



**DRAFT DRINKING WATER
SUPPLY OPERATIONAL
COMPLIANCE RULES**

CONTENTS PAGE

1	Introduction.....	4
1.1	Components of a drinking water supply	4
1.2	Water supply categories	5
1.3	Water supplier duties	6
1.4	Structure of the rules.....	6
1.5	Reporting compliance.....	6
1.6	Acceptable solutions.....	7
2	On Demand Network Drinking Water Supplies	9
2.1	Very small drinking water supplies.....	10
2.2	Small drinking water supplies.....	11
2.2.1	Source water compliance monitoring rules.....	11
2.2.2	Treatment plant compliance rules.....	13
2.2.3	Distribution system compliance monitoring rules	17
2.3	Large drinking water supplies.....	20
2.3.1	Source Water Compliance Monitoring Rules	20
2.3.2	Treatment Plant Compliance Monitoring Rules	23
2.3.3	Distribution System Compliance Monitoring Rules.....	60
3	Trickle Feed Water Supplies	68
4	Secondary Drinking Water Supplies	69
5	Self-Supplied Building Drinking Water Supplies	70
6	Water Carrier Supplies	71
7	Planned Temporary Drinking Water Supplies.....	75
8	Community Drinking Water Stations.....	76
9	Definitions	77

LIST OF TABLES

Table 1. Small Supply Source Water Compliance Monitoring Rules.....	12
Table 2. Small Supply Source Water Monitoring Determinands for Surface Water and Ground Water.....	13
Table 3. Small Supply Additional Source Water Monitoring Determinands for Ground Water (Spring and Bore).....	13
Table 4. Small Supply Source Water Monitoring Determinands for Roof Water	13
Table 5. Small Supply Treatment Plant Compliance Rules	14
Table 6. Small Supply Filtration Rules	15
Table 7. Small Supply Chlorine Disinfection Rules	15
Table 8. Small Supply UV Disinfection Rules	16
Table 9. Small Supply Chemical Rules	17
Table 10. Small Supply Distribution System Compliance Rules	18
Table 11. Small Supply Distribution System Monitoring Determinands.....	19
Table 12. Large Supply Source Water Compliance Rules	21
Table 13. Large Supply Source Water Monitoring Determinands.....	21
Table 14. Large Supply Compliance Rules for Water Disinfected with Chlorine.....	23
Table 15. Large Supply Requirements for Drinking Water Disinfected with Chlorine	25
Table 16. Large Supply Compliance Rules for Water Disinfected with Ozone.....	27
Table 17. Large Supply Requirements for Water Disinfected with Ozone.....	27
Table 18. Large Supply Compliance Rules for Water Disinfected with Ultraviolet Light	29
Table 19. Large Supply Requirements for UV disinfection	30
Table 20. Large Supply Protozoal Compliance Rules.....	33
Table 21. Large Supply Coagulation and Sedimentation without Filtration Rules [0.5 Log].....	34
Table 22. Large Supply Requirements for Coagulation and Sedimentation without Filtration.....	34
Table 23. Large Supply Coagulation and Direct Filtration Rules [2.5-3.5 Log].....	35
Table 24. Large Supply Requirements for coagulation and direct filtration.....	36
Table 25. Large Supply Coagulation, Sedimentation, and Filtration Rules [3-4 Log]	37
Table 26. Large Supply Requirements for coagulation, sedimentation and filtration.....	38
Table 27. Large Supply Second Stage Filtration Rules [0.5 Log].....	40
Table 28. Large Supply Requirements for Second Stage Filtration.....	40
Table 29. Large Supply Slow Sand Filtration Rules [2.5 Log].....	41
Table 30. Large Supply Requirements for Slow Sand Filtration.....	42
Table 31. Large Supply Membrane Filtration Rules [up to 4.0 Log]	43
Table 32. Large Supply Requirements for Membrane Filtration	44
Table 33. Large Supply Cartridge Filtration Rules [2.0 Log]	46
Table 34. Large Supply Requirements for Cartridge Filtration	47
Table 35. Large Supply Ozone Rules [0.25 to 3.0 Log].....	49
Table 36. Large Supply C.t values (min.mg/L) for Cryptosporidium inactivation by ozone.....	49
Table 37. Large Supply Requirements for ozone disinfection.....	50
Table 38. Large Supply Ultraviolet Light Rules Ultraviolet Light [up to 3 Log].....	51
Table 39. Large Supply Requirements for UV disinfection	52
Table 40. Large Supply Treatment Chemical Determinand Minimum Sampling Frequencies	55
Table 41. Large Supply Treatment Chemical Determinand Monitoring.....	56
Table 42. Large Supply Chemical Compliance Rules.....	56
Table 43. Large Supply Cyanotoxin Compliance Rules	59
Table 44. Large Supply Backflow Protection Rules.....	60
Table 45. Large Supply Hygiene Procedures Rules	61
Table 46. Large Supply Storage Facilities Rules.....	63
Table 47. Large Supply Residual Disinfection and Disinfection By-product Rules	64
Table 48. Large Supply FAC and pH sampling frequency	65
Table 49. Large Supply Disinfection by-product sampling frequency.....	66
Table 50. Large Supply Microbiological Monitoring Rules	66
Table 51. Large Supply Microbiological Sampling Frequencies.....	67
Table 52. Water Carrier Supply Rules.....	71
Table 53. Disinfection with Sodium Hypochlorite (Plain Household Bleach).....	73

1 Introduction

These Drinking Water Supply Operational Compliance Rules (the Rules) set out the requirements that drinking water suppliers must meet to demonstrate that they are not exceeding the maximum acceptable values (MAVs) for microbiological determinands, organic determinands, inorganic determinands, cyanotoxin determinands and radiological determinands that are set out in the *New Zealand Drinking Water Standards 202X*.

Where MAVs cannot be (or are not) used to measure compliance, measurement of treatment efficacy is used as the surrogate criteria for demonstrating compliance. When surrogate criteria are used, the rules specify operational requirements, compliance with which is considered to give a high level of confidence that the water will be safe to drink. Free available chlorine (FAC) and compliance with filter performance parameters such as turbidity are examples of this.

The rules set out minimum compliance requirements for the supply of drinking water, but water suppliers are advised that undertaking further measures, depending on water supply circumstances and risks may be prudent.

The safety of drinking water is best maintained if multiple barriers to contamination are in place. These barriers include:

- Preventing hazards from entering the source or raw water,
- removing particles, pathogens and chemical and radiological hazards from the water by physical treatment,
- killing or to inactivating any pathogenic organisms that may be present in the water by disinfection,
- maintaining the quality of water in the distribution system.

The rules cover the parts of a water supply where these barriers can be applied.

The rules have been prepared by Taumata Arowai under the powers set out in the *Water Services Act 202X*.

The rules do not set quality requirements for bottled water or water used for industrial or agricultural purposes. For people with certain medical conditions, or for uses of water for purposes other than drinking, additional or other water quality criteria may apply.

Key terms used in these rules are defined in the Definitions Section.

1.1 Components of a Drinking Water Supply

A drinking water supply comprises one or more of each of the following components:

- source water
- water treatment plant
- distribution system.

Taumata Arowai allocates code numbers to registered water supply communities, sources, treatment plants and distribution zones. Water carriers are vehicles used to carry water. A code is issued to each registered water carrier.

1.2 Water Supply Categories

The operational compliance rules have been prepared for the following water supply categories:

1. **On demand networked supplies** – Water supplies that provide water via a piped network at a pressure and volume to meet consumer demand. These supplies may include storage facilities within the network to buffer demand. The rules have been prepared for the supplies with the following population sizes:
 - < 50 (Very small supplies)
 - 50 – 500 (Small supplies)
 - >500 (Large supplies)
 - Varying population size
2. **Trickle feed water supplies** – Water supplies which provide water at a low volume (trickle feed) to a point of supply storage tank on a consumers' property. Typically, these supplies provide domestic or stock water in rural areas with an agreed quantity over a period of 24 hours.
3. **Secondary drinking water supplies** – Water supplies which use another water supply as a source of water and provide water to more than one property via a piped network. The ownership and management of the supply is independent of the water supplier from which water is abstracted. Secondary suppliers are responsible for the safety and compliance of water within their system which will include a distribution network and may include a treatment plant. Examples include an industrial park where water is abstracted from a council network and on sold to premises at the park, a port, an airport or a trickle feed supply which takes water from another networked supply.
4. **Self-supplied building drinking water supplies** – Water supplies which provide water to a single building only. This category does not include a single domestic dwelling.
5. **Water carrier supplies** - Water that is supplied from a vehicle with a water tank (e.g. a truck, trailer, or rail wagon) to a storage tank on a property. Typically, water carriers provide potable water to houses that have their own supply but need the quantity of stored water to be augmented. Water carriers can also augment other water supplies particularly during droughts and emergencies and provide water to temporary planned events.
6. **Planned temporary drinking water supplies** – Short term events where people gather and where a water supply is required for the duration of an event which continues for less than 30 days. Typically, this category includes events like music festivals.
7. **Community drinking water stations** – Water supplies that provide water from a single site to members of a community who collect the water in containers. Community drinking water stations do not include taps connected to a treated network.

Water supplies must comply with the rules set out for the type of supply they are operating, however a water supplier of a self-supplied building, trickle feed supply or secondary supply may elect to comply with the rules set out for on demand supplies serving >500 people if they consider those rules to be more appropriate or better suited to the treatment systems of their supply.

1.3 Water Services Act 202X

These operational compliance rules have been prepared pursuant to Subpart 6, section 48 of the Water Services Act 202X, which allows Taumata Arowai to make rules which set out the requirements relating to the performance of water supplier duties under the Act.

1.4 Structure of the Rules

The rules have been structured according to the water supply categories outlined in Section 1.2.

For each category, compliance rules have been prepared for:

- **Source water** – including monitoring for bacteriological, protozoal, chemical, cyanobacteria and radiological determinands.
- **Treatment systems** – including criteria for bacterial compliance, protozoal compliance, chemical compliance and cyanotoxin compliance.
- **Distribution systems** – including rules for backflow prevention, hygiene practices for maintenance and upgrades, monitoring disinfection by-products and microbial water quality. (Not applicable to self-supplied buildings)

The rules are set out in the blue tables. Each rules table includes explanatory information and each rule has been identified as a monitoring or audit rule depending on its purpose. Details of the reporting requirements are associated with each rule.

1.5 Reporting Compliance

Monitoring rules

Monitoring rules are rules that cover determinands that need to be either continuously monitored or regularly sampled. Suppliers must provide a report of compliance against monitoring rules to Taumata Arowai within 14 days of the end of each month.

Monitoring rules have compliance monitoring periods associated with them.

One day compliance monitoring periods

Any determinand that is continuously monitored or sampled daily has a compliance monitoring period of 24 hours (midnight to midnight). Each monthly report must indicate, for each rule with a 24-hour compliance monitoring period, the number of compliant days per month. It must also provide a report for each non-compliant day, outlining the reasons for non-compliance.

Compliance is assessed as the number of days that compliance was achieved during the previous year. A year is 365 days, or 366 days as required to take account of any leap year.

One-week compliance monitoring periods

Rules that require weekly monitoring have a compliance monitoring period of one week. Each monthly report must indicate, for each rule with a one-week compliance monitoring period, the number of compliant weeks per month. It must also provide a report for each non-compliant week, outlining the reasons for non-compliance.

Compliance is reported as the number of weeks that compliance was achieved during the previous 52 weeks.

One-month monitoring periods

Rules that require monthly monitoring have a compliance monitoring period of one month. Each monthly report must indicate, for each rule with a monthly compliance monitoring period, whether the rule was complied for the previous month. It must also provide a report outlining the reasons for non-compliance.

Compliance is reported as the number of months that compliance was achieved during the previous 12 months.

One-year compliance monitoring periods

For all other determinands, compliance is reported annually. Annual reporting is still required even if the determinand is only monitored once every three years or once every five years.

Audit rules

Audit rules cover activities that water suppliers need to undertake for example the preparation of a backflow prevention programme or a distribution zone sampling plan. Audit rules have a compliance monitoring period of one year. Compliance with audit rules needs to be reported to Taumata Arowai within 14 days of the end of June each year, but they may also be the subject of planned or targeted audits of a water supply that Taumata Arowai may undertake.

1.6 Acceptable Solutions

Acceptable solutions are prescribed requirements by which a water supplier can demonstrate compliance against to automatically meet some of the legislative requirements set out in the *Water Services Act 202X*. Adopting an acceptable solution provides a way that water suppliers can demonstrate compliance with the duty to comply with operation compliance rules. Acceptable solutions have been prepared by Taumata Arowai and relate to specific types of supply. A water supplier can only use an acceptable solution designed for that supply type.

To achieve compliance with the acceptable solution, a water supplier must demonstrate that all the requirements set out in the acceptable solution documentation have been met.

Each acceptable solution sets out which duties in the *Water Services Act 202X* that a water supplier does not need to meet if the acceptable solution is adopted.

Demonstrating compliance against an acceptable solution does not exempt water suppliers from complying with all of the duties set out in the *Water Services Act 202X*. For example, the water supplier must still comply with the *New Zealand Drinking Water Standards 202X* and prepare a drinking water safety plan.

DRAFT

2 On Demand Network Drinking Water Supplies

The following rules for on demand supplies apply to networked drinking water supplies that provide water at a pressure and volume to meet consumer demand.

DRAFT

2.1 Very Small Drinking Water Supplies

The following very small supply rules apply to drinking water supplies that provide networked drinking water to a population of less than 50 people.

To be prepared.

DRAFT

2.2 Small Drinking Water Supplies

The rules in this section apply to drinking water supplies that provide networked drinking water to a population of 50-500 people.

The rules are grouped around the four key barriers to contamination:

- Preventing hazards from entering the source or raw water,
- removing particles, pathogens and chemical and radiological hazards from the water by physical treatment,
- killing or to inactivating any pathogenic organisms that may be present in the water by disinfection,
- maintaining the quality of water in the distribution system.

The results of water testing must be compared to the MAVs in the *New Zealand Drinking Water Standards 202X* to ensure the MAVs are not exceeded.

2.2.1 Source Water Compliance Monitoring Rules

This section sets out the minimum requirements a water supplier must follow to monitor source water quality. The monitoring will help the water supplier understand the actual and potential hazards to the drinking water supply and to assist with the preparation and implementation of a source water risk management plan and drinking water safety plan. Information gathered during the preparation of the source water risk management plan may indicate that additional monitoring needs to be undertaken. Water suppliers must collect and analyse samples more frequently if further water quality information is required.

All source water types are covered by this rule. Where a water supply abstracts water from multiple sources, the rules apply to each source.

Table 1. Small Supply Source Water Compliance Monitoring Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
1	Surface water sources must be monitored for the determinands and at the frequency set out in Table 2	Monitoring	As set out in Table 2
2	Bore water sources must be monitored for the determinands and at the frequency set out in Table 2 and Table 3.	Monitoring	As set out in Table 2 and Table 3
3	Roof water sources must be monitored for the determinands and at the frequency set out in Table 4.	Monitoring	As set out in Table 4
4	Additional monitoring of any source water must be undertaken for any other contaminants identified to exceed 50% of the MAV set out in the <i>New Zealand Drinking Water Standards 202X</i> .	Monitoring	Determined by the drinking water supplier
5	Consumer taste and odour complaints which have the potential to relate to cyanotoxins must be recorded and investigated to determine if cyanobacteria or cyanotoxins are the cause.	Audit	Yearly
6	Between October and May, the water and area around a surface water intake must be inspected each month for the presence of benthic cyanobacteria mats or planktonic cyanobacterial growth each month.	Audit	Yearly
7	If inspections of the intake (surface waters and springs) indicate the presence of benthic cyanobacterial mats or planktonic cyanobacterial growth, a cyanotoxin management plan must be prepared and followed.	Audit	Yearly
8	Samples must be collected at the source abstraction point for surface water or groundwater supplies and at the tank outlet for roof water supplies.	Audit	Yearly

Table 2. Small Supply Source Water Monitoring Determinands for Surface Water and Ground Water

Contaminant Group	Determinands	Sampling Frequency	Compliance Monitoring Period
Bacterial	Escherichia coli (E. coli) and total coliforms.	Monthly	Monthly
Chemical	Arsenic, boron, cadmium, chloride, copper, iron, manganese, nitrate, phosphorus, potassium, selenium, sodium.	Every three years	Yearly
Physical	pH, turbidity, temperature.	Monthly	Monthly

Table 3. Small Supply Additional Source Water Monitoring Determinands for Ground Water (Spring and Bore)

Contaminant Group	Determinands	Sampling Frequency	Compliance Monitoring Period
Radiological	Gross alpha activity. Gross beta activity.	Every five years	Yearly

Table 4. Small Supply Source Water Monitoring Determinands for Roof Water

Contaminant Group	Determinands	Sampling Frequency	Compliance Monitoring Period
Bacterial	<i>E. coli</i> and total coliforms.	Monthly	Monthly
Chemical	Copper, zinc, lead, polyaromatic hydrocarbons (In winter – June, July or August).	Every three years	Yearly

2.2.2 Treatment Plant Compliance Rules

This section sets out the minimum compliance requirements for drinking water leaving a treatment plant. Regular sampling is required to provide evidence that treatment processes have been effective. The rules are based on four key outcomes:

- Monitoring to ensure determinands do not exceed the MAVs set out in the *New Zealand Drinking Water Standards 202X*.
- Effective particle removal, to remove protozoa, provide the conditions for the disinfectant to be effective, and some remove chemicals found in source water.
- Effective disinfection which ensures the correct disinfectants and conditions are provided to kill or deactivate target micro-organisms.
- Effective management of chemical dosing to avoid treatment of chemical carry-over or chemical by-products entering the distribution system.

Table 5. Small Supply Treatment Plant Compliance Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
9	<i>E. coli</i> and total coliforms must be monitored at a point leaving the treatment plant at least 30 minutes after chlorine is added.	Monitoring	Monthly
10	There must be no more than 45 days between <i>E. coli</i> samples and consecutive samples must not be taken on the same day of the week and over a year, five different days of the week must be used as sampling days.	Audit	Yearly
2	Bore water with turbidity less than 1 NTU measured using continuous turbidity monitoring must be disinfected. Water from any other source must be filtered and disinfected.	Audit	Yearly
3	Filtration and disinfection systems must be designed to remove and/or inactivate microorganisms including bacteria and protozoa.	Audit	Yearly
4	The flow must be within design specifications for the treatment processes 100% of the time.	Audit	Yearly

Table 6. Small Supply Filtration Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
5	A filtration system must provide a barrier to protozoa unless UV disinfection is installed.	Audit	Yearly
6	Turbidity of filtered water to achieve a barrier for protozoa must not exceed 1 NTU and must be tested daily after filtration.	Monitoring	Daily
7	Turbidity of filtered water prior to UV disinfection for protozoa must not exceed 5 NTU and must be tested daily.	Monitoring	Daily

Table 7. Small Supply Chlorine Disinfection Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
8	Chlorine contact time must be at least 30 minutes before the first person consumes the water.	Audit	Yearly
9	Free available chlorine (FAC) at the treatment plant not be less than 0.5 mg/L and must be tested daily FAC must be monitored at a point at least 30 minutes after chlorine is added.	Monitoring	Daily
10	The pH of water at the treatment plant must be between 6.5 and 8.0 and must be tested daily. The pH must be monitored at a point at least 30 minutes after chlorine is added.	Monitoring	Daily

Table 8. Small Supply UV Disinfection Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
11	UV units must meet (and operate within the specifications of) one of the following standards: NSF/ANSI 55 Class A (NSF, ANSI n.d.); DVGW Technical Standard W294 (DVGW 2006); öNORM M5873 (Osterreichisches Normungsinstitut 2001).	Audit	Yearly
12	UV units must be validated to operate at a minimum of 12 mJ/cm ² UV dose for inactivation of protozoa and if used for the disinfection of bacteria, must be validated and operated to deliver at least 40 mJ/cm ² UV dose.	Audit	Yearly
13	UV dose must be monitored continuously by the UV intensity meter (the UV sensor), with an alarm installed to alert the operator (24/7) if it is outside the range of validated limit. The system must be designed to shut off when the UV dose fails to meet the requirements.	Audit	Yearly
14	UV transmittance (UVT) must be measured weekly with no sample less than 80% transmittance. UVT must be monitored immediately before the first disinfection process. [this rule does not apply where the UV dose is automatically adjusted as the UV transmittance changes].	Monitoring	Weekly
15	Lamp usage and outage must be monitored continuously, and an alarm must alert the operator when validated lamp hours are reached, or if there is a lamp outage.	Audit	Yearly

Table 9. Small Supply Chemical Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
16	Treated water must be tested monthly for any chemical that is used in a treatment process. (excluding fluoride, refer Rule 26).	Monitoring	Monthly
26	If fluoride is added at the treatment plant, the water leaving the treatment plant must be tested for fluoride levels each week.	Monitoring	Weekly
17	Should the water supplier become aware of an event that may rapidly introduce high concentrations of chemicals into the water at the source or at the treatment plant, the water supplier must carry out event-based monitoring to show that the threat to the water safety has been adequately managed.	Monitoring	In response to the event
18	Sodium hypochlorite must be used within three months of the date of manufacture (to minimise chlorate formation).	Audit	Yearly
19	All chemical samples must be taken from a point directly after the final treatment process.	Audit	Yearly

2.2.3 Distribution System Compliance Monitoring Rules

This section sets out the minimum compliance requirements for water in a distribution system. The rules are based on two key outcomes:

- maintaining the integrity (barrier) of the distribution system to prevent contamination of treated water at all times.
- maintaining effective disinfection, to inactivate microorganisms, throughout the entire distribution zone.

Table 10. Small Supply Distribution System Compliance Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
20	Water in the distribution system must be monitored for the determinands and at the frequencies set out in Table 11.	Monitoring	Monthly
21	For <i>E. coli</i> and total coliform samples: <ul style="list-style-type: none"> i. there must be no more than 45 days between samples. ii. consecutive samples must not be taken on the same day of the week and over a year, five different days of the week must be used as sampling days. 	Audit	Yearly
22	The FAC must not be less than 0.2 mg/L.	Monitoring	Monthly
323	The pH must be between 6.5 and 8.0.	Monitoring	Monthly
24	Samples must be taken at regular sampling points that are representative of the geographical coverage of the distribution system and include storage reservoirs and the end points of the system.	Audit	Yearly
25	All work (planned or unplanned) on the water supply must be completed by suitably trained, certified and authorised personnel who must: <ul style="list-style-type: none"> i. maintain personal hygiene. ii. not be experiencing any gastrointestinal illness. iii. protect the work site, materials and tools from contamination. iv. prevent contamination of the drinking water. 	Audit	Yearly

26	<p>An assessment of the distribution system for backflow risk must be performed annually, and:</p> <ul style="list-style-type: none"> i. any connections found to be at risk for backflow must be recorded along with the potential hazard(s). ii. any connections found to be at risk for backflow must have a suitable backflow prevention or containment device fitted. iii. all backflow prevention devices must be inspected and tested annually by a suitably trained and qualified person and remediated if found to be faulty. iv. any cross connections that are identified must be removed. 	Audit	Yearly
-----------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------	--------

Table 11. Small Supply Distribution System Monitoring Determinands

Contaminant Group	Determinands	Sampling Frequency	Compliance Monitoring Period
Bacterial	<i>E. coli</i> and total coliforms	Monthly	Monthly
Disinfectant	FAC and pH	Daily	Monthly

2.3 Large Drinking Water Supplies

The rules in this section apply to all drinking water supplies serving a population greater than 500 people. Rules are included for source water compliance monitoring, treatment plant compliance monitoring and distribution system compliance monitoring. Water suppliers operating large water supplies are required to demonstrate that they:

- understand the quality of the source water they are using,
- have installed and are operating barriers to bacterial and protozoal contamination.
- are providing water that does not contain levels of chemical or cyanotoxin determinands that exceed health-based targets (MAVs) and
- have measures in place to prevent recontamination of water within a distribution system.

Compliance with these rules is required to demonstrate that the MAVs in the *New Zealand Drinking Water Standards 202X* have not been exceeded in water leaving a treatment plant or in a distribution system.

2.3.1 Source Water Compliance Monitoring Rules

Water suppliers are required to monitor a range of determinands in source water to understand which determinands are present in the water and how the levels compare to the MAVs set out in the *New Zealand Drinking Water Standards 202X*. Water quality may change over time or in relation to environmental conditions, land use or weather events. It is important that water suppliers understand baseline source water quality and how that quality changes to ensure that treatment systems are appropriate and operating effectively. Water suppliers also need to understand how changes in water quality may challenge water treatment systems.

This section sets out the minimum rules a water supplier must follow for monitoring source water quality. Information gathered during the preparation of the source water risk management plan may inform additional monitoring that needs to be undertaken. Water suppliers must collect and analyse samples more frequently if further water quality information is required.

Where a water supply abstracts water from multiple sources, the rules apply to each source.

Table 12. Large Supply Source Water Compliance Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
27	Source water must be monitored for the determinands and at the frequency set out in Table 13	Monitoring	As set out in Table 13
28	Additional monitoring of source water must be undertaken during severe or extreme weather events	Monitoring	Determined by the drinking water supplier
29	Monitoring of source water must be undertaken for any determinand additional to those set out in Table 13 if the determinand has been identified in the drinking water supply Source Water Risk Management Plan as presenting a potential risk to the drinking water supply.	Monitoring	Monthly if the determinand exceeds 50% of the MAV

Table 13. Large Supply Source Water Monitoring Determinands

Contaminant Group	501-10,000 population served	Sampling Frequency	>10,000 population served	Sampling Frequency
Bacterial	<i>E. coli</i> and total coliforms	Monthly	<i>E. coli</i> and total coliforms	Monthly
Chemical	Chloride, sulphate, nitrate, arsenic, boron, bromide, cadmium, calcium, chromium, copper, fluoride, iron, lead, magnesium, manganese, potassium, silica, sodium, zinc, total hardness, alkalinity, conductivity, turbidity SVOC and VOC, TOC, DOC, pesticides screen	Annually	Chloride, sulphate, nitrate, arsenic, boron, bromide, cadmium, calcium, chromium, copper, fluoride, iron, lead, magnesium, manganese, potassium, silica, sodium, zinc, total hardness, alkalinity, conductivity, turbidity SVOC and VOC, TOC, DOC, pesticides screen	Annually, but Monthly if the determinand exceeds 50% of its MAV
Radiological	Gross alpha activity Gross beta activity	Every five years Monthly if the determinand	Gross alpha activity. Gross beta activity.	Every five years Monthly if the determinand

Contaminant Group	501-10,000 population served	Sampling Frequency	>10,000 population served	Sampling Frequency
		exceeds 50% of its MAV		exceeds 50% of its MAV
Physical	pH, turbidity, temperature, turbidity	Daily	pH, turbidity, temperature, turbidity, conductivity	Continuous
	Conductivity, dissolved organics	Monthly	Dissolved organics	Weekly

DRAFT

2.3.2 Treatment Plant Compliance Monitoring Rules

Treatment systems must provide multiple barriers to contaminants. The following compliance rules have been prepared for bacterial, protozoal, chemical and cyanotoxin contaminants. Different treatment systems may be required for different contaminant types though some treatments systems can be effective against more than one type of contaminant.

2.3.2.1 Bacterial Compliance

Bacterial pathogens usually from a human or animal faecal source can cause illness in people if they are ingested in drinking water. Water suppliers are required to demonstrate that water has been disinfected to kill or inactivate bacterial pathogens. For disinfection processes to be effective water must have low levels of turbidity.

It is impractical to monitor water supplies for all potential human pathogens and bacterial samples take time to process with results usually provided after the water has been delivered to consumers. Continuous monitoring of treatment processes provides real time information and allows action to be taken if parameters do not meet pre-determined targets. For these reasons, continuous monitoring of disinfection process(es) is used to demonstrate bacterial compliance.

The following options may be used to demonstrate bacterial compliance:

- 1 Disinfection with chlorine¹
- 2 Disinfection with ozone
- 3 Disinfection with UV light

Table 14. Large Supply Compliance Rules for Water Disinfected with Chlorine

Rule Number	Requirement	Monitoring/audit	Compliance Monitoring Period
30	All water is treated with chlorine and must be monitored in accordance with Table 15.	Monitoring	Daily
31	C.t of at least 15 min.mg/L for at least 95 % of the day must be achieved.	Monitoring	Daily
32	T ₁₀ contact time of at least 5 minutes must be demonstrated.	Audit	Yearly

¹ Rules for bacterial disinfection with chlorine dioxide will be provided by Taumata Arowai on request.

33	The pH of water leaving the treatment plant must be between 6.5 and 8.0. pH must be monitored at a point at least 5 minutes after chlorine is added.	Monitoring	Daily
34	FACE must not be less than 0.3mg/L at any time in water leaving the treatment plant	Monitoring	Daily
35	Turbidity less than 1.0 NTU must be maintained for at least 95% of the day in water prior to or immediately after chlorine dosing.	Monitoring	Daily
36	Turbidity must not exceed 2.0 NTU for the duration of any consecutive 15-minute period in water prior to or immediately after chlorine dosing.	Monitoring	Daily

Table 15. Large Supply Requirements for Drinking Water Disinfected with Chlorine

Parameters that need to be continuously monitored and where they need to be monitored:	<i>Parameters:</i> Free Available Chlorine (FAC) <i>Where they need to be monitored:</i> Water at a point after the prescribed disinfection contact time has elapsed but before the first consumer.
	<i>Parameters:</i> pH <i>Where they need to be monitored:</i> Water a point after the prescribed disinfection contact time has elapsed but before the first consumer.
	<i>Parameters:</i> Turbidity <i>Where they need to be monitored:</i> Water at a point immediately before or after the chlorine dosing point.
	<i>Parameters:</i> Flow <i>Where they need to be monitored:</i> Water leaving the treatment plant at a point after the prescribed disinfection contact time has elapsed but before the first consumer unless the contact tank has a high-level outlet weir in which case water entering the contact tank is acceptable.
	Water level in the contact tank (if used)
Calculations that need to be continuously monitored:	Free Available Chlorine Equivalent (FACE).
	T ₁₀ Contact Time.
	C.t.
Separation between data records ² :	One minute ³ .
Instrument Calibration/Verification:	<p>Turbidity monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency or monthly whichever is more frequent. • Calibration verified in accordance with the instrument manufacturers specified procedures weekly.

² If data is missing for more than 15 consecutive minutes, or for a total of more than 72 minutes in the day, then compliance cannot be achieved.

³ An exception to accept separation between data records of up to five minutes is allowed where the minimum cycle time specified by the FAC analyser manufacturer exceeds 1 minute.

	<p>FAC and pH monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none">• Calibrated in accordance with the instrument manufacturers specified procedures and frequency or weekly whichever is more frequent. <p>Other instrumentation must be calibrated in accordance with the instrument manufacturers specified procedures and frequency.</p>
--	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

DRAFT

2.3.2.2 Compliance Rules for Water Disinfected with Ozone

Table 16. Large Supply Compliance Rules for Water Disinfected with Ozone

Rule Number	Requirement	Monitoring/audit	Compliance Monitoring Period
37	All water must pass through the ozone contactor and must be monitored in accordance with Table 17.	Monitoring	Daily
38	C.t of at least 1.2 mg.min/L for more than 95% of the day.	Monitoring	Daily
39	Turbidity does not exceed 5.0 NTU for the duration of any consecutive 15-minute period.	Monitoring	Daily

Table 17. Large Supply Requirements for Water Disinfected with Ozone

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> Ozone Residual</p> <p><i>Where they need to be monitored:</i> Water at a point after the prescribed disinfection contact time has elapsed but before the first consumer.</p>
	<p><i>Parameters:</i> Turbidity</p> <p><i>Where they need to be monitored:</i> At a point prior to the contact tank.</p>
	<p><i>Parameters:</i> Flow</p> <p><i>Where they need to be monitored:</i> Water leaving the treatment plant at a point after the prescribed disinfection contact time has elapsed but before the first consumer unless the contact tank has a high-level outlet weir in which case water entering the contact tank is acceptable.</p>
	Level of water in the contact tank (if used)
Calculations that need to be continuously monitored:	T ₁₀ Contact Time.
	C.t (Ozone Residual x T ₁₀ Contact Time).

<p>Separation between data records⁴:</p>	<p>One minute.</p>
<p>Instrument calibration/verification:</p>	<p>Turbidity monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency or monthly whichever is more frequent. • Calibration verified in accordance with the instrument manufacturers specified procedures weekly. <p>Ozone in water monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency or weekly whichever is more frequent. <p>Other instrumentation must be Calibrated in accordance with the instrument manufacturers specified procedures and frequency.</p>

⁴ If data is missing for more than 15 consecutive minutes, or for a total of more than 72 minutes in the day then compliance cannot be achieved.

2.3.2.3 Compliance Rules for Water Disinfected with Ultraviolet Light

Table 18. Large Supply Compliance Rules for Water Disinfected with Ultraviolet Light

Rule Number	Requirement	Monitoring/audit	Compliance Monitoring Period
40	All water must pass through the UV reactor(s) and must be monitored in accordance with Table 19.	Monitoring	Daily
41	UVI is not less than the value (established by validation) required to achieve reduction equivalent dose of not less than 40 mJ/cm ² for not less than 95 % of the day.	Monitoring	Daily
42	UVI is not less than 80% of the value (established by validation) required to achieve reduction equivalent dose of not less than 40 mJ/cm ² for any consecutive 15-minute period.	Monitoring	Daily
43	Turbidity does not exceed 5.0 NTU for the duration of any consecutive 15-minute period.	Monitoring	Daily
44 ⁵	UVT is not less than 95% of the lowest UVT for which the reactor has been validated for more than 5% of the day.	Monitoring	Daily
45 ⁵	UVT is not less than 80% of the lowest UVT for which the reactor has been validated for the duration of any consecutive 15-minute period.	Monitoring	Daily
46	The equipment is operated within the flow range for which it was validated for at least 95% of the day.	Monitoring	Daily

⁵ These requirements do not apply to UV disinfection systems that automatically adjust the UV dose as the UV transmittance of the water flowing through the reactor varies.

Table 19. Large Supply Requirements for UV disinfection

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> UV Transmittance</p> <p><i>Where they need to be monitored:</i> Water entering or leaving the UV reactor(s).</p>
	<p><i>Parameters:</i> Turbidity</p> <p><i>Where they need to be monitored:</i> Water entering or leaving the UV reactor(s).</p>
	<p><i>Parameters:</i> UV Intensity</p> <p><i>Where they need to be monitored:</i> The same point in the reactor as that used for validation.</p>
	<p><i>Parameters:</i> Flow</p> <p><i>Where they need to be monitored:</i> Water entering or leaving the reactor(s).</p>
Compliance monitoring period:	1 day (midnight to midnight).
Separation between data records ⁶ :	1 minute.
Instrument calibration/verification:	<p>Turbidity monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency or monthly whichever is more frequent. • Calibration verified in accordance with the instrument manufacturers specified procedures weekly. <p>UVT monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency or weekly whichever is more frequent. <p>Duty UVI sensors must be checked at least monthly against the reference sensor. If the difference between the two readings exceeds the manufacturers specified limits, then the Duty UVI sensor shall be replaced.</p>

⁶ If data is missing for more than 15 consecutive minutes, or for a total of more than 72 minutes in the day then compliance cannot be achieved

	<p>Reference UVI sensor must be standardised at least annually in accordance with Ultraviolet Disinfection Guidance Manual (USEPA 2006b) or other traceable procedure. Alternatively, after 12 months the supplier can use the reference sensor as a duty sensor and purchase a new standardised sensor for use as a reference sensor.</p> <p>Other instrumentation must be Calibrated in accordance with the instrument manufacturers specified procedures and frequency.</p>
<p>UV validation:</p>	<p>The equipment must be validated to meet the required reduction equivalent dose of 40 mJ/cm² using one of the:</p> <ul style="list-style-type: none"> • <i>Ultraviolet Disinfection Guidance Manual (USEPA 2006b).</i> • <i>DVGW Technical Standard W294 (DVGW 2006)</i> • <i>öNORM M5873 (Osterreichisches Normungsinstitut 2001).</i> • <i>NSF/ANSI 55 (NSF, ANSI nd) for Class A systems (for populations of up to 5000) – 3 log.</i>

2.3.2.4 Protozoal Compliance

Protozoa such as *Cryptosporidium* and *Giardia* may occur in New Zealand surface waters and bore waters. Protozoa found in the faeces of humans and animals and are excreted as cysts or oocysts (collectively (oo)cysts). (Oo)cysts can cause illness when ingested. *Cryptosporidium* is the most problematic waterborne protozoa as the oocysts are small and resistant to chlorine at the concentrations used in drinking water treatment. They are therefore difficult to remove or inactivate. The compliance criteria are constructed on the principle that if a treatment process deals successfully with *Cryptosporidium*, it will also deal successfully with other protozoa.

Methods for assessing the infectiousness of protozoa are not yet suitable for routine monitoring, so all (oo)cysts must be considered infectious.

Protozoa can be removed by filtration or inactivated by disinfection using ozone or UV light. Inactivation renders a microorganism incapable of reproduction, so it is unable to infect a host.

The risk of infection from drinking water contaminated by waterborne protozoa is affected by many factors. The two most important factors are:

- concentration of infectious protozoal (oo)cysts in the raw water
- extent to which (oo)cysts are inactivated or removed by the treatment processes.

The compliance criteria for protozoa are based on the probability that the treatment process has inactivated (by disinfecting to achieve the prescribed C.t value) or removed (by achieving target filtrate turbidity) any protozoa present. To take account of the cumulative effect of a series of treatment processes on the removal of protozoa, a 'log credit' approach is used. The log credit approach identifies the level of *Cryptosporidium* treatment, based on a log scale, that is required for a range of source waters. Treatment processes need to match or exceed the log level of treatment that is identified for the type of source water that is being used.

Log credit requirements

- Ground water sources that draw water from a depth of 30 metres (measured from the top of the screen) and via a sanitary bore head in which *E. coli* and total coliforms have not been detected over a period of three years (monthly samples with a maximum of 45 days between samples), are not required to provide a protozoa barrier.
- Ground water sources that draw water from a depth of between 30 metres and 10 metres (measured from the top of the screen) and via a sanitary bore head are required to provide a protozoa treatment barrier of 3-log.
- Ground water sources that draw water from a depth of less than 10 metres (measured from the top of the screen), ground water sources that draw water from a depth of 10 metres or greater without a sanitary bore head, spring water sources and surface water sources are required to provide a protozoa treatment barrier of 4-log.

Water supplies that require a protozoa treatment barrier of 4-log may reduce the level of protozoa treatment to 3-log if the source water risk management plan for the supply provides evidence that the source water has a low risk of protozoa contamination.

Sanitary bore head requirements

A bore head is considered a sanitary bore heads if it meets the following criteria:

1. The bore head is installed above ground.
2. The bore is installed in an area of ground that is not below surrounding ground such that ponding does not occur around the bore during rainfall.
3. The annulus of the casing is sealed to prevent the ingress of surface water via the outside of the casing and the bore is grouted to a depth of at least five metres.
4. A concrete apron is installed around the bore head, extending a minimum of one metre from the casing and sloping away from the casing so that any surface water is carried away from the bore
5. All apertures into the bore (for cables etc) are sealed to prevent access from water or are elevated at least 0.5 metres above the 100-year flood level.
6. All air vents must be screened, facing downwards, and elevated at least 0.5 metres above the 100-year flood level.
7. The bore is fenced so that any animals are excluded from an area extending five metres from the bore.

Table 20. Large Supply Protozoal Compliance Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
47	Water suppliers must determine the protozoa log treatment requirements for each of the source waters that are used.	Audit	Yearly

Treatment processes and log credit allocations

The processes that can be used for protozoal compliance, and the log credits that can be achieved are⁷:

1. Coagulation and sedimentation process without filtration [0.5 Log]
2. Coagulation and direct filtration [2.5-3.5 Log]
3. Coagulation, sedimentation, and filtration [3-4 Log]

⁷ Rules for protozoal disinfection with chlorine dioxide will be provided by Taumata Arowai on request

4. Second stage filtration [0.5 Log]
5. Slow sand filtration [2.5 Log]
6. Membrane filtration [up to 4.0 Log]
7. Cartridge filtration [2.0 Log]
8. Ozone [0.25 to 3.0 Log]
9. Ultraviolet light [up to 3Log].

The cumulative effect of successive treatment processes can be calculated by adding the log credits of all the qualifying processes in use and must not be less than the minimum log-credits required.

Water suppliers must comply with the rules set out below that apply to the treatment process (es) they are using.

Table 21. Large Supply Coagulation and Sedimentation without Filtration Rules [0.5 Log].

Rules 58 to 60 must be met to achieve 0.5 Log compliance.			
Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
48	All water must pass through the sedimentation process.	Audit	Yearly
49	The sedimentation process must achieve at least a 70% reduction in turbidity each day based on the arithmetic mean of the turbidity of the raw water and the water leaving the sedimentation process.	Monitoring	Daily
50	All of the requirements in Table 22 must be met	Audit	Yearly

Table 22. Large Supply Requirements for Coagulation and Sedimentation without Filtration

Parameters that need to be continuously monitored and where they need to be monitored:	<i>Parameters:</i> Turbidity. <i>Where they need to be monitored:</i> On the outlet of sedimentation process, on any recycle streams to the plant inlet [if present].
Separation between data records ⁸ :	1 minute.

⁸ If data is missing for more than 15 consecutive minutes, or for a total of more than 72 minutes in the day, then compliance cannot be achieved.

Instrument Calibration/Verification:	<p>Turbidity monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency or monthly whichever is more frequent. • Calibration Verified in accordance with the instrument manufacturers specified procedures weekly.
Process Limitations:	<p>Sedimentation includes dissolved air flotation.</p> <p>Recycled water from other treatment processes must not be added to the raw water.</p>

Table 23. Large Supply Coagulation and Direct Filtration Rules [2.5-3.5 Log]

Rules 61 to 64 must be met to achieve 2.5 Log compliance:			
Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
51	All water must pass through the coagulation and filtration process.	Audit	Yearly
52	Turbidity must not to exceed 0.30 NTU for more than 5% of a day.	Monitoring	Daily
53	Turbidity must not exceed 0.50 NTU for the duration of any consecutive 15-minute period.	Monitoring	Daily
54	All of the requirements in Table 24 must be met.	Audit	Yearly
Rules 65 to 68 must be met to achieve 3.0 Log compliance.			
Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period

55	All water must pass through the coagulation and filtration process.	Audit	Yearly
56	Turbidity must not to exceed 0.15 NTU for more than 5% of a day.	Monitoring	Daily
57	Turbidity must not exceed 0.50 NTU for the duration of any consecutive 15-minute period.	Monitoring	Daily
58	All of the requirements in Table 24 must be met.	Audit	Yearly
Rules 69 to 72 must be met to achieve 3.5 Log compliance.			
Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
59	All water must pass through the coagulation and filtration process.	Audit	Yearly
60	Turbidity must not to exceed 0.10 NTU for more than 5% of a day.	Monitoring	Daily
61	Turbidity must not exceed 0.30 NTU for the duration of any consecutive 15-minute period.	Monitoring	Daily
62	All of the requirements in Table 24 must be met.	Audit	Yearly

Table 24. Large Supply Requirements for coagulation and direct filtration.

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> Turbidity</p> <p><i>Where they need to be monitored:</i> On the outlet of each filter. Monitored when the filter is in service to supply, on any recycle streams to the plant inlet [if present].</p>
	<p><i>Parameter:</i> Service State.</p> <p><i>Where they need to be monitored:</i> Each filter.</p>
Separation between data records ⁹ :	1 minute.

⁹ If data is missing for more than 15 consecutive minutes, or for a total of more than 72 minutes in the day, then compliance cannot be achieved.

<p>Instrument Calibration/Verification:</p>	<p>Turbidity monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency or monthly whichever is more frequent. • Calibration Verified in accordance with the instrument manufacturers specified procedures weekly.
<p>Process Limitations:</p>	<p>Filtration is of a rapid granular media design (pressure or gravity equivalent).</p> <p>Water treatment plants that recycle waste streams (excluding water from rapid granular media filters being diverted during restart after backwash, often called 'filter to waste') must return the recycle stream so that it undergoes the full treatment process and provide flow equalisation such that the instantaneous total return rate does not exceed 10% of the plant inflow. Turbidity monitoring is required to demonstrate that the recycled water has received effective solids/liquid separation.</p>

Table 25. Large Supply Coagulation, Sedimentation, and Filtration Rules [3-4 Log]

<p>Rules 73 to 76 must be met to achieve 3.0 Log compliance.</p>			
<p>Rule Number</p>	<p>Requirement</p>	<p>Audit/Monitoring</p>	<p>Compliance Monitoring Period</p>
<p>63</p>	<p>All water must pass through the coagulation, sedimentation and filtration process.</p>	<p>Audit</p>	<p>Yearly</p>
<p>64</p>	<p>Turbidity must not to exceed 0.30 NTU for more than 5% of a day.</p>	<p>Monitoring</p>	<p>Daily</p>
<p>65</p>	<p>Turbidity must not exceed 0.50 NTU for the duration of any consecutive 15-minute period.</p>	<p>Monitoring</p>	<p>Daily</p>
<p>66</p>	<p>All of the requirements in Table 26 must be met.</p>	<p>Audit</p>	<p>Yearly</p>
<p>Rules 77 to 80 must be met to achieve 3.5 Log compliance</p>			
<p>Rule Number</p>	<p>Requirement</p>	<p>Audit/Monitoring</p>	<p>Compliance Monitoring Period</p>

67	All water must pass through the coagulation, sedimentation and filtration process.	Audit	Yearly
68	Turbidity must not to exceed 0.15 NTU for more than 5% of a day.	Monitoring	Daily
69	Turbidity must not exceed 0.50 NTU for the duration of any consecutive 15-minute period.	Monitoring	Daily
70	All of the requirements in Table 26 must be met.	Audit	Yearly
Rules 81 to 84 must be met to achieve 4.0 Log compliance			
Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
71	All water must pass through the coagulation, sedimentation and filtration process.	Audit	Yearly
72	Turbidity must not to exceed 0.10 NTU for more than 5% of a day.	Monitoring	Daily
73	Turbidity must not exceed 0.30 NTU for the duration of any consecutive 15-minute period.	Monitoring	Daily
74	All of the requirements in Table 26 must be met.	Audit	Yearly

Table 26. Large Supply Requirements for coagulation, sedimentation and filtration.

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> Turbidity.</p> <p><i>Where they need to be monitored:</i> On the outlet of each filter. Monitored when the filter is in service to supply, on any recycle streams to the plant inlet [if present].</p>
	<p><i>Parameters:</i> Service State.</p> <p><i>Where they need to be monitored:</i> Each filter.</p>

<p>Separation between data records¹⁰:</p>	<p>1 minute.</p>
<p>Instrument Calibration/Verification:</p>	<p>Turbidity monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency or monthly whichever is more frequent. • Calibration Verified in accordance with the instrument manufacturers specified procedures weekly.
<p>Process Limitations:</p>	<p>Sedimentation includes dissolved air flotation.</p> <p>Filtration is of a rapid granular media design (pressure or gravity equivalent).</p> <p>Water treatment plants that recycle waste streams (excluding water from rapid granular media filters being diverted during restart after backwash, often called 'filter to waste') must return the recycle stream so that it undergoes the full treatment process and provide flow equalisation such that the instantaneous total return rate does not exceed 10% of the plant inflow. Turbidity monitoring is required to demonstrate that the recycled water has received effective solids/liquid separation.</p>

¹⁰ If data is missing for more than 15 consecutive minutes, or for a total of more than 72 minutes in the day, then compliance cannot be achieved

Table 27. Large Supply Second Stage Filtration Rules [0.5 Log]

Rules 85 to 88 must be met to achieve 0.5 Log compliance			
Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
75	All water must pass through the second stage filtration process.	Audit	Yearly
76	Turbidity must not to exceed 0.10 NTU for more than 5% of a day.	Monitoring	Daily
77	Turbidity must not exceed 0.30 NTU for the duration of any consecutive 15-minute period.	Monitoring	Daily
78	All of the requirements in Table 28 must be met.	Audit	Yearly

Table 28. Large Supply Requirements for Second Stage Filtration

Parameters that need to be continuously monitored and where they need to be monitored:	<i>Parameters:</i> Turbidity. <i>Where they need to be monitored:</i> On the outlet of each filter, monitored when the filter is in service to supply.
	<i>Parameters:</i> Service State. Each filter.
Separation between data records ¹¹ :	1 minute.
Instrument calibration/verification:	Turbidity monitors used to demonstrate compliance with this rule must be: <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency or monthly whichever is more frequent. • Calibration Verified in accordance with the instrument manufacturers specified procedures weekly.
Process Limitations:	A second filtration stage consists of rapid sand, dual media, granular activated carbon, other fine grain media in a separate stage after granular media filtration with preceding coagulation.

¹¹ If data is missing for more than 15 consecutive minutes, or for a total of more than 72 minutes in the day, then compliance cannot be achieved

Table 29. Large Supply Slow Sand Filtration Rules [2.5 Log]

Rules 89 to 97 must be met to achieve compliance			
Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
79	All water must pass through the slow sand filtration process.	Audit	Yearly
80	The filter must not dry out.	Audit	Yearly
81	Disinfecting chemicals must not be dosed such that they leave a residual disinfectant upstream of the filter beds.	Audit	Yearly
82	Following filter maintenance, water suppliers must not deliver water to consumers until the filtration process has been demonstrated to be effective.	Audit	Yearly
83	The filters must be operated at a surface loading rate of less than 0.35 m ³ /m ² /h.	Audit	Yearly
84	The temperature of the water entering the filter does not drop below 6°C for the duration of a day.	Monitoring	Daily
85	Turbidity must not exceed 0.5 NTU for more than 5 percent of the day.	Monitoring	Daily
86	Turbidity must not exceed 1.0 NTU for the duration of any consecutive 15-minute period.	Monitoring	Daily
87	All of the requirements in Table 30 must be met	Audit	Yearly

Table 30. Large Supply Requirements for Slow Sand Filtration

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> Temperature.</p> <p><i>Where they need to be monitored:</i> Water entering the filtration stage.</p>
	<p><i>Parameters:</i> Turbidity.</p> <p><i>Where they need to be monitored:</i> On the outlet of each filter, monitored when the filter is in service to supply.</p>
	<p><i>Parameters:</i> Flow.</p> <p><i>Where they need to be monitored:</i> On the outlet of each filter, monitored when the filter is in service to supply.</p>
Calculations that need to be continuously monitored:	Surface loading rate.
Separation between data records ¹²	1 minute.
Instrument calibration/verification:	<p>Turbidity monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency or monthly whichever is more frequent. • Calibration Verified in accordance with the instrument manufacturers specified procedures weekly. <p>Other instrumentation must be Calibrated in accordance with the instrument manufacturers specified procedures and frequency.</p>

¹² If data is missing for more than 15 consecutive minutes, or for a total of more than 72 minutes in the day, then compliance cannot be achieved.

Table 31. Large Supply Membrane Filtration Rules [up to 4.0 Log]

Rules 98 to 104 must be met to achieve 4.0 log compliance			
Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
88	All water must pass through the membrane filtration process.	Audit	Yearly
89	Direct integrity tests must be performed on each membrane filtration unit at least daily (midnight to midnight) if the membrane filtration unit has been in service at any point during the day.	Audit	Yearly
90¹³	The membrane filtrate turbidity must not exceed the turbidity of the membrane feed water for the duration of any consecutive 15-minute period.	Monitoring	Daily
91	No membrane unit may be used while it has a failed its direct integrity test.	Audit	Yearly
92	If the turbidity of the membrane filtrate exceeds 0.10 NTU for more than 15 minutes the membrane unit must be shut down and not returned to service until it as passed a direct integrity test.	Monitoring	Yearly
93	If the membrane unit has been out of service for maintenance a direct integrity test must be completed before the unit is returned to service.	Audit	Yearly
94	All of the requirements in Table 32 must be met.	Audit	Yearly

¹³ Exceedances of not more than 2% are allowable to take account of measurement accuracy.

Table 32. Large Supply Requirements for Membrane Filtration

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> Turbidity.</p> <p><i>Where they need to be monitored:</i> on the combined inlet to the membrane process.¹⁴ On the outlet of each membrane filtration unit when in service to supply. On any recycle streams to the plant inlet [if present].</p>
	<p><i>Parameters:</i> Service State.</p> <p><i>Where they need to be monitored:</i> Each membrane filtration unit.</p>
Parameters that need to be non-continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> Membrane Integrity.</p> <p><i>Where they need to be monitored:</i> Each membrane filtration unit.</p>
Separation between data records ¹⁵	1 minute.
Instrument calibration/verification:	<p>Turbidity monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency or monthly whichever is more frequent. • Calibration Verified in accordance with the instrument manufacturers specified procedures weekly.
Process Limitations:	<p>Membrane filtration includes microfiltration and ultrafiltration.</p> <p>Water treatment plants that recycle waste streams must return the recycle stream so that it undergoes the full treatment process and provide flow equalisation such that the instantaneous total return rate does not exceed 10% of the plant inflow. Turbidity monitoring is required to demonstrate that the recycled water has received effective solids/liquid separation.</p>
Membrane Certification:	<p>The maximum number of log credits (up to a maximum of 4.0) that a membrane filtration process is eligible to receive depends on the manufacturer's certification of the log removal that the filter plant can deliver. The manufacturer's certificate (or validation) must specify the operational and maintenance requirements to ensure the membrane units will perform to specification and the integrity</p>

¹⁴ This may be source water turbidity before coagulation when membrane filtration is the only process. It may be the average of turbidity from in service pre-treatment units.

¹⁵ If data is missing for more than 15 consecutive minutes, or for a total of more than 72 minutes in the day, then compliance cannot be achieved.

	<p>testing procedure that the water supplier must carry out to demonstrate that the plant is operating at the claimed log credit rating. It must also document the challenge, or other, tests that were carried out to verify the log credit rating. The Membrane Filtration Guidance Manual (USEPA 2005) outlines a suitable verification procedure.</p>
<p>Direct Integrity test requirements:</p>	<p>The test is applied in such a manner that a 3µm hole affects the response from the test.</p> <p>The test can verify the log removal value claimed for the membrane process.</p>

DRAFT

Table 33. Large Supply Cartridge Filtration Rules [2.0 Log]

Rules 105 to 114 must be met to achieve 2.0 log compliance			
Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
95	All water must pass through the cartridge filtration process.	Audit	Yearly
96	A slow opening/closing valve must be fitted ahead of each housing, or each feed pump must be fitted with a variable speed drive, to minimise pressure surges onto the cartridges.	Audit	Yearly
97	Pumps must not be connected directly to the discharge side of a cartridge filter. After filtration, the filtrate must pass directly to a tank if there is subsequent pumping.	Audit	Yearly
98	Turbidity does not exceed 0.5 NTU for more than 5 percent of the day.	Monitoring	Daily
99	Turbidity does not exceed 1.0 NTU for the duration of any consecutive 15-minute period.	Monitoring	Daily
100¹⁶	The filtrate turbidity does not exceed the turbidity of the cartridge feed water for the duration of any consecutive 15-minute period.	Monitoring	Daily
101	The equipment is operated within the flow range for which it was certified.	Audit	Yearly
102¹⁷	Differential pressure always exceeds the value corresponding to a clean filter established during commissioning and is	Audit	Yearly

¹⁶ Exceedances of not more than 2% are allowable to take account of measurement accuracy.

¹⁷ Exceedances of not more than 2% are allowable to take account of measurement accuracy.

	kept within the manufacturer’s recommendations.		
103	Individual cartridges are clearly labelled with the manufacturer’s name and the part number that relates to the certification.	Audit	Yearly
104	All of the requirements in Table 34 must be met.	Audit	Yearly

Table 34. Large Supply Requirements for Cartridge Filtration

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> Turbidity. Where they need to be monitored: on the combined inlet to the process. On the outlet of each filtration unit.</p>
	<p><i>Parameters:</i> Differential Pressure. Where they need to be monitored: Across each filtration unit.</p>
	<p><i>Parameters:</i> Flow. Where they need to be monitored: On the inlet or outlet of each filtration unit.</p>
	<p><i>Parameters:</i> Service State. Where they need to be monitored: Each filtration unit.</p>
Separation between data records ¹⁸	1 minute.
Instrument calibration/verification:	<p>Turbidity monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency or monthly whichever is more frequent. • Calibration Verified in accordance with the instrument manufacturers specified procedures weekly. <p>Other instrumentation must be Calibrated in accordance with the instrument manufacturers specified procedures and frequency.</p>

¹⁸ If data is missing for more than 15 consecutive minutes, or for a total of more than 72 minutes in the day, then compliance cannot be achieved.

Cartridge Certification:	<p>Each cartridge has a certified <i>Cryptosporidium</i> or cyst removal efficiency of at least 3-log. The cartridge supplier's certification is acceptable provided an appropriately accredited inspection body has performed the testing, the tests are made on filter units including seals and other components integral to the process, that the installed equipment is identical (or validated as equivalent) to the equipment tested during the certification process, individual cartridges are clearly labelled with the manufacturer's name and the part number that relates to the certification and it meets one of the following:</p> <ul style="list-style-type: none">• the USEPA (2010)'s Long Term 2 Enhanced Surface Water Treatment Rule: Toolbox Guidance Manual Part 8: Bag and Cartridge Filters.• the (oo)cyst reduction conditions of Drinking Water Treatment Units: Health effects, NSF/ANSI 53 (NSF, ANSI 2002).• The (oo)cyst removal requirements of a standard formally recognised by Taumata Arowai as being equivalent (eg, AS/NZS 4348:1995 in conjunction with AS/NZS 3497:1998 (updated 2001)).
--------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Table 35. Large Supply Ozone Rules [0.25 to 3.0 Log]

Rules 115 to 119 must be met to achieve compliance			
Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
105	All water must pass through the ozone process.	Audit	1 year
106	The C.t and water temperature required for the log credit claimed (Table 40) must be achieved for more than 95% of the day.	Monitoring	1 day
107	The C.t and water temperature required for the log credit claimed (Table 40) must not be less than 80% for the duration of any consecutive 15-minute period.	Monitoring	1 day
108	Turbidity must not exceed 5.0 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day
109	All of the requirements for ozone disinfection (Table 41) must be met.	Audit	1 year

Table 36. Large Supply C.t values¹⁹ (min.mg/L) for *Cryptosporidium* inactivation by ozone

Log Credit	Water Temperature (°C) ²⁰					
	1	5	10	15	20	25
0.25	5.8	4.0	2.5	1.6	1.0	0.6
0.5	12	7.9	4.9	3.1	2.0	1.2
1.0	23	16	9.9	6.2	3.9	2.5
1.5	35	24	15	9.3	5.9	3.7
2.0	46	32	20	12	7.8	4.9
2.5	58	40	25	16	9.8	6.2
3.0	69	47	30	19	12	7.4

¹⁹ The C.t data in this table are valid for ozone concentrations in the range 0.2-5.0mg/L.²⁰ C.t values between the indicated temperatures may be determined by interpolation.

Table 37. Large Supply Requirements for ozone disinfection

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> Ozone.</p> <p><i>Where they need to be monitored:</i> Water leaving the contact tank.</p>
	<p><i>Parameters:</i> Temperature.</p> <p><i>Where they need to be monitored:</i> Water leaving the contact tank.</p>
	<p><i>Parameters:</i> Turbidity.</p> <p><i>Where they need to be monitored:</i> Water leaving the contact tank.</p>
	<p><i>Parameters:</i> Flow.</p> <p><i>Where they need to be monitored:</i> Water leaving the contact tank unless there is a high-level outlet weir in which case water entering the contact tank is acceptable.</p>
	<p>Water level in the contact tank (if used).</p>
Calculations that need to be continuously monitored:	<p>T₁₀ Contact Time.</p>
	<p>C.t (Ozone x T₁₀ Contact Time).</p>
Separation between data records ²¹	<p>One minute.</p>
Instrument calibration/verification:	<p>Turbidity monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency - or monthly (whichever is more frequent). • Calibration Verified in accordance with the instrument manufacturers specified procedures weekly. <p>Ozone in water monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency - or weekly (whichever is more frequent). <p>Other instrumentation must be calibrated in accordance with the instrument manufacturers specified procedures and frequency.</p>

²¹ If data is missing for more than 15 consecutive minutes, or for a total of more than 72 minutes in the day, then compliance cannot be achieved.

Table 38. Large Supply Ultraviolet Light Rules Ultraviolet Light [up to 3 Log]

Rules 120 to 127 must be met to achieve 3.0 log compliance			
Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
110	All water must pass through the UV reactor.	Audit	1 year
111	UV Intensity (UVI) must not be less than the value (established by validation) required to achieve the claimed log credit for more than 5 % of the day.	Monitoring	1 day
112	UVI must not be less than 80% of the value (established by validation) required to achieve the claimed log credit for any consecutive 15-minute period.	Monitoring	1 day
113	Turbidity must not exceed 5.0 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day
114²²	UV Transmittance (UVT) must not be less than 95% of the lowest UVT for which the reactor has been validated for more than 5% of the day.	Monitoring	1 day
115²²	UVT must not be less than 80% of the lowest UVT for which the reactor has been validated for the duration of any consecutive 15-minute period.	Monitoring	1 day
116	The equipment must be operated within the flow range for which it was validated for at least 95% of the day.	Audit	1 year
117	All of the requirements for UV disinfection (Table 43) must be met	Audit	1 year

²² These requirements do not apply to UV disinfection systems that automatically adjust the UV dose as the UV transmittance of the water flowing through the reactor varies.

Table 39. Large Supply Requirements for UV disinfection

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> UVT.</p> <p><i>Where they need to be monitored:</i> Water entering or leaving the UV reactor(s).</p>
	<p><i>Parameters:</i> Turbidity.</p> <p><i>Where they need to be monitored:</i> Water entering or leaving the UV reactor(s).</p>
	<p><i>Parameters:</i> UVI.</p> <p><i>Where they need to be monitored:</i> The same point in the reactor as that used for validation.</p>
	<p><i>Parameters:</i> Flow.</p> <p><i>Where they need to be monitored:</i> Water entering or leaving the reactor(s).</p>
Separation between data records ²³	1 minute.
Instrument calibration/verification:	<p>Turbidity monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency - or monthly (whichever is more frequent). • Calibration verified in accordance with the instrument manufacturers specified procedures weekly. <p>UVT monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency - or weekly (whichever is more frequent). <p>Duty UVI sensors must be checked at least monthly against the reference sensor. If the difference between the two readings exceeds the manufacturers specified limits, then the Duty UVI sensor shall be replaced.</p> <p>Reference UVI sensor must be standardised at least 1 year in accordance with <i>Ultraviolet Disinfection Guidance Manual (USEPA 2006b)</i> or other traceable procedure. Alternatively, after 12 months the supplier can use the reference sensor as a duty sensor and purchase a new standardised sensor for use as a reference sensor.</p>

²³ If data is missing for more than 15 consecutive minutes, or for a total of more than 72 minutes in the day, then compliance cannot be achieved.

	<p>Other instrumentation must be calibrated in accordance with the instrument manufacturers specified procedures and frequency.</p>
<p>UV validation:</p>	<p>The equipment must be validated to meet the required log credit using one of:</p> <ul style="list-style-type: none"> • the <i>Ultraviolet Disinfection Guidance Manual (USEPA 2006b)</i> – variable log credits. • <i>DVGW Technical Standard W294 (DVGW 2006)</i> – 3 log. • <i>öNORM M5873 (Osterreichisches Normungsinstitut 2001)</i> – 3 log. • <i>NSF/ANSI 55 (2019)</i> for Class A systems (for populations of up to 5,000) – 3 log.

DRAFT

2.3.2.1 Chemical Compliance

This section sets out the requirements a water supplier must follow to achieve chemical compliance at the treatment plant.

Chemical compliance monitoring is required to ensure that any chemicals added during the treatment process and any chemicals created during the treatment process do not exceed the MAVs outlined in the *New Zealand Drinking Water Standards 202X*. Monitoring is also required for any chemicals that exceed 50% of a MAV in the source water.

Compliance monitoring is not undertaken for the purpose of controlling treatment processes; that is the role of operational monitoring.

Typical Values

A water supplier must determine the typical value of a range of determinands to identify if that value exceeds the MAV in the *New Zealand Drinking Water Standards 202X* and to determine the on-going monitoring frequency for those determinands.

Standard typical value refers to a determinand for which any of 15 samples exceeds 50% of the MAV but does not exceed 100% of the MAV and require on-going monthly sampling.

Reduced typical value refers to a determined for which all samples are less than 50% of the MAV and require annual sampling.

Where annual sampling for a determinand identified as reduced value indicates the determined to exceed 50% of the MAV, the determinand becomes a standard value determinand and must be monitored at the standard value rate.

Chlorate and perchlorate are required to be monitored weekly, regardless of the levels determined by sampling.

In the first 12 months after identifying the need to establish a determinand's typical value, 15 samples must be taken with no more than two samples collected in any calendar month.

A determinand's typical value must be determined in the water leaving the treatment plant if:

- (i) the determinand has a MAV; *and*
- (ii) the determinand is:
 - A. present in the source water at a concentration more than 50% of its MAV; *or*
 - B. a chemical added during treatment, or a possible contaminant in a treatment chemical; *or*
 - C. formed as the result of a treatment process and is *not* expected to change in concentration beyond the treatment plant; *or*
 - D. any other determinand identified in the water supply's source water risk management plan or water safety plan as arising from the source water or treatment plant and is not expected to change in concentration beyond the treatment plant.

Following collection of the first 15 samples to establish a determinand's typical value, the monitoring frequencies for the determinand are shown in Table 40.

Table 40. Large Supply Treatment Chemical Determinand Minimum Sampling Frequencies

Minimum sampling frequency		
Standard (Typical value >50 -100% MAV)	Reduced (Typical value ≤ 50% MAV)	Fluoride (ClO ₃ ⁻ , ClO ₄ ⁻ , if sodium hypochlorite is used for disinfection)
Monthly	Annually	Weekly

Event based monitoring

- a. Should the water supplier become aware of an event that may *rapidly* introduce *high* concentrations of health-significant chemical determinands into the water at the source or at the treatment plant, they must carry out event-based monitoring to show that the threat to water safety has been adequately managed. This monitoring is in addition to any operational or other compliance monitoring being undertaken.
- b. If there is doubt as to whether an event meets the requirements of (a), monitoring must be undertaken.
- c. Sampling must start as soon as the water supplier becomes aware of the event and continue until the concentrations of the determinands of concern return to values less than their MAVs. Sampling frequencies should take account of the hazard and risk associated with the determinand but must be higher than those given in Table 40. Typical value sampling must then be undertaken to establish the typical value of the determinand and the on-going monitoring frequency. Sampling may be discontinued when it has been established that the determinand is no longer present.

The contaminants that may arise from treatment chemicals are listed in Table 41.

Table 41. Large Supply Treatment Chemical Determinand Monitoring

Treatment Chemical	Determinands to monitor
Al-based coagulants/flocculants	Al, metals ²⁴
Fe-based coagulants/flocculants	Metals ²⁵
Polyacrylamide (polyelectrolyte)	Acrylamide
EP-DMA (polyelectrolyte)	Epichlorohydrin
Chlorine (gas)	FAC
Hypochlorite	FAC,
	ClO ₃ ⁻ , ClO ₄ ⁻ , BrO ₃ ⁻
Ozone	BrO ₃ ⁻
Permanganate	Mn
Fluoride (in any compound)	F ⁻

Table 42. Large Supply Chemical Compliance Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
118	The determinands that need to be monitored and their typical values must be identified, based on table 41. A determinand's typical value is calculated at the end of each compliance year using the determinand's values measured, or calculated, in the previous 15 samples.	Monitoring	1 month
119	Determinands with a typical value > 50% MAV must be sampled at the <i>standard rate</i> .	Monitoring	1 month
120	Determinands with a typical value ≤ 50% MAV may be sampled at the <i>reduced rate</i> .	Monitoring	1 year
121	A determinand's typical value is calculated at the end of each compliance year using the	Monitoring	1 year

²⁴ Metals: antimony, cadmium, copper, chromium, lead, mercury, nickel.

	determinand's values measured, or calculated, in the previous 15 samples.		
122	If sodium hypochlorite is used as a disinfectant, chlorate and perchlorate and must be monitored weekly	Monitoring	1 week
123	Sodium hypochlorite must not be used as a disinfectant if it is older than 3 months.	Audit	1 year
124	If fluoride is added to treated water, it must be monitored weekly.	Monitoring	1 week
125	Samples must be taken from a point directly after the final treatment process.	Audit	1 year
126	Containers used for collecting samples must be obtained from a laboratory (or made of a material and containing a preservative) that are acceptable to the laboratory for the target determinand.	Audit	1 year
127	Event based monitoring must be undertaken for any event that may <i>rapidly</i> introduce <i>high</i> concentrations of health-significant chemical determinands into the water at the source or at the treatment plant.	Monitoring	1 month after the beginning of the event

2.3.2.1 Cyanotoxin Compliance

Cyanotoxins are produced by cyanobacteria (also known as blue-green algae) and are generally more frequently observed in the warmer months of the year when lakes stratify and there are stable river flows. Not all cyanobacteria species can produce cyanotoxins, therefore, cyanotoxins may or may not be present in waterbodies containing cyanobacteria. However, the presence of any cyanobacteria in a waterbody shows that there is potential for toxin-producing cyanobacteria to grow and a potential risk for water consumers. Because cyanobacteria growth is seasonal, the monitoring frequencies need to be increased in the warmer months of the year (October to May).

Cyanotoxins are not neutralised by boiling of drinking-water and advanced water treatment processes are required for their removal. Therefore, 'boil water notices' cannot be used to manage the risk from cyanobacteria in water supplies.

Source Water Cyanobacteria/Cyanotoxin Risk

Different source water types have different levels of cyanotoxin risk associated with them, mostly related to their requirement for light to grow. Low risk source waters have lower compliance requirements than at risk and high-risk source waters. Water suppliers must establish whether source waters are low risk for cyanotoxins or at risk for cyanotoxins. All water suppliers must then undertake on-going assessment of cyanobacterial risk. When cyanobacteria are found to be present in a water source, the water supplier must manage the risk of cyanotoxins in treated water.

Source waters considered *low risk* for cyanotoxins:

- Groundwater (water abstracted from bores or wells).
- Springs if they are not influenced by surface conditions (e.g. covered) and the water is abstracted before it is exposed to the environment (into a pool or stream).

Source waters considered *at risk* for cyanotoxins:

- Creeks, streams and rivers.
- Lakes, dams and impounding reservoirs.
- Springs that are under the influence of surface conditions and/or the water is abstracted from a pond/pool or stream downstream from the spring.

Source waters considered *high risk* for cyanotoxins

- Any source water where cyanotoxins have been identified.

Source waters considered *high risk* for cyanotoxins require careful monitoring and management.

At risk source waters that have not shown any evidence of cyanobacteria for two consecutive years can be considered to be a low-risk source water.

Table 43. Large Supply Cyanotoxin Compliance Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
128	Information on taste and odour problems (e.g., consumer complaints or observations by personnel) that are not chlorine related, must be collected and considered in relation to the risk of cyanobacteria or cyanotoxins.	Audit	Annual
129	Water sources must be categorised as either low risk, at risk or high risk.	Audit	Annual
130	When a water supply is categorised as at-risk or high risk, a cyanobacteria/cyanotoxin response plan must be prepared which includes vigilance levels for assessing the presence of cyanobacteria and alert levels related to the presence of cyanotoxins.		
131	If cyanotoxin levels exceed 50% of the MAVs set out in the <i>New Zealand Drinking Water Standards 202X</i> , source water and treated water must be monitored twice weekly for cyanotoxin levels.	Monitoring	1 week
132	If cyanotoxin levels exceed the MAVs in the <i>New Zealand Drinking Water Standards 202X</i> either a 'do not drink advisory' must be issued to consumers, or water must be provided from an alternative source	Audit	Month

2.3.3 Distribution System Compliance Monitoring Rules

Distribution systems provide opportunities for recontamination of treated water with micro-organisms or chemical determinands from a range of situations. Water suppliers are required to protect water in a distribution system to ensure it remains safe to drink.

The following rules cover water supplier's responsibilities for backflow protection, hygiene procedures when repairs are undertaken of new water pipes are installed, the operation, maintenance and disinfection of storage reservoirs, monitoring of FAC and disinfection by-products and microbiological monitoring of water in a distribution system.

2.3.3.1 Backflow protection

Water suppliers must prevent biological, chemical, and physical contaminants from entering the distribution system and exposing consumers to micro-biological or chemical contaminants.

The most effective measure a water supplier can take to prevent contamination resulting from a backflow event is to install or require the installation of a backflow prevention device close to each point of supply and to regularly ensure that the device remains functional. The appropriate backflow prevention device type will depend on the level of hazard posed by a connection and the nature of the activities associated with the customer facility. A greater level of hazard requires a device of greater reliability.

Table 44. Large Supply Backflow Protection Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
133	Water suppliers must prepare and implement a backflow prevention programme to protect their network.	Audit	1 year
134	Periodic surveys of medium and high-risk customer premises must be undertaken at a minimum of once every five years to assess the adequacy of backflow protection at the site.	Audit	1 year
135	Where backflow requirements at customer premises are deemed inadequate, the water supplier must determine the type of backflow device required and ensure that it is installed within three months.	Audit	1 year
136	Testing of testable backflow prevention devices must be undertaken, at least annually.	Audit	1 year

137	A water supplier must maintain a register of the location of all testable backflow protection devices, device types and the results of testing of devices.	Audit	1 year
138	Persons conducting surveys, installing, testing, repairing and inspecting backflow devices, must be suitably trained and qualified.	Audit	1 year
139	Access to a water network through use of a standpipe is not permitted except by the fire service, other emergency services, the water supplier or authorised contractor to the water supplier for the purpose of undertaking legitimate water supply activities.	Audit	1 year

2.3.3.2 Hygiene procedures for new and repaired watermains

Activities including planned construction of new watermains and unplanned emergency repairs of ruptured watermains expose the distribution system to potential contamination by microbial pathogens unless risks are managed.

Typically, the installation of new watermains involves rigorous cleaning and disinfection procedures. Emergency repairs of ruptured mains must minimise the risks of contamination during repair work. The requirements of emergency and unplanned repair procedures need to be based on an assessment of the risks associated with the type of main break, conditions during repair procedures, the extent of any depressurisation, and the potential for contamination entering the system.

Table 45. Large Supply Hygiene Procedures Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
140	All personnel authorized to perform construction or repair activities of the water distribution system must maintain personal hygiene, not be experiencing gastrointestinal illness, protect the worksite, materials and tools from contamination, and be adequately trained in procedures that minimize the entry of contamination into the water supply during planned and unplanned activities.	Audit	1 year

141	Before carrying out repairs to pipes in a water distribution, a water supplier must undertake and keep records of a risk assessment to determine the risk of contamination to the network and the procedures required to minimise contamination of the network.	Audit	1 year
142	All materials used in construction and repairs must be free of visible contamination and remain protected from contamination until installation.	Audit	1 year
143	All tools contacting the water supply or its parts, particularly cutting surfaces, must be adequately disinfected using a minimum 1% sodium hypochlorite solution (or equivalent) prior to commencing work and subsequently as necessary when tools contact sewage-contaminated soil or backfill material.	Audit	1 year
144	Disinfection of mains (when required) must follow best management practices including but not limited to methods such as tablet, continuous feed, slug, spray chlorination, or equivalent as appropriate.	Audit	1 year
145	Water suppliers must develop and document standard operating procedures for planned, unplanned and emergency repairs.	Audit	1 year

2.3.3.3 Storage facilities operation, maintenance and disinfection

Water storage facilities can significantly increase the hydraulic residence time, or water age, in the distribution system, and potentially result in a deterioration of water quality due to physical, chemical, and microbiological processes. These include the accumulation of sediment on tank floors, thermal stratification, loss of a detectable chlorine residual, the growth of heterotrophic bacteria in the water and within biofilms on tank surfaces and sediments.

Storage facilities are also susceptible to external contamination entering through structural breaches or deficiencies in vents, screens, hatches, and overflows. Routine inspections are

required to assess conditions, detect deficiencies, and evaluate the need for planned maintenance activities.

Table 46. Large Supply Storage Facilities Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
146	Water suppliers that have storage facilities within a distribution system must prepare a water storage management plan for the operation of storage facilities which includes the minimum and maximum operating levels, target turnover rates inspection and cleaning.	Audit	1 year
147	All storage facilities must be subject to a security and contamination inspection and assessment annually.	Audit	1 year
148	Water suppliers shall have written disinfection procedures for storage facilities that refer to industry best management practices.	Audit	1 year
149	All new storage facilities and existing storage facilities that have been drained for maintenance purposes must be cleaned and disinfected prior to being brought back into use.	Audit	1 year
150	Divers suits, rafts, and remotely operated vehicles (ROVs) used during inspection or maintenance of storage facility interiors shall use materials acceptable for contact with potable water and suitable for disinfection.	Audit	1 year
151	All equipment and materials entering storage facilities must be made of materials acceptable for contact with potable water and must be disinfected immediately prior to entry according to industry best management practices.	Audit	1 year

152	Following full or partial draining of storage facilities for maintenance and after completion of disinfection procedures, storage facilities must be refilled with potable water and tested for <i>E. coli</i> , total coliforms and disinfectant residual to ensure there is no contamination.	Audit	1 year
------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------	--------

2.3.3.4 Residual disinfection and disinfection by-product rules

The maintenance of residual disinfection throughout a distribution system serves to protect water quality during transit to consumers. The disinfectant residual protects against acute risk of pathogen exposure and should not be absent or remain inadequate for any significant length of time. Potential causes of residual loss include contamination due to cross-connections, leaks and breaks, unhygienic installation and repair practices, the accumulation of corrosion by-products, sediment, and biofilm, as well as thermal stratification and prolonged residence times in storage facilities.

Chemical disinfectants may react with naturally occurring organic matter originating from terrestrial and aquatic environments within the watershed or aquifer, producing unintended by-products. When chlorine is used as the residual disinfectant, the two most common and easily measured groups of disinfection by-products are the trihalomethanes (THMs) and haloacetic acids (HAAs). The MAVs for THMs and HAAs apply to long-term exposures and not to short-term exceedances. Disinfection by-products are required to be sampled in an initial sampling programme to determine typical levels each distribution zone. The typical levels then determine the on-going sampling frequencies.

Table 47. Large Supply Residual Disinfection and Disinfection By-product Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
153	A written sampling plan for determinands to be sampled in relation to disinfection and disinfection by-products must be prepared including a system map indicating sampling locations and response procedures to be followed when sample results do not meet prescribed levels.	Audit	1 year
154	If chlorine is used as a disinfectant, samples must be collected for FAC and pH at the frequencies outlined in Table 48.	Monitoring	1 day

155	If chlorine is used as a disinfectant, a residual of at least 0.20 mg/L and a pH 8.5 or less must be maintained at all locations at all times.	Monitoring	1 day
156	Routine sampling sites must be located to adequately represent the distribution system and areas associated with higher risk of deterioration in water quality and population exposure.	Audit	1 year
157	Sample collection must be performed by a person suitably trained in the collection of drinking water samples for compliance purposes.	Audit	1 year
158	Analyses must be undertaken for the following disinfection by-products trihalomethanes: chloroform, bromodichloromethane, dibromochloromethane, and bromoform; and the haloacetic acids: dichloroacetic acid and trichloroacetic acid in each distribution zone according to the frequencies set out in Table 48.	Monitoring	1 month or 1 year as set out in Table 48
159	Sample sites for disinfection by-products should represent both peripheral and central locations in the distribution system.	Audit	1 year

Table 48. Large Supply FAC and pH sampling frequency

Distribution zone population	Number of samples per day
501 – 20,000	1
20,000 – 100,000	2
>100,001	3
For each additional 100,000 people above 100,000	+1

Water suppliers may continuously monitor FAC and pH in a distribution zone as an alternative to the sampling frequencies set out in the Table 48 above.

Table 49. Large Supply Disinfection by-product sampling frequency

Disinfection by- products sampling requirements	Number samples
For 1-year, initial programme – Each distribution zone	1 per month
After 12 consecutive monthly samples less than 50% of the MAV	1 per quarter
After 2 years consecutive samples below less than 50% of the MAV	1 per year

2.3.3.5 Microbiological monitoring

Pathogenic microorganisms, may enter the distribution system if a physical pathway exists and hydraulic conditions allow inward flow. Total coliform bacteria are a useful indicator of contaminant intrusion and potential loss of integrity. Total coliform bacteria may also be associated with biofilm released into the water as a result of changing flow conditions.

Detection of total coliforms in any samples should be confirmed by repeat sampling at the same locations and possibly locations near it, the cause investigated, and corrective actions initiated.

E. coli are a subset of the total coliform group that are primarily associated with faecal contamination and are easily analysed from the same sample taken for total coliform bacteria. A sample that is positive for *E. coli* indicates that faecal contamination has occurred and that a waterborne outbreak may be in progress. Emergency response procedures must be followed in such cases.

Table 50. Large Supply Microbiological Monitoring Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
160	A written sampling plan for monitoring total coliforms, <i>E. coli</i> and any other determinands deemed necessary by the water supplier must be prepared, including a system map indicating sampling locations.	Audit	1 year
161	<i>E. coli</i> and total coliforms must be monitored in each zone of the distribution system according to the frequencies set out in Table 51.	Reporting	1 week
162	Routine sampling sites must be located to adequately represent water in the distribution system, include storage facilities, and entry points for water from another water supplier.	Audit	1 year

163	Samples must be collected according to written sampling protocols prepared by the water supplier or the laboratory undertaking the sample analysis.	Audit	1 year
164	Sample collection shall be performed by a person suitably trained in the collection of drinking water samples for compliance purposes.	Audit	1 year

Table 51. Large Supply Microbiological Sampling Frequencies

Distribution zone population	Number of samples per week	Maximum interval between samples (days)	Minimum number of days of the week used
501–5000	1	11	5
5001–45,000	2	6	6 (at least one Saturday or one Sunday sample each year)
45,001–65,000	3	4	7 (at least one Saturday and one Sunday sample each year)
65,001–90,000	4	3	7 (at least four Saturday and four Sunday samples each year)
90,001–120,000	5	2	7 (at least one Saturday or one Sunday sample each week)
120,001–160,000	6	2	7 (at least one Saturday or one Sunday sample each week)
160,001–200,000	7	1 (daily)	7 (includes Saturdays, Sundays and public holidays)
For each 40,000 people above 200,000	+1	1 (daily)	7 (includes at least one sample each Saturday, Sunday and public holiday)

3 Trickle Feed Water Supplies

Water supplies which provide water at a low volume (trickle feed) to a point of supply storage tank on a consumers' property. Typically, these supplies provide domestic or stock water in rural areas with an agreed quantity over a period of 24 hours, but other supply circumstances exist including communities where all of the water supplied is used at households or commercial premises.

Water Suppliers providing trickle feed water supplies are required to ensure the water is safe to drink and complies with the *New Zealand Drinking Water Standards 202X* at all times if the water is used as drinking water. This requires source water monitoring, treatment and the protection of water from recontamination in the distribution system.

Owners of trickle feed water supplies must demonstrate compliance with the Rules set out below:

- *Trickle feed water supplies serving up to 500 people* must comply with the on demand small drinking water supply rules.
- *Trickle feed water supplies serving more than 500 people* must comply with the on demand large drinking water supply rules.

Water suppliers of trickle feed water supplies that are rural agricultural supplies have the option of adopting the *Rural Agricultural Acceptable Solution* as an alternative to complying with the trickle feed water supplies rules.

4 Secondary Drinking Water Supplies

Water supplies which use another water supply as a source of water and provide water to more than one property via a piped network are categorised as secondary drinking water supplies. The category applies where the ownership and management of the supply is independent of the water supplier from which water is abstracted. A secondary supply will include a distribution network and may or may not include a treatment plant. Examples include an industrial park where water is abstracted from a Council network and on sold to premises at the park, a port or an airport, a retirement village with multiple buildings or a trickle feed supply which takes water from another network supply.

Water Suppliers providing water to consumers via a secondary drinking water supply are required to ensure the water is safe to drink and complies with the *New Zealand Drinking Water Standards 202X* at all times. If the supply is provided with water that has not been treated, the secondary drinking water supply must include a treatment system and the water supplier is responsible for ensuring the water in the distribution zone is protected from recontamination. If the supply is provided with water that has been treated, the secondary water supplier is responsible for ensuring the water in the distribution zone is protected from recontamination.

Owners of secondary drinking water supplies must demonstrate compliance with the Rules set out below.

- *Secondary drinking water supplies serving up to 500 people that use water that has not been treated* must comply with the on demand small drinking water supply rules for treatment (depending on the treatment process, Rules 9 – 29) and distribution systems (Rules 30 – 36).
- *Secondary drinking water supplies serving up to 500 people that use water that has been treated* must comply with the on demand small drinking water supply rules for distribution systems (Rules 30 – 36).
- *Secondary drinking water supplies serving more than 500 people that use water that has not been treated* must comply with the on demand Large Drinking Water Supply rules for treatment (depending on the treatment process, Rules 40 – 142) and distribution systems (Rules 143 – 174).
- *Secondary drinking water supplies serving more than 500 people that use water that has been treated* must comply with the on demand Large Drinking Water Supply rules for distribution systems (Rules 143 – 174).

5 Self-Supplied Building Drinking Water Supplies

Self-supplied buildings are buildings which have a water supply that provides water specifically for the building but does not provide water to any other building. This category does not include a single domestic household but would include a building of apartments.

Water Suppliers providing drinking water to self-supplied buildings are required to ensure the water is safe to drink and complies with the *New Zealand Drinking Water Standards 202X* at all times. This requires source water monitoring and treatment of the water provided to consumers.

Owners of self-supplied building drinking water supplies must demonstrate compliance with the Rules set out below:

- The on demand small drinking water supply rules for source water (Rules 1 – 8) and treatment (depending on the treatment process) (Rules 9 – 29).

DRAFT

6 Water Carrier Supplies

Drinking water may, on occasion, need to be carried in a tank from a drinking water supply to a customer or consumer. Most commonly water carriers are used to transport drinking water to fill up household rainwater tanks during dry weather periods or used as a source of drinking water during emergencies or planned events, such as festivals.

A number of public health risks are associated with the carriage of drinking water. The drinking water must be protected at all times from contamination, which may arise from the carrier's tanker, and the equipment used to load and unload the water.

The purpose of this rule is to provide clear instructions for water carriers on what they need to do to demonstrate that the water they provide to consumers complies with the *New Zealand Drinking Water Standards 202X*. The rule covers the safety of drinking water from the point of filling of a tanker or tank, during transportation, to the point of discharge to a customer or consumer.

Every carrier of drinking water in New Zealand is a water supplier and must ensure any water sold or supplied for potable purposes – drinking, food preparation or personal hygiene – meets the *New Zealand Drinking Water Standards 202X* and the requirements of this section. Water carriers that fill tankers from their own supply, must register that supply and comply with the Rules relevant to that supply.

Table 52. Water Carrier Supply Rules

Rule Number	Requirement	Audit/Monitoring	Compliance Monitoring Period
165	All water to be carried must be sourced from a registered drinking water supplier whose water is (a) safe to drink and (b) complies with the <i>New Zealand Drinking Water Standards 202X</i> . Evidence of registered source must be included on a written statement (delivery docket).	Audit	1 year
166	If water is sourced from a registered drinking water supply that is exempt from chlorination, disinfectant must be added to the tank at loading to give a free available chlorine (FAC) residual between 0.2 mg/L and 5 mg/L (Table 1).	Audit	1 year
167	The carrier can only take water from a point in the distribution system prescribed by the water supplier.	Audit	1 year

168	The operator of any vehicle used to transport water must ensure all tanks, and the equipment used for loading or unloading water, must only be used for drinking water (after the water has been delivered it may be used for purposes other than drinking).	Audit	1 year
169	The operator of any vehicle used to transport water must ensure all tanks, and the equipment used for loading and unloading water, are kept clean and clear of any possible contaminants at all times, with all openings and connections sealed to protect them from possible contamination. The drinking water is to be protected from contamination at all times during its loading, transit and delivery.	Audit	1 year
170	If tanks and the equipment used for loading and unloading water are not used for the transport of drinking water for a period of 30 days, the tank and fittings must be disinfected by filling with drinking water containing at least 5 mg/L FAC for not less than 30 minutes before discharging safely to waste.	Audit	1 year
171	A sample from every load of water must be tested on filling and at delivery, and have a free available chlorine (FAC) level of at least 0.2 mg/L, but less than 5 mg/L.	Monitoring	1 month
172	The carrier operator must ensure there is backflow prevention or an adequate air gap in place when discharging drinking water from the carrier's tank.	Audit	1 year

173	When drinking water is delivered, a written statement must be supplied to the customer/consumer stating the: <ul style="list-style-type: none"> i. Fill date and time. ii. Registered drinking water supply from which the tanker was loaded. iii. FAC level at time of filling the tanker of the amount and type of disinfectant if added to the tanker by carrier operator. iv. Delivery date, time, location and volume of water delivered. v. FAC of water delivered (at discharge). vi. Name and signature of delivery person and carrier registration number. 	Audit	1 year
174	If the water is supplied to a planned event, the statement must be displayed in a prominent location that allows all potential consumers to read it.	Audit	1 year

Table 53. Disinfection with Sodium Hypochlorite (Plain Household Bleach)²⁵

Volume of water in tank (in Litres)	Bleach (mL) required to achieve chlorine dose of:				
	0.2 mg/L	0.5 mg/L	1 mg/L	2 mg/L	5 mg/L
50	-	1	2	3	8
100	1	2	4	7	17
150	1	2	5	10	25
200	1	3	7	13	33
250	2	4	9	17	42
300	2	5	10	20	50
350	2	6	12	23	58
400	3	6	13	27	67
450	3	7	15	30	75
500	3	8	17	33	83
600	4	10	20	40	100
700	5	11	23	47	117

²⁵ Modified from APPENDIX II. Household Water Supplies <https://www.healthed.govt.nz/resource/household-water-supplies> (accessed 29 September 2020)

DRAFT - Drinking Water Supply Operational Compliance Rules

800	5	13	27	53	133
900	6	15	30	60	150
1000	7	16	33	67	167
2000	13	33	67	133	333
3000	20	50	100	200	500
4000	27	67	133	267	667
5000	33	83	167	333	833
6000	40	100	200	400	1000
7000	47	116	233	467	1167
8000	53	133	267	533	1333
9000	60	150	300	600	1500
10000	67	166	333	667	1667
20000	133	333	667	1333	3333

To use the table:

- a. Calculate the volume of water in the tank in litres (L)
- b. Select the dose required (mg/L)
- c. Read the amount of sodium hypochlorite (in millilitres) to be added

7 Planned Temporary Drinking Water Supplies

Planned temporary drinking water supplies are supplies that are established for a specific purpose and for a limited time of less than 60 days. They are not emergency supplies which are dealt with differently under the *Water Services Bill*. Typically, this category includes events like music festivals, farm field days, civil defence or military exercises.

Owners of planned temporary drinking water supplies are required to ensure the water is safe to drink and complies with the *New Zealand Drinking Water Standards 202X* at all times. The water provided to consumers by a Planned Temporary Drinking Water Supplies must be filtered and disinfected. If the supply provides water via a piped network the water must also contain a residual disinfectant.

Requirements for planned temporary drinking water supplies need to be tailored to the circumstances that apply to each situation. Registrations for planned temporary drinking water supplies must be made to Taumata Arowai. At the time of registration, the Rules specific to the supply will be determined and provided as conditions associated with the registration.

8 Community Drinking Water Stations

Community drinking water stations are supplies that provide water from a single site to a community who collect the water in containers. These supplies do not provide water via a piped network. Community drinking water stations use water from a designated source (bore, spring or surface water).

Public taps or container filling stations that are connected to a network supply and provide water which is chlorinated or de-chlorinated are not considered to be community drinking water stations.

Owners of community drinking water stations are required to ensure the water is safe to drink and complies with the *New Zealand Drinking Water Standards 202X* at all times. This requires source water monitoring and treatment of the water provided to consumers.

Owners of community drinking water stations must demonstrate compliance with the Rules set out below.

- The on demand small drinking water supply rules for source water (Rules 1 – 8) and treatment (depending on the treatment process) (Rules 9 – 29).

9 Definitions

To be prepared.

DRAFT