Commonwealth of the Northern Mariana Islands
OFFICE OF THE GOVERNOR
Division of Environmental Quality

Coliform Monitoring Plans

Guidance for CNMI Public Water Systems

CNMI Division of Environmental Quality
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Table of Contents

Part 1 - General Information Regarding Coliform Monitoring Plans

What is a *Coliform Monitoring Plan*?

A *Coliform Monitoring Plan* is a tool for public water systems (PWS) to identify the best points to collect coliform samples required under the CNMI Drinking Water Regulations [§2141.21(a)]. These requirements are sometimes referred to as the *Total Coliform Rule* in the U.S. Federal Regulations. The purpose of routine coliform sampling is to assure that the water delivered to all users meets drinking water microbiological standards. It is essential that the entire system be routinely monitored since coliform contamination can occur anywhere in the system.

The plan specifies where in the distribution system *routine samples* will be collected in order to ensure that they are "representative" of the water supplied to every user. Representative samples that accurately reflect the quality of the finished water are crucial because, if coliforms are in the water supply, they may not be found uniformly throughout the distribution system. The sampling plan also designates repeat sampling sites to be used if a sample collected from a routine sampling point tests positive for coliforms. Remember, the purpose of sampling is not to draw "clean" samples, but to identify any coliform contamination so it can be dealt with promptly.

The size and complexity of the plan will depend upon the structure and composition of the water system itself.

Do I need to have a *Coliform Monitoring Plan* for my water system?

Every type of public water system (community, non-transient non-community and transient non-community) must have a *Coliform Monitoring Plan*.

Both local (CNMI Drinking Water Regulations §2141.21) and Federal (40 CFR 141.21) regulations require all public water systems to *"...collect total coliform samples at sites which are representative of water throughout the distribution system according to a written sample siting plan."*

In addition, CNMI Drinking Water Regulations require the plan to *"...be written in accordance with Division guidance..."* (using this document), and *"... submitted to the Director for approval."*

Once the *Coliform Monitoring Plan* is developed and approved by DEQ, will I ever have to modify it?

Your *Coliform Monitoring Plan* should be updated annually or more frequently (for example, if there is a change in your distribution system, sample site locations or sampling personnel).

If it is necessary to change a sampling site, a written request must be submitted to DEQ within 30 days of the change, indicating the reason for the change and the location of the new site to be substituted. DEQ must review and approve the change in writing.

What are the components of a *Coliform Monitoring Plan*?

There are two major components to a CNMI *Coliform Monitoring Plan*. The first is a series of *Descriptive Tables* that describe important information pertaining to the water system in general, the distribution system(s) utilized by the PWS, and the rotation of coliform sample sites. The second component is a *Sample Site Location Map* that displays the location of all coliform sample sites. Part 3 of this document describes in detail how the two components of a *Coliform Monitoring Plan* should be developed.

Part 2 - Important Concepts in Developing Your Coliform Monitoring Plan

What are the different types of coliform samples?

Routine Samples are collected from the distribution system on a monthly basis. The number of samples collected depends upon the population served and the number of *independent distribution systems*, or in the case of bottled water companies, the configuration of the distribution system. An increased number of *routine samples* are required for small systems the month following a positive coliform result. All *routine samples* are included in compliance calculations.

Repeat Samples are required within 24 hours of learning of a positive coliform result. Three or four *repeat samples* must be collected for each positive coliform sample. *Repeat samples* must be collect at the original site of the positive *routine sample*, five service connections upstream of the original site and five service connections downstream of the original site. If a fourth *repeat sample* is required, it can be collected anywhere in the distribution system. All *repeat samples* are included in compliance calculations.

Special Samples are collected to verify the effectiveness of disinfection after construction, repair or remediation of any component of the water system. *Special samples*, collected from water that is **not** being served to the system's water users, are **not** included in compliance calculations. If samples are collected to verify disinfection from water that is being served to the users, those samples must be reported as either *routine* or *repeat samples*.

Replacement Samples are collected to replace *routine*, *repeat* or *special samples* when the original sample has been rejected or invalidated by the laboratory. *Replacement samples* count towards compliance if they replace *routine* or *repeat samples*.

When should I schedule the collection of coliform samples?

If you collect only one or two *routine samples* per month in any distribution system, you should schedule your samples to be collected early in the month (e.g., the first or second week). By doing so, you can avoid unexpected situations later in the month that could delay you from collecting samples and possibly result in a failure-to-monitor violation.

In addition, if you collect samples late in the month that are coliform positive and that result in a Maximum Contaminant Level (MCL) violation, you will want to perform remediation to address the contamination. If that remediation fails, you run the risk of collecting additional positive coliform *routine*

samples in a new month that could put your system in violation for a second month in a row. Additional positive samples collected in the same month as the original violation will not result in a new violation.

If you collect several *routine samples* per month in any distribution system, or if you are collecting a minimum of 5 *routine samples* due to a positive coliform sample the previous month, you should spread the sample collection over the month (e.g., two samples the first week, two the second, and one the third). Spreading the samples out over time is more protective of public health as sampling is performed on a more frequent basis.

It can also save you money. If you collect all 5 *routine samples* at one time, and they are all coliform positive, you will have to collect 15 *repeat samples* within 24 hours (for a total of 20 samples in that distribution system that month). If the *routine samples* were spread over time, 2 positive *routine samples* the first week would require 6 *repeat samples* within 24 hours. If the contamination was remediated, only 3 additional *routine samples* would be required (for a total of 11 samples that month). At $50 per sample, that's a $450 savings.

Finally, if you do not chlorinate on a continuous or daily basis, **you should not collect routine samples within 7 days from the last time you chlorinated**. Again, the purpose of sampling is not to collect "clean" samples, but to identify any coliform contamination to which your users might be exposed. Collecting samples a short time after chlorination may result in samples with no coliform growth. However, it is not protecting the health of your customers, workers and guests if the samples do not truly reflect the quality of the water to which your users are normally exposed.

What are *independent distribution systems* and how do they affect my monitoring requirements?

In the CNMI, many public water systems rely on multiple sources of water to meet their drinking, washing, sanitation, industrial and agricultural needs. The sources for this water may include one or more wells, rainwater collection, or the purchase of water from another water system. Sometimes the waters from different sources are combined before entering a distribution system. Other times, mainly due to differences in water quality and the final use of the water, these different sources are not combined and each source has its own distribution system. This guidance uses the term *independent distribution systems* to describe water distribution systems that are not interconnected to each other and that, therefore, routinely have different qualities of water flowing through them.

All *independent distribution systems* that supply water for any *human consumption* purpose must be monitored under the *Total Coliform Rule*. Each distribution system is treated separately in order to assure that all consumers are adequately protected from potential bacterial contamination. A water system that, based on population served, is required to take one sample per month, must collect one sample per month from each *independent distribution system* that serves water for *human consumption* purposes.

If a positive coliform sample occurs, the required *repeat samples* must all be collected from the *independent distribution system* that had the positive result. The minimum 5 samples that must be collected the next month following a positive sample must also be collected from the same distribution system that originally had the positive result. This sampling is in addition to the *routine samples* required from the other *independent distribution systems* of the water system.

Do I need to monitor all independent distributions systems?

As mentioned above, only distribution systems that serve water for *human consumption* purposes need to be monitored under the *Total Coliform Rule*. Human consumption includes drinking, bathing, showering, cooking, dishwashing, and maintaining oral hygiene. If distribution systems supply water **solely** for purposes such as laundry machines or agricultural use, those distribution systems do not need to be monitored for bacterial quality as long as there are no locations where users could potentially access the water for other purposes.

How should I select my Sample Sites?

Sampling sites specified in the sampling plan should be carefully selected throughout the distribution system to represent the varying conditions that occur there. It is especially important to identify and include in the sampling plan areas that may adversely affect the microbiological quality of the water. Factors to consider when selecting sample sites on your *Sample Site Location Map* should include those listed below. You must target a representative number of sample sites where you anticipate bacteriological quality may be poor.

- The location and type of water sources, treatment facilities, storage tanks, pressure stations, and service connections
- The location of dead-end pipes, main and branch lines, loops, and other aspects of the piping system's configuration
- The location of cross connection hazards and shared connections
- Areas of low water pressure and slow water movement
- Areas where positive pressure is not continually maintained
- Areas where pipeline location/connections are not definitively known
- Areas that are not continuously disinfected

What if I don't have enough sample sites?

What if you don't have an adequate number of sample sites in any *independent distribution system* to collect 4 *repeat samples* within 24 hours or 5 *routine samples* the month following a positive result?

Water systems with very small distribution systems or with no distribution systems (e.g., bottled water companies) will likely not have an adequate number of individual sample sites to collect 4 *repeat samples* within 24 hours. If this is your situation, your *Coliform Sampling Plan* should clearly indicate where and when you will collect your *repeat samples*. The CNMI Drinking Water Regulations allow a system with a single service connection to collect a set of *repeat samples* over a four-day period.

If you have a limited number of sample sites in your distribution system and you are required to collect 5 *routine samples* the month following a positive result, you should not collect all 5 samples in one day. If you did collect them all on one day, and all 5 of them were coliform positive, you would not have enough individual sample sites (15 would be needed) to collect the required number of *repeat samples*. Therefore, if you have less than 15 sample sites in an *independent distribution system*, your *Coliform Monitoring Plan* must describe how you will spread out the collection of your samples over the month when you are required to collect 5 *routine samples* the month following a positive result.

Are there taps or faucets I should avoid when collecting coliform samples?

In addition to carefully choosing sample sites, the actual water tap from which samples will be collected should be carefully evaluated. Some sample taps are actually the cause of positive coliform samples and should be avoided (or replaced) because the purpose of routine coliform sampling is to determine the quality of the water in the distribution system. Some examples of **undesirable** sample taps are:

- Swivel-type faucets that have a single valve for hot and cold water
- Faucets that have leaky packing material around the stem
- Faucets that supply areas, such as janitorial or commercial sinks, where bacterial contamination is likely
- Faucets close to or below ground level.
- Faucets that point upward
- Faucets that have threads on the inside of their spouts
- Faucets that have aerators (If such faucets are to be used, the aerators must be removed before a sample is collected.)

Multiple sample taps that are joined together (e.g., a number of faucets in a long sink or wash area) **do not** count as multiple sample sites. Together, they represent one sample site. When collecting a coliform sample from such a site, DEQ recommends documenting the tap number (e.g., 3rd tap from left) in the comments section of the sample form.

Part 3 - Components of a Coliform Monitoring Plan

This part of the guidance document describes how to develop your *Coliform Monitoring Plan*. There are two components to the Plan:

- A Sample Site Location Map
- Numerous Descriptive Tables

The *Sample Site Location Map* accurately displays the distribution system(s) and the location of all coliform sample sites. In most cases, your *Sample Site Location Map* should be drawn prior to developing your *Descriptive Tables*. *Descriptive Tables* describe important information pertaining to the water system in general, its distribution system(s), and the rotation of its coliform sample sites.

Use the tables in Appendix A when you are ready to put your plan together. Your PWS ID Number and the date the plan was prepared must appear on every page of the document. The instructions that follow will assist you in developing both components of your *Coliform Monitoring Plan*.

Sample Site Location Map

A system schematic, distribution system map, engineering drawing (as-built) or a hand-drawn sketch must be submitted that clearly displays the entire water system (from water sources to the ends of the distribution system). The map does not need to be "to scale" or be professionally developed, but it must plainly identify the location of the items listed below. In addition, a person looking at the map must be

able to clearly distinguish between *independent distribution systems*. For complex maps, color-coding or some other form of clarification may be helpful.

- All sources of water
- Every distribution system
- Location of dead-end pipes, main and branch lines, loops, and other aspects of the piping system's configuration
- Service connections
- Treatment facilities (identify treatment)
- Storage tanks and reservoirs
- Pressure-reducing stations
- Booster pumps
- Pressure zones
- Interconnections and critical valves
- Hydrant locations
- Location of blow-offs/flushing points
- Areas of low water pressure and slow water movement
- Areas where positive pressure is not continually maintained (i.e., areas not supplied with 24-hour water)
- **Coliform sample sites**
- Point-of-entry-to-the-distribution-system sample sites
- Other designated sample sites

In addition, the map must be identified with:

- ❑ PWS Name
- ❑ PWS ID Number
- ❑ Name of the person who developed the map
- ❑ Date the map was drawn
- ❑ North arrow
- ❑ Legend for any symbols used

Descriptive Tables

Descriptive Tables must provide complete, accurate and current information about your coliform samplers, plan development, distribution systems, sources of water, uses of the water, coliform sample sites and their rotation.

Table 1 - Administrative Information

Public Water System Name				**PWS ID Number**
Populations Served	# of Residents	# of Non-Transients	# of Transients	Total #
Administrative Contact	Name	Title		Phone Number
Primary Sampler	Name	Title		Phone Number
Backup Sampler #1	Name	Title		Phone Number
Backup Sampler #2	Name	Title		Phone Number
If coliform sample collection is contracted to an independent contractor:				
Company Name	CNMI Business License #	Primary Contact		Phone Number

Administrative Information (Table 1)

Enter your **Public Water System Name** and **PWS ID Number** (assigned by DEQ).

Enter the **Populations Served** for each of the three categories defined below:

Residents: Number of individuals who live or sleep year-round at all facilities served by the water system.

Non-Transients: Number of individuals who work each day (total, all shifts) at all facilities served by the water system or the number of students/teachers each day at the facility. Do not include individuals who are already counted under "Residents."

Transients: Average number of customers, guests, or visitors each day.

Total: Sum of all three categories.

The **Administrative Contact** is the primary contact of the water system for DEQ and the name should match the information on file at DEQ. The Division needs written notice whenever the Administrative Contact is changed, as this person will receive all official DEQ correspondence.

Provide information on the **Primary Sampler** who is responsible for routinely collecting coliform samples. Every water system should have at least one additional **Backup Sampler** who can serve as support if the primary sampler is unavailable to collect samples.

If your PWS uses a **contractor** to collect coliform samples, provide the information requested.

Table 2 - Sample Plan Information

Plan Development	Person who developed/revised this plan (Print/Signature)	Developed/Revised Date
Plan Location	This Coliform Monitoring Plan will be kept at	
DEQ Approval	DEQ Reviewer (Print/Signature)	Approval Date

Sample Plan Information (Table 2)

The **individual who developed** or revised the *Coliform Monitoring Plan* should **print** their name and then **sign and date** the document. A person familiar with the characteristics of the source water, the system's treatment and storage facilities, and the distribution system should do the initial preparation, as well as the maintenance of the sample plan.

Indicate the **location** where the *Coliform Monitoring Plan* will be kept by the water system. It should not be filed away never to be seen again, or left to gather dust on some shelf. It should be kept in a location where the water system operator can easily find it and refer to it.

DEQ must review and approve you plan after it is developed and every time it changes.

Table 3A - Identification of Independent Distribution Systems

Dist. Sys. Identifier	Distribution System Name	Uses of Water	Coliform Sampling Required? How many per month?	

Continued on Table 3B

Table 3B - Sources & Treatment of Independent Distribution Systems

Dist. Sys. Identifier	Disinfection Practices (see below)		Water Source(s)
	Type	Frequency	

Disinfection Types

Chlorine Gas	Ozone
Chlorine Granular/Tablets	Ultraviolet Light
Chlorine Liquid	Other (specify)

Disinfection Frequency

Continuous
Daily
Weekly
Monthly
Occasionally

Identification of Independent Distribution Systems (Tables 3A & 3B)

List every water distribution system that serves your facility, even if you purchase the water (e.g., from CUC) or if it is not used for human consumption purposes.

Enter a **Distribution System Identifier** that uniquely identifies each distribution system (e.g., DS01, DS02, etc.).

Enter a **Distribution System Name**. The name should reflect the source of the water (e.g., Well #1 System, CUC System, etc.) or the ultimate use of the water (Laundry System, RO System, etc.).

Describe all the **Uses of Water** for that distribution system (e.g., drinking, cooking, washing, sinks, toilets, showers, boilers, agriculture, etc.).

Enter YES or NO as to whether **Coliform Monitoring** is **Required** (it is required if any of the water is used for human consumption purposes). If it is required, enter the number of samples that are required each month.

Enter the **Type of Disinfection** used on that distribution system (if any) and the **Frequency of Disinfection**.

Finally, enter the **Water Source(s)** for this distribution system (e.g., Well #2, CUC, Building A Roof Catchment, etc.).

Table 4 - Monthly Rotation of Coliform Sample Sites

Sample Location ID#	Sample Location Description	Month of Year												Upstream Sample Location ID#	Downstream Sample Location ID#	Elsewhere Sample Location ID#
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC			
Distribution System Name (ID):														**Number of Samples Collected Monthly:**		

Rotation of Coliform Sample Sites (Tables 4)

A separate table or section must be created for each *independent distribution system*. Enter the **Distribution System Name** from Table 3 and enter the **Number of Samples Collected Monthly** from that distribution system. The minimum number of samples required is found in the regulations and is based on the population served by the water system, or in the case of bottled water companies, by the configuration of the distribution system. However, DEQ advises that additional samples beyond the required minimum number be collected in order to better protect the health of your water users.

Enter a unique **Sample Location ID#** for each coliform sample site. Do not use a Sample Location ID# that DEQ has previously assigned to another sample site of your water system (e.g., wellhead, entry point to the distribution system, etc.). For Sample Location ID#'s, use the format XXXYY where XXX represents the last 3 digits of your PWS ID and YY is an incremental number (e.g., 01, 02, 03, etc). **DEQ strongly recommends that all sample sites be clearly labeled at the actual sample location using paint, hanging tags, adhesive labels or any other means that identifies the site.**

Enter a **Sample Location Description** for each coliform sample site. The description must clearly specify the location of the sample site so that anyone could find the site without a map. Do not say "Men's Bathroom." Instead, say "Bldg C, 2nd fl., Men's bath."

Enter an "**X**" under the month or months that coliform samples will be collected from that sample site. The number of X's in any one column should equal the "Number of Samples Collected Monthly" as displayed on the table (described above).

Enter the Sample Location ID# of the **upstream, downstream and elsewhere sample sites** where *repeat samples* will be collected if the monthly/quarterly *routine sample* is coliform positive.

Bottled water companies must identify each truck/trailer that hauls bulk drinking water and each bulk retail water tank that they deliver water to as a sampling location in their plan.

Table 5 - Sample Collection Schedules

Distribution System Name (ID):		
Routine Samples	**Sample Collection Schedule:**	
Repeat Samples	**Number of Repeat Samples Required:**	
	Sample Collection Schedule:	
Additional Routines	**Number of Additional Routines Required:**	
	Sample Collection Schedule:	
	Sample Site Locations:	

Sample Collection Schedules (Table 5)

Routine Samples

Sample Collection Schedule – Describe when *routine samples* will be collected each month or quarter (e.g., "the first Monday of each month," or "2 samples the first week and 2 samples the second week of each month").

Repeat Samples

Number of Repeat Samples Required – State the number of *repeat samples* that will be collected in this distribution system whenever a *routine sample* is coliform positive. [Usually 3 or 4 *repeat samples*, as per the Drinking Water Regulations.]

Sample Collection Schedule – Describe when the *repeat samples* will be collected. [Usually within 24 hours of notification of the positive sample, except for distribution systems with single service connections.]

Additional Samples

Number of Additional Routines Required – State the number of additional samples that will be collected the month following a positive coliform sample.

Sample Collection Schedule – Describe when the additional samples will be collected.

Sample Site Locations – List or describe at which *Samples Site Locations* the additional samples will be collected (i.e., in addition to the sites that are already scheduled for collection that month, per Table 4).

Appendix A - Coliform Monitoring Plan Descriptive Tables

Coliform Monitoring Plan

Administrative Information (Table 1)

Public Water System Name				**PWS ID Number**
Populations Served	# of Residents	# of Non-Transients	# of Transients	Total #
Administrative Contact	Name	Title		Phone Number
Primary Sampler	Name	Title		Phone Number
Backup Sampler #1	Name	Title		Phone Number
Backup Sampler #2	Name	Title		Phone Number
If coliform sample collection is contracted to an independent contractor:				
Company Name		CNMI Business License #	Primary Contact	Phone Number

Sample Plan Information (Table 2)

Plan Development	Person who developed/revised this plan (Print/Signature)	Developed/Revised Date
Plan Location	This Coliform Monitoring Plan will be kept at	
DEQ Approval	DEQ Reviewer (Print/Signature)	Approval Date

Identification of Independent Distribution Systems (Table 3A)

Dist. Sys. Identifier	Distribution System Name	Uses of Water	Coliform Sampling Required? How many required each month?	

Continued on Table 3B

Sources & Treatment of Independent Distribution Systems (Table 3B)

Dist. Sys. Identifier	Disinfection Practices (see below)		Water Source(s)
	Type	Frequency	

Disinfection Types

Chlorine Gas	Ozone
Chlorine Granular/Tablets	Ultraviolet Light
Chlorine Liquid	Other (specify)

Disinfection Frequency

Continuous
Daily
Weekly
Monthly
Occasionally

Monthly Rotation of Coliform Sample Sites (Table 4)

Sample Location ID#	Sample Location Description	Month of Year												Upstream Sample Location ID#	Downstream Sample Location ID#	Elsewhere Sample Location ID#
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC			
Distribution System Name (ID):														**Number of Samples Collected Monthly:**		

Sample Collection Schedules (Table 5)

Distribution System Name (ID):		
Routine Samples	**Sample Collection Schedule:**	
Repeat Samples	**Number of Repeat Samples Required:**	
	Sample Collection Schedule:	
Additional Routines	**Number of Additional Routines Required:**	
	Sample Collection Schedule:	
	Sample Site Locations:	