

NMED Drinking Water Bureau



Microbiological Sampling Requirements Summary for Ground Water Systems under both the Total Coliform Rule (TCR) & Ground Water Rule (GWR)

October 5, 2009

The following DWB guidance has been compiled from various EPA guidance documents.

TABLE OF CONTENTS

TABLE OF CONTENTS.....	2
I. Background Information.....	3
What has changed from the Total Coliform Rule?	3
What is the Ground Water Rule?	3
How does the GWR Impact the Total Coliform Rule (TCR) Sampling Requirements?	3
II. Collecting T.C./E.Coli samples for TCR & GWR.....	4
Sampling Location	4
Sample Containers	4
Sample Collection Procedures	5
III. Sequential Rule Provisions & Sampling Frequencies	6
1. TCR Routine Sample Collection Requirements:	6
2. TCR Repeat Sample Collection Requirements:.....	7
3. GWR Treatment Technique Compliance Monitoring Requirements (when PWS's treatment is approved by DWB):	8
4. GWR Triggered Source Water Monitoring (for all other groundwater sources):	9
5. GWR Additional Source Water Monitoring (i.e. - source water repeat samples):	9
6. GWR Assessment Source Water Monitoring (for special studies at high risk PWSs):	10

I. Background Information

What has changed in the Total Coliform Rule?

Changes have not been made to the Total Coliform Rule (TCR) at this point. Routine and repeat sampling requirements will remain the same and all approved TCR sampling plans will continue to be utilized by public water systems (PWSs). The New Mexico Water Conservation Fee will continue to fund routine sample analysis and repeat samples will be paid for by the PWS.

What is the Ground Water Rule?

The U.S. Environmental Protection Agency (EPA) published the Ground Water Rule (GWR) on November 8, 2006. One goal of the GWR is to provide increased protection against microbial pathogens, specifically bacterial and viral pathogens, in public water systems (PWSs) that use ground water. Instead of requiring disinfection for all ground water sources, the GWR establishes a risk-targeted approach to identifying ground water sources that are susceptible to fecal contamination. The GWR requires systems with ground water sources at risk of microbial contamination to take corrective action to protect consumers from harmful bacteria and viruses. Monitoring is a key element of this risk targeted approach.

There are two types of monitoring required by the GWR:

Source Water Monitoring: *Triggered* source water monitoring is used to determine if fecal contamination is present in the ground water source. Triggered source water monitoring is required for any PWS that has a positive total coliform result under the Total Coliform Rule (TCR) routine sampling and does not provide and monitor for 4-log treatment of viruses as approved by the state. Alternatively, states may require PWSs with sources that seem susceptible to fecal contamination to conduct **assessment** source water monitoring. Since this sampling at the source is only required when “triggered” or a problem is identified, these samples will not be paid for by the NM water conservation fee, but will be collected and analyzed at the cost of the PWS.

Compliance Monitoring: Systems that notify the state that they provide and monitor for 4-log treatment of viruses and have had their treatment plans approved by DWB are required to conduct treatment technique compliance monitoring under the GWR. Since this sampling is a requirement to monitor PWS treatment techniques, it will not be funded by the NM Water Conservation Fee and will be collected and analyzed at the cost of the PWS.

For the GWR, PWSs must have an approved 4 Log treatment and conducting compliance monitoring or will be regulated under the triggered source water monitoring **beginning December 1, 2009.**

How does the GWR Impact the Total Coliform Rule (TCR) Sampling Requirements?

The TCR is still implemented and enforced by the Drinking Water Bureau (DWB) in the same way. This rule addresses pathogens found in the distribution of a public water

system. The GWR addresses potential pathogens in the source water of a public water system, which in terms of sampling requirements, becomes mandatory as a consequence of a problem or concern with microbial pathogens already impacting the distribution of a water system. The only cross over between rules is that a PWS with a population less than 1000 has the option of the required fourth repeat sample to be taken at the source and have that sample count towards both rule requirements. Water systems will have the opportunity to develop a GWR sample siting plan to submit to DWB if they do not have 4 log treatment. This plan will show that multiple sources can be sampled at a representative entry point prior to treatment in the case of triggered source water monitoring.

II. Collecting T.C./E.Coli samples for TCR & GWR

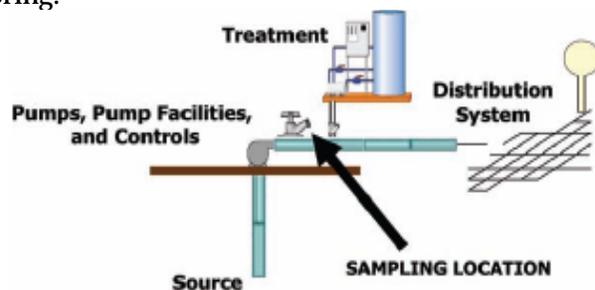
Sampling Location

TCR:

- Total Coliform Rule samples should be collected from rotating locations throughout the distribution as described by the PWS specific sampling plan that has been approved by the State.

GWR:

- For both triggered source water monitoring and assessment source water monitoring, samples must be collected at the ground water source **before treatment**. **PWSs may be required to put in sample taps before treatment in order to comply with the GWR.**
- Other sampling locations, such as entry points before treatment combining wells from the same aquifer, can be approved by the State through the submittal of a GWR sampling plan.
- PWSs should install a sample tap at each source to enable source water monitoring.
- The diagram below represents an appropriate sampling location for source water monitoring.



Sample Containers

- ▶ Samples should be collected in sterile, plastic or glass containers with a leak-proof lid. Generally in New Mexico these are provided by the laboratory analyzing the sample.
- ▶ The GWR requires PWSs conducting source water monitoring to analyze at least a **100 mL sample volume**. However, EPA recommends that the PWS collect and ship more than 100-mL of sample to ensure that a minimum of 100 mL is available for analysis (see below).
- ▶ The sample containers should be large enough to allow at least **1-inch of headspace** to facilitate mixing of the sample by shaking prior to analysis.

▶ Sample volume and container size recommendations for samples of various types are provided below.

E. coli and Enterococci Samples:

▶ NMED DWB has decided that E.Coli will be the fecal indicator for compliance samples under both rules.

▶ **Sample volume:** At least **120 mL** of sample should be collected to ensure sufficient volume for sample analysis is available in the event of spillage at the laboratory.

▶ **Container Size:** The capacity of sample containers should allow at least a **1-inch headspace** to facilitate mixing of the sample by shaking prior to analysis.

Sample Collection Procedures

Gloves and hand washing:

▶ When collecting samples from a ground water source, individuals should wash their hands before collecting samples and if possible wear **gloves** (latex, etc.).

Records:

▶ All samples taken should be recorded in an on-site **sample log book** or on a **sample collection form** if it is to be sent to a laboratory for analysis. Sample log books and sample collection forms should contain the following information:

- Name of system and Public Water System Identification number
- Sample site location and ID number**
- Sample type (routine, repeat, repeat source and distribution, special distribution, source, repeat source, special source)
- Sampler's name and certification number
- Sample number
- Date of sample collection
- Time of sample collection
- Analysis requested
- Any repeat samples must also have the sample ID of the positive routine samples tied to it.

** It is essential that source water samples have a sample site ID number in order for the source sample location to be uploaded to the database with the result.

Water tap and service line:

▶ **Water taps** used for sampling should be free of aerators, bubblers, strainers, hose attachments, mixing type faucets, and purification devices. The flow of water out of the tap should be adjusted so the water will not splash out when the sample is collected. The tap should be cleaned and flushed.

▶ The **service line** should be cleared before sampling by maintaining a steady water flow for at least two minutes (or until the water changes temperature).

Collecting samples:

▶ Using **aseptic technique** (i.e., sanitize tap, do not touch the inside of the sample container), the individual taking the sample should fill the sample containers, leaving at least 1-inch of headspace.

Cap and label the container:

▶ Immediately following sample collection, the sampler should tighten the sample container lid.

▶ The system name, sampler's name, sample number, sample type, date and time of sample collection, sample location, and analysis requested should be recorded on the sample container.

▶ **IMPORTANT:** If the sample will not be shipped off-site for analysis immediately, the sample should be placed upright in a refrigerator to maintain the sample at a temperature of < 8°C prior to shipment. If a refrigerator is unavailable, the sample should be insulated in some other manner or put on ice to keep it cool.

Packaging:

▶ If the samples will be analyzed at a laboratory that is off-site, the water system should contact the laboratory as soon as possible (preferably prior to sampling) so that the laboratory can be prepared with the appropriate media.

▶ As soon as the sample has been collected, labeled and capped, the sample should be packaged in a shipping cooler or foam box that is used exclusively for this purpose.

▶ The cooler should be double lined with plastic (i.e., with trash bags) and contain ice (wet ice in ziplock bags, gel packs, or blue ice). The GWR recommends keeping samples below **10°C**.

▶ The signed and dated sample collection form should be included with the sample.

▶ The lid of the cooler should be securely sealed and the joints of the container should be sealed with duct tape.

▶ If the package is being shipped, a copy of the airbill or shipping record should be kept by the ground water system.

▶ Packages should be sent priority overnight so that the arrangements for transport and shipping-time from collection to analysis does not exceed **30 hours** as required by the GWR.

Chain-of-Custody:

Sample collectors and laboratories should follow applicable State regulations pertaining to chain of custody procedures, since it is necessary to have an accurate written record to trace the possession and handling of samples from collection through reporting.

▶ This procedure includes:

•• Field records of sample collection (sample collection form),

•• Label or standardized tag on the sample container(s),

•• Package sent to lab with chain-of-custody record form, pertinent field records, and analysis request form (generally in NM these are all on one lab form).

▶ The procedure used by the water system and the laboratory should be documented.

▶ **Every person** who takes custody of the sample should fill in the appropriate section of the chain of custody record. See EPA's *Manual for the Certification of Laboratories Analyzing Drinking Water: Criteria and Procedures Quality Assurance (Fifth Edition)* for more information.

II. Rule Provisions & Sampling Frequencies

(Presented in the order of sample collection requirements.)

1. TCR Routine Sample Collection Requirements:

▶ Total coliform samples must be collected at sites which are representative of water quality throughout the distribution system according to a written sample siting plan subject to state review and revision.

▶ Samples must be collected at regular time intervals throughout the month except groundwater systems serving 4,900 persons or fewer may collect them on the same day.

▶ Monthly sampling requirements are based on population served (see following table for the minimum sampling frequency).

► A reduced monitoring frequency may be available for systems serving 1,000 persons or fewer and using only ground water if a sanitary survey within the past 5 years shows the system is free of sanitary defects (the frequency may be no less than 1 sample/quarter for community and 1 sample/year for non-community systems).

► Each total coliform-positive routine sample must be tested for the presence of fecal coliforms or *E. coli*.

****Consequences of a positive ROUTINE TCR result:****

- 1) If any routine sample is total coliform-positive, **repeat samples (# 2 below) are required.**
- 2) A positive ROUTINE or REPEAT total coliform result **requires a minimum of five ROUTINE samples be collected the following month** the system provides water to the public unless waived by the state.
- 3) After any positive ROUTINE sample, **the PWS is also required to comply with the Compliance Monitoring provision (#3 below) of the GWR if the system’s 4-Log treatment has been approved by the State, or if not approved, the Triggered Source Water Monitoring provision (# 4 below) of the GWR will be applied.**

Public Water System ROUTINE Monitoring Frequencies					
Population	Minimum Samples/ Month	Population	Minimum Samples/ Month	Population	Minimum Samples/ Month
25-1,000*	1	21,501-25,000	25	450,001-600,000	210
1,001-2,500	2	25,001-33,000	30	600,001-780,000	240
2,501-3,300	3	33,001-41,000	40	780,001-970,000	270
3,301-4,100	4	41,001-50,000	50	970,001-1,230,000	300
4,101-4,900	5	50,001-59,000	60	1,230,001-1,520,000	330
4,901-5,800	6	59,001-70,000	70	1,520,001-1,850,000	360
5,801-6,700	7	70,001-83,000	80	1,850,001-2,270,000	390
6,701-7,600	8	83,001-96,000	90	2,270,001-3,020,000	420
7,601-8,500	9	96,001-130,000	100	3,020,001-3,960,000	450
8,501-12,900	10	130,001-220,000	120	≥ 3,960,001	480
12,901-17,200	15	220,001-320,000	150		
17,201-21,500	20	320,001-450,000	180		

*Includes PWSs which have at least 15 service connections, but serve <25 people.

2. TCR Repeat Sample Collection Requirements:

► Within 24 hours of learning of a total coliform-positive ROUTINE sample result, at least 3 REPEAT samples must be collected and analyzed for total coliforms:

1. One REPEAT sample must be collected from the same tap as the original sample.
2. One REPEAT sample must be collected within five service connections upstream.
3. One REPEAT sample must be collected within five service connections downstream.
4. Systems that collect 1 ROUTINE sample per month or fewer must collect a 4th REPEAT sample. **PWSs with a population <1000 may collect this 4th REPEAT sample at the source to satisfy a source sample required by the GWR, Triggered source Water Monitoring provision (# 4 below).**

► ****If any REPEAT sample is total coliform-positive: ****

1. The system must analyze that total coliform-positive culture for fecal coliforms or *E.coli*.
2. The system must collect another set of REPEAT samples, as before, unless the MCL has been violated and the system has notified the state.

3. **GWR Treatment Technique Compliance Monitoring Requirements (when treatment is approved by DWB):**

If any PWS discontinues any DWB approved treatment under this provision, they will be subject to the Triggered Source Water Monitoring provision of the GWR (# 4 below).

Compliance Monitoring Requirements for Chemical Disinfection at PWSs Serving 3,300 or Less

- ▶ PWSs using chemical disinfection and serving 3,300 or fewer persons must monitor for the **residual disinfectant concentration** and meet the **State specified** minimum concentration at or before the first customer.
- ▶ PWSs must monitor on a **daily** basis and collect a grab sample during the hour of peak flow or at another time specified by the State. If any daily grab sample is less than the minimum disinfectant residual concentration, the system must take follow-up samples **every four hours** until the residual meets or exceeds the State-specified minimum concentration. These systems also have the option to monitor **continuously**. If the PWS monitors continuously, the system must meet the monitoring requirements for PWSs serving greater than 3,300 persons (see below).
- ▶ PWSs must monitor at a State-approved location.

Compliance Monitoring Requirements for Chemical Disinfection at PWSs Serving Greater than 3,300 Persons

- ▶ PWSs using chemical disinfection and serving greater than 3,300 persons that conduct compliance monitoring must monitor for the **residual disinfectant concentration** and meet the **State specified** minimum concentration at or before the first customer.
- ▶ PWSs of this size must monitor **continuously** and record the lowest residual disinfectant concentration each day that water from the ground water source is served to the public.
- ▶ PWSs must monitor at a State-approved location.

Failure of Continuous Monitoring Equipment

- ▶ In the event of equipment failure for continuous monitoring, provisions are available for all PWSs serving greater than 3,300 persons and PWSs serving 3,300 persons or fewer who opt to monitor continuously.
- ▶ If there is a failure in continuous monitoring equipment, the ground water system must **conduct grab sampling every four hours** until the continuous monitoring equipment is returned to service.
- ▶ The system must resume continuous residual disinfectant monitoring **within 14 days**.

Compliance Monitoring Requirements for Membrane Filtration

- ▶ PWSs that use membrane filtration systems to achieve 4-log virus treatment to meet GWR requirements must:
 1. Operate the process in accordance with State-specified compliance requirements.
 2. Monitor the membrane filtration process in accordance with all State-specified monitoring requirements.
 3. Verify that the integrity of the membrane is intact.
- ▶ The **frequency** and **location** of samples for systems conducting membrane filtration will be determined by the State.

Compliance Monitoring Requirements for Alternative Treatment

► PWSs that use alternative treatment systems to achieve 4-log virus treatment to meet GWR requirements must:

1. Operate the process in accordance with State-specified compliance requirements.
2. Monitor the process in accordance with State-specified monitoring requirements.

Compliance Monitoring and Validation Testing for Ultraviolet (UV) Disinfection

► PWSs using UV disinfection as an alternative technology to meet GWR requirements should:

1. Monitor for UV intensity, as measured by a UV sensor, flow rate and UV lamp status and any additional State-specified parameters.
2. Verify the calibration of UV sensors, and recalibrate in accordance with a State-approved protocol, at least monthly.

► UV reactors should undergo validation testing to determine the operating conditions under which the reactor delivers the UV dose corresponding to the virus log removal credit received. See “Ultraviolet Disinfection Guidance for the Final Long Term 2 Enhanced Surface Water Treatment Rule” (http://www.epa.gov/ogwdw/disinfection/lt2/pdfs/guide_lt2_uvguidance.pdf) for more information.

4. GWR Triggered Source Water Monitoring (for all other groundwater sources):

Collecting and Analyzing Triggered Source Water Monitoring Samples

When triggered source water monitoring is required, PWSs must:

► Collect at least one ground water source sample from each source in use at the time the total coliform-positive sample was collected. This is being interpreted by the EPA as one source sample from each source in use **per** positive result from the distribution sample set. Therefore if there were two positive Total Coliform results and three wells, two source water samples are required at each well.

1. Samples must be collected within 24 hours of being notified of the total coliform-positive sample (unless the 24-hour limit is extended by the State).
2. Sample must be taken before treatment or at a State-approved location after treatment.

► Ensure all samples are analyzed for the presence of a fecal indicator (*E. coli*) using an approved GWR method. If a fecal indicator-positive source sample is invalidated by the State, the PWS must collect another source water sample within 24 hours of being notified by the State of the sample invalidation using an approved method. See the “Analytical Methods Approved for the Ground Water Rule” at <http://www.epa.gov/safewater/methods/analyticalmethods.html>.

5. GWR Additional Source Water Monitoring (source water repeat samples):

► If the initial triggered source water sample is fecal indicator-positive, and the State does not require corrective action in response, PWSs must conduct additional source water monitoring.

1. PWSs must collect five additional source water samples (from the source(s) that contained the original fecal indicator positive samples) within 24 hours of being notified of the fecal indicator-positive sample.
2. The additional samples must be tested for a fecal indicator using an approved GWR method.

▶ ****If any one of the five additional samples is fecal indicator-positive, the system must take corrective action. ****

▶ If any additional sample is found to be fecal indicator-positive but is subsequently invalidated by the State, the PWS must resample for the same fecal indicator within 24 hours of being notified of the invalidation.

Note: If the PWS is a wholesale system, it must notify all consecutive systems served by a source of any fecal indicator positive samples from that source within 24 hours of being notified of the sample result.

6. GWR Assessment Source Water Monitoring (special studies for high risk PWSs):

This is a provision that gives New Mexico the ability to target high risk PWSs for additional monitoring. DWB will make determinations on these assessments and subsequent required sampling on a case by case basis.