limits



Jar Testing (Surface Water)

Basics

Determines coagulant dose
Used for turbidity reduction
Surface water only
Jar testing is **operational only** (no EPA method)

Hold Time / Bottle / Preservation

Analyze immediately
No bottle required (jar apparatus)
If transported:
 Use **clean plastic or glass** bottles
 Hold at $\leq 6^{\circ}\text{C}$ and test within **24 hours**

Method / Calibration

Jar tester does **not** require calibration
Turbidity must be performed **FIRST**
Turbidity must be read *within 15 minutes*
Instruments used during jar testing **must be calibrated**:
 Turbidity meter
 pH meter

Filter Checks (Surface Water)

Basics

Ensures proper filter performance
Surface water only
Operational testing (no EPA method)

Hold Time / Bottle / Preservation

Analyze immediately
No bottle required (on-site testing)
If raw water or effluent samples are transported:
 Use clean plastic or glass
 Hold at $\leq 6^{\circ}\text{C}$
 Test turbidity within 24 hours

Method / Calibration

No EPA method (operational only)
Turbidity must be performed **FIRST**
Turbidity must be read *within 15 minutes*

Process

Collect raw water
Measure in this order:
 1. Turbidity (within 15 minutes)
 2. pH & Temperature
 3. Alkalinity (if used)
 4. Dose selection
Add coagulant
Rapid mix $\rightarrow$ slow mix
Floc formation
Settle
Measure turbidity
Select best dose

Operator Notes

Raw water changes daily
Dose must match conditions
Turbidity spikes require adjustment
Overdose = pin floc
Underdose = weak floc

Instruments used during jar testing **must be calibrated**:

Turbidity meter
 pH meter

Flow rate verified using plant instrumentation

Parameters

Head loss
Filter rate
Turbidity spikes
Backwash performance

Process

Monitor turbidity (first, within 15 minutes)
Check filter rate
Measure pH & temperature
Inspect media (mudballs, channeling, cracks)
Evaluate backwash performance



Record data

Operator Notes

Breakthrough = immediate action

High head loss = dirty filter

Poor backwash = media issues

Rate changes can indicate hydraulic problems

Filters must be monitored continuously during high turbidity events

Understanding Results

Understanding the results of testing is part of the operator's QC responsibilities.

Operators must be able to interpret test results and correctly apply the proper action.

Operators Must Know:

Pass / Fail Determination

Whether the test has a regulatory pass/fail limit. Whether the result meets operational expectations. Whether the result indicates a process issue. What action(s) to take for a Fail test

Units of Measurement

- ▶ mg/L (chlorine, nitrate, fluoride)
- ▶ µg/L – metals (arsenic, lead, copper, chromium)
- ▶ NTU (turbidity)
- ▶ µS/cm (conductivity)
- ▶ pH (unitless)
- ▶ °C / °F (temperature)
- ▶ mg/L (DO)
- ▶ MPN/100 mL – total coliform (lab result)
- ▶ CFU/100 mL – total coliform (lab result, membrane filtration)
- ▶ pCi/L – radionuclides (gross alpha/beta, radium, uranium)

Regulatory Limits (Compliance)

- ▶ MCLs (arsenic, nitrate, fluoride, DBPs, metals)
- ▶ MRDL (chlorine)
- ▶ TT requirements (turbidity for surface water)
- ▶ Permit limits (groundwater, entry point requirements)
- ▶ What constitutes a violation

Operating Parameters (Process Control)

- ▶ Target chlorine residual
- ▶ Acceptable turbidity ranges
- ▶ pH operating window
- ▶ DO expectations for wells
- ▶ Conductivity trends for blending
- ▶ Filter performance indicators

Invalidated Tests

Tests may be invalidated because of the wrong bottle type, the wrong preservative, the hold time expired, the temperature was out of range, a contaminated sample, improper sampling technique, meter was not calibrated, or a QC failure (duplicate/blank mismatch)

What the Result Means

Does it indicate a treatment issue? Does it indicate a distribution issue? Does it indicate a sampling error? Does it require operational adjustment? Does it require resampling? Does it require reporting? Where do the results go?



Required Actions

Once the operator has interpreted the results, they must determine what action or actions are required.

If Results Are Acceptable

No corrective action is required. Record results in daily logs, bench sheets, SCADA notes. Enter results into the Monthly Operating Report (MOR). Submit MOR through SDWIS (or state reporting portal). File lab reports in system records. Continue normal operations. Maintain documentation for compliance.

Important Clarification

Labs report violations, NOT routine compliance results. **Operators report routine compliance results through MOR/SDWIS**. This is required by SDWA and NMED

If Results Are NOT Acceptable

Action is required. Operators must determine which of the following applies:

Pass / Fail Interpretation

Does the result exceed an MCL, MRDL, TT, or permit limit?

If YES → **take the following actions:**

- Notify supervisor
- Verify operational conditions (chlorine residual, turbidity, pH, equipment)
- Determine if resampling is required
- Determine if PN is required
- Document corrective actions
- Prepare for reporting (timelines handled on Reporting slide)
- NMED may require additional sampling
- NMED may require operational changes
- NMED may require engineering review (arsenic, radionuclides)
- NMED may require corrosion control (Lead & Copper)

Acute Violations (Immediate Action Required)

(E. coli, nitrate/nitrite, acute turbidity TT failure, pressure loss)

Operator Actions

- Notify supervisor immediately
- Verify chlorine residual at the site
- Inspect for line breaks, repairs, flushing
- Inspect pumps, injection, mixing equipment
- Check for low/no residual in the area
- Inspect sample tap
- Review sampling technique
- Collect required repeat samples
- Collect triggered source sample (GWR)
- Adjust operations immediately (dose, flush, backwash)
- Prepare Tier 1 PN
- Document corrective actions
- NMED may require alternative water
- NMED may require emergency operational changes
- NMED may issue emergency orders



Non-Acute Violations

(Arsenic, DBPs, fluoride, metals, radionuclides, non-acute turbidity)

Operator Actions

- Notify supervisor
- Review treatment operations
- Adjust dosage **only if operational conditions contributed**
- Prepare Tier 2 PN
- Follow NMED instructions
- Continue monitoring
- Document corrective actions
- NMED may require quarterly monitoring
- NMED may require corrosion control (Lead & Copper)
- NMED may require engineering review (arsenic, radionuclides)
- NMED may require operational changes if treatment is failing

Important: Non-acute violations do **NOT** require immediate resampling unless NMED requests it.

When to Resample

Resampling is required when a compliance sample fails, a sample is invalidated, a lab requests confirmation, NMED requests confirmation, a duplicate or blank fails QC, triggered source sampling is required (GWR), or operational anomalies occur (low chlorine, turbidity spike, pH drift).

Resamples must use correct bottles, use correct preservatives, meet hold times, be delivered to the lab before expiration, and follow chain of custody

When to Notify NMED

Operators notify NMED when field conditions indicate an imminent health risk, emergency conditions exist (pressure loss, boil advisory), and directed by NMED after a failed compliance result.

Labs notify NMED for compliance failures. Operators notify supervisors. All violations must be reported within 24 hours.

When to Issue Public Notice (PN)

Public notice is required when there are acute violations (E. coli, nitrate/nitrite), when there is a turbidity TT failure (surface water), when there is a loss of pressure or a boil water advisory is triggered, or as directed by NMED.

Public notice timelines follow the following tier schedules:

Tier 1: 24 hours

Tier 2: 30 days

Tier 3: Annual

When to Adjust Operations

Operational adjustments are required when chlorine residual is low, turbidity increases, pH drifts out of range, DO indicates well changes, conductivity changes (blending issues), filter breakthrough occurs, chemical feed issues arise, and when tank turnover problems appear.



Adjustments may include changing the chemical dose, flushing lines or tanks, backwashing filters, inspecting equipment, checking source water, or reviewing sampling technique

When a BacT Sample Fails

- ◆ Notify supervisor immediately
- ◆ Notify NMED withing 24 hours
- ◆ Verify chlorine residual at the sample site
- ◆ Check for recent line breaks, repairs, or flushing
- ◆ Check pumps, injection and mixing equipment for failures/break
- ◆ Check for low residual or no residual in the area
- ◆ Inspect sample tap for improper conditions
- ◆ Review sampling technique for errors
- ◆ Resample according to NMED and SDWA requirements

Reporting

Introduction

Reporting covers the required documentation and communication of water system performance under SDWA and NMAC 20.7.10.

Reporting includes:

- ◆ Required timelines for each parameter
- ◆ How and when to submit Monthly Operating Reports (MORs)
- ◆ Uploading MOR data to SDWIS (via NMED)
- ◆ Public Notification (Tier 1, Tier 2, Tier 3)
- ◆ Reporting violations and emergencies
- ◆ Record keeping and documentation
- ◆ Using laboratory results to verify compliance with health-based and aesthetic standards

Reporting is required by law, a proof of system performance, verification of compliance, and documentation for NMED and EPA review

Key Definitions & Acronyms

Action Level (Lead & Copper Rule)

Not an MCL. If exceeded → **Tier 2 PN**, follow-up sampling, corrosion control. **Action Level = triggers actions, not a legal limit like an MCL.**

Acute Violation

Immediate health risk. Requires **Tier 1 Public Notice within 24 hours**. Examples: E. coli, nitrate/nitrite, acute turbidity failure, pressure loss.



MCL → Maximum Contaminant Level

The **legal limit** for a contaminant in drinking water. Exceeding an MCL = **violation** → triggers reporting and Public Notice.

MCLG → Maximum Contaminant Level Goal

The **health-based goal** for a contaminant. Not enforceable. Used for risk assessment and treatment planning. **MCLG = ideal. MCL = legal limit.**

MRDL → Maximum Residual Disinfectant Level

Legal limit for disinfectant levels (chlorine, chloramine, chlorine dioxide). Exceedance = violation → Tier 2 PN.

This one is sometimes listed with a 'G' for Goal as well.

Monitoring/Reporting Violation

Failure to monitor, sample, or report correctly. Requires **Tier 3 Public Notice annually**.

Examples: missed samples, late reporting, incorrect forms.

Non-Acute Violation

Health-based violation that is **not** immediately dangerous. Requires **Tier 2 Public Notice within 30 days**. Examples: arsenic, DBPs, lead & copper AL exceedance, radionuclides.

PN → Public Notice

Required communication to customers when water quality or compliance is affected. Three tiers: **Tier 1 (24h), Tier 2 (30d), Tier 3 (annual)**.

TT → Treatment Technique

A required **process** instead of a numeric limit. Failure to meet a TT = violation. Examples: turbidity performance, CT disinfection requirements.

Trigger

An event that requires reporting, follow-up sampling, or public notification. Examples: positive coliform, nitrate exceedance, DBP exceedance, LCR exceedance, GWR triggered source sample, any acute MCL.

Reporting Tiers

Tiers used to define the urgency of the action required mainly for Public Notice reporting

Tier 1 → Acute (24 hours)

Immediate health risk

Requires rapid communication

Examples: E. coli, nitrate/nitrite, acute turbidity failure, pressure loss/boil advisory



Tier 2 → Non-Acute (30 days)

Health-based violation but not immediately dangerous

Requires timely communication

Examples: arsenic, DBPs, lead & copper AL exceedance, radionuclides, non-acute turbidity

Tier 3 → Informational (Annual)

Monitoring/reporting violations or secondary standards

Routine communication

Examples: SMCL fluoride, failure to monitor, failure to report

What Triggers Reporting

Positive coliform

Total coliform positive → repeat sampling required

E. coli positive → Tier 1 PN (24 hours)

Repeat sampling requires three consecutive negatives before returning to normal sampling and reporting

Lab reports to PWS & NMED

Operator reports violation to NMED

Nitrate exceedance

Above MCL (10 mg/L) → Tier 1 PN (24 hours) Lab reports to PWS & NMED

Operator reports violation to NMED

DBP exceedance (TTHM/HAA5)

Above MCL → Tier 2 PN (30 days)

Quarterly monitoring until running annual average (RAA) returns to compliance

LCR exceedance (Lead & Copper)

Above Action Level → Tier 2 PN (30 days)

Follow-up sampling required

Corrosion control actions required

GWR triggered source sample

Triggered when routine sample is positive

Source sample required within 24 hours

E. coli in source → Tier 1 PN (24 hours)

Any acute MCL

E. coli

Nitrate/Nitrite

Acute turbidity TT failure

Loss of pressure / boil advisory → All require Tier 1 PN (24 hours or immediate)



Well rehab, construction, or permit changes

Any modification to a well or treatment system → notify NMED

Any construction affecting water quality → reporting required

Any permit change → reporting and documentation required

Population changes

Population increase or decrease → update system classification

May change monitoring schedules, sampling frequency, and reporting requirements

Reporting Timelines

Acute Violations → Tier 1 (24 hours)

E. coli → report within 24 hours

Nitrate/Nitrite → report within 24 hours

Acute turbidity TT failure (surface water) → report within 24 hours

Loss of pressure / boil water advisory → report immediately

Non-Acute Violations → Tier 2 (30 days)

Arsenic → notify NMED within 24 hours, PN within 30 days

DBPs (TTHM/HAA5) → PN within 30 days

Lead & Copper AL exceedance → PN within 30 days

Radionuclides → PN within 30 days

Non-acute turbidity (surface water) → PN within 30 days

Non-Acute Violations → Tier 3 (Annual)

Fluoride above SMCL (2.0 mg/L) → annual PN

Monitoring/reporting violations → annual PN

Follow-up Monitoring Requirements

Arsenic → quarterly until back in compliance

Radionuclides → quarterly until back in compliance

DBPs → quarterly until RAA returns to compliance

Metals (Lead & Copper) → follow-up sampling as directed (usually 60–90 days)Corrosion

control actions → required

Fluoride above MCL (4.0 mg/L) → Tier 2 PN within 30 days

Reporting Chain

Lab → PWS

PWS → NMED & Public if notice is required

NMED → EPA

Lab Reporting Requirements

Violations → within 24 hours to system and NMED

Routine compliance results → within rule timelines



Labs upload **ONLY** BacT results through Lab-to-State.

All other compliance results go into the MOR through PWS.

Operator Reporting Requirements

Emergencies → immediately

Violations → within 24 hours

Public Notices →

 Tier 1 (24h)

 Tier 2 (30d)

 Tier 3 (annual)

Routine compliance results → review immediately

Operational testing results

MOR → monthly submission to SDWIS

All reports should be:

 Reported to supervisors

 Documented in hard copy format

BacT Sample Form Requirements

The BacT sample form from NMED is a **reporting document** that combines sample identification, chain of custody, field data, and reporting information. Every BacT sample must have a **complete and accurate form**. Missing information can cause **rejections, delays, or compliance errors**.

Required fields:

 System name, address, and PWS ID

 Location of sampling site

 Date and time collected

 Type of water (raw or treated)

 Chlorine residual at time of sampling

 Computer ID number (lab tracking)

 Name of operator collecting the sample

Why this matters (Reporting)

The form acts as **CoC plus field data plus reporting record**. Labs use the form to enter results into **SDWIS**. Operators use the form to verify **RTCR compliance**. NMED uses the form to confirm **sampling accuracy**. Incorrect or incomplete forms can invalidate results



Monthly Operating Reports (MORs)

What goes in

- Daily operational data
- Entry point chlorine
- Distribution chlorine
- Turbidity (surface water)pH, temperature, flow rates
- Chemical/physical compliance results
- Operational notes (flushing, repairs, outages)Follow-up actions for violations
- Any deviations from normal operation
- Documentation of emergencies or pressure loss
- All data required by NMED for monthly review

Deadlines

- MORs are due **monthly**
- Submitted through SDWIS by the PWS
- Labs upload **ONLY BacT** results through Lab-to-State
- All other compliance results → included in the MOR
- Operators must review lab results immediately to ensure MOR accuracy

Who receives them

- MOR submitted to SDWIS through the NMED state portal
- NMED reviews MORs for compliance
- Supervisors must receive copies
- MORs must be retained on-site for inspection

Common operator mistakes

- Missing daily data
- Illegible handwriting
- Not documenting operational changes
- Forgetting to record chlorine residuals
- Not including follow-up actions
- Incorrect units (mg/L vs ppm)
- Rounding errors
- Not reviewing lab results before submission
- Assuming the lab uploads everything (they do NOT)
- Failing to keep **hard copy** records

**Record keeping requirement****If it isn't written down, it didn't happen.**MORs must be documented in **hard copy format**

All reports must be provided to supervisors

All records must be retained for NMED/EPA review

*Example of a Monthly Operating Report (MOR) Summary**(Surface Water System Example)*

- ◆ **Note:** There is **no single standard MOR template**
- ◆ Each system's report varies depending on source type, treatment process, and parameters required by NMED.
- ◆ This example shows a **surface water MOR summary**, including:
 - ◆ Combined Filter Effluent (CFE) turbidity tracking
 - ◆ Individual filter monitoring questions
 - ◆ Entry point and distribution residual disinfectant concentrations
 - ◆ Monthly averages and exceedance checks

Monthly Operating Reports (MORs) Summary			
(for surface water system use)			
Year:	2006	PWS Name:	
Month:	July	Facility Name:	
Combined Filter Effluent (CFE) Turbidity			
Number of samples required			Number of samples taken
Number of samples exceeding 1 NTU			
Number of samples exceeding 0.3 NTU			
Highest single turbidity reading NTU			Monthly average turbidity NTU
Individual Filter Effluent Turbidity			
1)	Was each filter continuously monitored for turbidity?	Yes	No
2)	Was each filter's monitoring results recorded every 15 minutes?	Yes	No
3)	Was there a failure of the continuous turbidity monitoring equipment?	Yes	No
*4)	Was any individual filter turbidity level > 1.0 NTU in two consecutive measurements?	Yes	No
*5)	Was any individual filter turbidity level > 0.5 NTU in two consecutive measurements at the end of 4 hours of operation after the filter has been backwashed or otherwise taken offline?	Yes	No
*6)	Was any individual filter turbidity level > 1.0 NTU in two consecutive measurements in each 3 consecutive months?	Yes	No
*7)	Was any individual filter turbidity level > 2.0 NTU in two consecutive measurements in 2 consecutive months?	Yes	No
*NOTE: If you answer "Yes" to any of the questions 4 through 7 above, follow-up action is required. See 15A NCAC 18C.2007 for required actions. Corrective actions must be explained on the MOR entitled "Individual Filter Monitoring Report." If you answer "No," you do not have to include the Individual Filter Monitoring Report as part of your MOR submittal.			
Entry Point Residual Disinfectant Concentration			
Disinfectant Used		Number of samples required	Number of samples taken
Number of samples under 0.2 mg/L if using chlorine or under 2.0 mg/L if using chloramine			
Distribution Residual Disinfectant Concentration			
Number of samples required		Number of samples taken	
Number of samples under 0.004 mg/L, without any detectable level, where HPC is = 500 mL			



Summary

Today's class reviewed the Need-to-Know (NTK) criteria for Water Supply Level 1 & 2 operators. Lead and Copper, Disinfection, and SDWA are covered in other classes.

◆ Sampling Procedure

- ◆ Identifying representative sample locations
- ◆ Proper sampling technique and contamination prevention
- ◆ Required paperwork and chain of custody
- ◆ Types of sampling (grab, composite, flow-weighted)
- ◆ Preservation, labeling, and shipping requirements

◆ Testing

- ◆ On-site operational testing for process control
- ◆ Off-site compliance testing using certified labs
- ◆ EPA-approved methods and hold times
- ◆ Understanding results and required actions
- ◆ Distinguishing operational vs. compliance data

◆ Reporting

- ◆ Required timelines for acute and non-acute violations
- ◆ Public Notice tiers (Tier 1 → 24 h, Tier 2 → 30 d, Tier 3 → annual)
- ◆ Monthly Operating Reports (MORs) submission through SDWIS
- ◆ Record keeping and documentation of system performance
- ◆ Reporting = Record Keeping → Record Keeping = Writing It Down

◆ Key Takeaway

- ◆ Accurate sampling, testing, and reporting protect public health, verify system performance, and ensure compliance with **SDWA and NMAC 20.7.10**.

If it isn't written down, it didn't happen.



Practice Exam

Choose the best answer.

1. Representative sampling means collecting samples that reflect the entire system, not just one point.
 - a. True
 - b. False
2. Which of the following is a compliance sample?
 - a. Chlorine residual
 - b. pH
 - c. Nitrate
 - d. Temperature
3. Which sample type must be tested within 15 minutes?
 - a. Metals
 - b. Dissolved oxygen
 - c. VOCs
 - d. Nitrate
4. Chain of Custody must include which of the following?
 - a. Operator's home address
 - b. Weather conditions
 - c. Who collected the sample
 - d. Customer complaint history
5. BacT bottles should never be rinsed before sampling.
 - a. True
 - b. False
6. Which of the following is NOT allowed for compliance sampling?
 - a. Sample taps
 - b. Hoses
 - c. Customer faucets
 - d. Entry points
7. Operational testing results are used for regulatory reporting.
 - a. True
 - b. False
8. Which sample requires zero headspace?
 - a. VOCs
 - b. Metals
 - c. Fluoride
 - d. Conductivity
9. Which parameter is calibrated with 0 NTU, 1 NTU, and 10 NTU standards?
 - a. pH
 - b. Turbidity
 - c. DO
 - d. Conductivity
10. Which of the following is part of avoiding contamination?
 - a. Using hoses
 - b. Touching inside of bottle caps
 - c. Using sterile bottles
 - d. Sampling hot water
11. Grab samples represent conditions only at the moment they are collected.
 - a. True
 - b. False



12. Which license can sign MORs?
- a. Water Sampling Technician
 - b. Water Supply Operator
 - c. Laboratory Analyst
 - d. Field Technician
13. Which sample type is assembled over time?
- a. Grab
 - b. Composite
 - c. Hot water
 - d. Aerator sample
14. Which is part of proper shipping?
- a. Freeze samples
 - b. Use absorbent padding
 - c. Leave cooler unsealed
 - d. Mix bottles horizontally
15. Samples preserved with acid must be adjusted to pH < 2.
- a. True
 - b. False
16. Which sample requires cooling to $\leq 6^{\circ}\text{C}$ (typically 4°C) and preserved with acid?
- a. Alkalinity
 - b. Residual disinfectant
 - c. Fluoride
 - d. Metals
17. Which is a compliance test?
- a. DO
 - b. Temperature
 - c. Lead
 - d. Jar testing
18. Which is an operational test?
- a. Arsenic
 - b. Free chlorine residual
 - c. VOCs
 - d. SOC
19. Chlorine residual samples must be tested immediately.
- a. True
 - b. False
20. Which item is required for sampling?
- a. Aerator
 - b. Garden hose
 - c. Cooler with ice
 - d. Hot water tap
21. Iron samples require which preservation?
- a. pH > 12
 - b. pH < 2
 - c. No preservative
 - d. Zero headspace
22. Which is part of representative sampling rules?
- a. No aerators
 - b. Use hot water
 - c. Use hoses
 - d. Use swivel faucets
23. Improper sampling technique can trigger unnecessary public notifications.
- a. True
 - b. False



24. Which parameter is measured in $\mu\text{S}/\text{cm}$?
- a. Turbidity
 - b. Conductivity
 - c. DO
 - d. Fluoride
25. Which parameter uses a probe with a membrane for testing?
- a. Dissolved oxygen
 - b. Turbidity
 - c. pH
 - d. Fluoride
26. Which sample type is used for DO, pH, turbidity, and chlorine residual?
- a. Grab
 - b. Composite
 - c. Hot water
 - d. Aerator sample
27. Which is part of equipment certification?
- a. Calibration
 - b. Freezing probes
 - c. Using expired reagents
 - d. Ignoring manufacturer instructions
28. Which is a reason sampling matters?
- a. To create public panic
 - b. To monitor system performance
 - c. To avoid paperwork
 - d. To eliminate CoC
29. Which is a reason reporting matters?
- a. To delay public information
 - b. To maintain public confidence
 - c. To avoid sampling
 - d. To reduce operator workload
30. Which is required on a BacT form?
- a. Sample location
 - b. Operator's home address
 - c. Mayor's name
 - d. Weather conditions
31. Which is part of a CoC?
- a. Why the sample was collected
 - b. Operator's birthday
 - c. Customer complaint history
 - d. Weather conditions
32. Which parameter is measured with the SPADNS method?
- a. DO
 - b. Fluoride
 - c. Conductivity
 - d. Turbidity
33. Which sample must be analyzed within 48 hours?
- a. Residual disinfectant
 - b. Metals
 - c. Nitrate
 - d. Fluoride
34. MCLs are the _____ of regulated contaminants in drinking water under the SDWA.
- a. Lowest allowable concentrations
 - b. Parasites
 - c. Bacterial colonies
 - d. Highest allowable concentrations



35. Which is part of avoiding contamination after sampling?
- a. Leave bottles in sunlight
 - b. Seal bottles immediately
 - c. Shake bottles vigorously
 - d. Remove labels
36. Which is part of proper BacT sampling?
- a. Removing thiosulfate
 - b. Rinsing the bottle
 - c. Flushing line for several minutes
 - d. Sampling hot water
37. Which is part of proper labeling?
- a. Operator's home address
 - b. Type of Water
 - c. Customer's birthdate and time
 - d. Weather conditions
38. Which is part of proper shipping?
- a. Freeze samples
 - b. Use absorbent padding
 - c. Leave cooler unsealed
 - d. Mix bottles horizontally
39. Which parameter requires follow-up monitoring every quarter until back into compliance after an MCL exceedance trigger?
- a. Arsenic
 - b. Temperature
 - c. DO
 - d. Turbidity
40. Which of the following uses IC for compliance testing and field kits for operational testing?
- a. Nitrite and nitrate
 - b. VOCs
 - c. SOC's
 - d. Turbidity
41. Jar testing is used for which process?
- a. Surface water treatment
 - b. Groundwater treatment
 - c. VOC removal
 - d. Fluoride adjustment
42. Filter checks are used for which purpose?
- a. Head loss and backwash performance
 - b. VOC testing
 - c. Metals testing
 - d. Nitrate removal
43. MORs must be submitted how often?
- a. Monthly
 - b. Weekly
 - c. Annually
 - d. Quarterly
44. A Water Sampling Technician can interpret compliance results.
- a. True
 - b. False
45. Which license can adjust treatment?
- a. WST
 - b. WSO
 - c. Customer
 - d. Courier



46. Which is part of testing responsibilities?
- a. Adjusting clocks for time changes
 - b. Delivering samples
 - c. Signing MORs
 - d. Interpreting compliance results
47. Which is part of understanding results?
- a. MCLs define pass/fail limits
 - b. MCLs apply to operational testing
 - c. MCLs are optional
 - d. MCLs are determined by the operator
48. Which is part of required actions?
- a. Ignore failed results
 - b. Follow reporting timelines
 - c. Delay corrective actions
 - d. Skip repeat sampling
49. Which is part of Reporting Tiers?
- a. Tier 1 = acute
 - b. Tier 1 = non-acute
 - c. Tier 2 = acute
 - d. Tier 3 = immediate health risk
50. Which triggers reporting?
- a. Positive BacT
 - b. Correct chlorine residual
 - c. Proper tap selection
 - d. Correct bottle type
51. Which is required for special BacT samples?
- a. Mark "Special Sample"
 - b. Use hot water
 - c. Remove thiosulfate
 - d. Skip labeling
52. Which is part of Reporting Timelines?
- a. Acute violations require immediate notification
 - b. Acute violations can wait 30 days
 - c. Non-acute violations require immediate notification
 - d. MORs are optional
53. Drinking water quality compliance data are reported as required by:
- a. Safe Drinking Water Act (SDWA)
 - b. NMDWB regulations NMAC 20.7.10
 - c. Federal regulations 40 CFR 141-143
 - d. All of the above
54. Which is NOT a part of compliance sampling and testing?
- a. Uses EPA-approved methods
 - b. Testing must be at a certified lab
 - c. Holding times are first come first serve
 - d. Requires chain of custody
55. Which is part of equipment calibration?
- a. Follow manufacturer instructions
 - b. Ignore calibration logs
 - c. Use expired standards
 - d. Skip calibration
56. Which is part of QA/QC?
- a. Proficiency testing
 - b. Ignoring method requirements
 - c. Skipping documentation
 - d. Using unverified equipment



57. Which is part of an off-site facility testing responsibilities?
- a. Labs are responsible for entering MORs
 - b. Labs must be accredited
 - c. Labs may use non-EPA approved methods
 - d. Labs may ignore hold times
58. How many resamples are required when routine BacT is positive?
- a. Any 3 negatives out of five resamples
 - b. Three consecutive positive resamples
 - c. 3 consecutive negative resamples
 - d. The next negative resample
59. Which is part of operator reporting responsibilities?
- a. Issue public notifications
 - b. Interpret compliance results
 - c. Adjust treatment
 - d. Upload MOR data to SDWIS
 - e. All of the above
 - f. None of the above
60. A flow-weighted composite sample requires 6 grab samples with flows of: 4.3, 6.4, 9.4, 7.6, 8.4, and 8.0 MGD. Final volume = 1000 mL. What is the aliquot volume for the 9.4 MGD grab?
- a. 145.2 mL
 - b. 172.4 mL
 - c. 181.4 mL
 - d. 213.2 mL



Answer Key

1. a. True
2. c. Nitrate
3. b. Dissolved oxygen
4. c. Who collected the sample
5. a. True
6. b. Hoses
7. b. False
8. a. VOCs
9. b. Turbidity
10. c. Using sterile bottles
11. a. True
12. b. Water Supply Operator
13. b. Composite
14. b. Use absorbent padding
15. a. True
16. d. Metals
17. c. Lead
18. b. Free chlorine residual
19. a. True
20. c. Cooler with ice
21. b. $\text{pH} < 2$
22. a. No aerators
23. a. True
24. b. Conductivity
25. a. Dissolved oxygen
26. a. Grab
27. a. Calibration
28. b. To monitor system performance
29. b. To maintain public confidence
30. a. Sample location
31. a. Why the sample was collected
32. b. Fluoride
33. c. Nitrate
34. d. Highest allowable concentrations
35. b. Seal bottles immediately
36. c. Flushing line for several minutes
37. b. Type of Water
38. b. Use absorbent padding
39. a. Arsenic
40. a. Nitrite and nitrate
41. a. Surface water treatment
42. a. Head loss and backwash performance
43. a. Monthly
44. b. False
45. b. WSO
46. d. Interpreting compliance results
47. a. MCLs define pass/fail limits
48. b. Follow reporting timelines
49. a. Tier 1 = acute
50. a. Positive BacT
51. a. Mark "Special Sample"
52. a. Acute violations require immediate notification
53. d. All of the above
54. c. Holding times are first come first serve
55. a. Follow manufacturer instructions
56. a. Proficiency testing
57. b. Labs must be accredited
58. c. Three consecutive negative resamples
59. e. All of the above
60. d. 213.2 mL
$$Q_{Total} = \Sigma_{MGD}$$
$$= 6.4 + 4.3 + 9.4 + 7.6 + 8.4 + 8.0 = \underline{44.1 \text{ MGD}}$$
$$f = V_{Total} \div Q_{Total} = 1000 \div 44.1 = \underline{22.68}$$
$$mL_t = Q_t \times f$$
$$mL = 9.4 \times 22.68 = 213.192 = \boxed{213.2 \text{ mL}}$$