

Exemption Decision Paper

Exemption Number	EXE-00001001
Exemption Type	Residual Disinfection Exemption
Supply Name	Cust
Supply ID	CUS001
Date	12 June 2023 / te 12 o Pipiri 2023
Applicant	Waimakariri District Council
Exemption Team	Jim Graham, Principal Advisor, Drinking Water Noah Hensley, Senior Technical Advisor
International panel member	Charles Haas

Recommendation

For the reasons set out in this paper, the Exemption Team recommends that you **decline** the residual disinfection exemption application for the Cust drinking water supply.

There are a number of matters, some major and some of lesser significance, set out below that, if satisfactorily addressed and accompanied by appropriate conditions, might enable the Exemption Team to recommend the granting of a residual disinfection exemption for the supply in any future application.

Executive summary

1. On 27 July 2022, Waimakariri District Council (**WDC**) applied for a residual disinfection exemption in relation to the Cust drinking water supply (supply ID CUS001). The application was made under section 58 of the Water Services Act 2021 (**WSA**).
2. The Exemption Team considers that the supply cannot currently be operated without residual disinfection in a way that is consistent with the main purposes of the WSA: i.e., to ensure that drinking water suppliers provide safe drinking water to consumers.
3. The exemption team acknowledges that WDC proposes installing an ultraviolet (**UV**) treatment system at the Cust supply in the near future. WDC's application has been assessed taking account of this proposal.
4. The key factors that underpin the Exemption Team's view are:
 - (a) The monitoring and modelling data provided by WDC is not sufficient to determine the degree of risk to the groundwater source from human enteric viruses from on-site wastewater systems near to the bores used to abstract water. Currently, chlorine treatment acts as a barrier to the risks posed by these viruses. In order to safely remove

this barrier, there would need to be evidence confirming the source water will not (or will be highly unlikely to) contain any human pathogenic enteric viruses.

- (b) Source water and abstraction risks are considered to be inadequately understood or managed. These include evidence of variable turbidity and the absence of satisfactory continuous monitoring of source water quality, bores that do not meet the sanitary bore head requirements of the Drinking Water Quality Assurance Rules (**DWQAR**), and risks associated with a backup bore that also provides water to other drinking water supplies.
 - (c) The current chlorine dosing system provides primary bacterial disinfection of the source water. If it is turned off the supply would be operating without a primary bacterial and protozoa barrier. Installation of UV disinfection has been proposed but is not yet installed. As noted in paragraph 3, the exemption application has been assessed on the basis that the UV barrier will be installed. Completion and commissioning of this infrastructure would be a necessary precondition for reliance on an exemption, if one was granted.
 - (d) Water loss in the supply's distribution system is not sufficiently understood and is unacceptably high for the supply to safely operate without residual disinfection. Water loss is a particularly significant risk factor, as the supply's distribution system is located within a community that includes on-site domestic wastewater systems where it is reasonable to expect that groundwater could be affected by wastewater containing human pathogenic viruses, bacteria, and protozoa. The supply's compliance history indicates that this risk is material.
 - (e) Backflow prevention measures in the supply distribution system are inadequate for a supply to be operated without residual disinfection.
 - (f) Historical results showing contamination of the supply with total coliforms have not been adequately explained. These results indicate contamination pathways which need to be investigated and eliminated.¹
5. A number of other factors relevant to the Exemption Team's view which are material to whether an exemption could be granted or not are set out below.

Supply information

- 6. The Cust drinking water supply serves a registered population of 333 people living in a rural community on the Canterbury Plains. The supply sources drinking water from an aquifer of the Waimakariri-Ashley Basin. The main characteristics of the supply are briefly described below. More details about certain components are set out elsewhere in this paper, where relevant.
- 7. The source water is drawn from two wells: the primary well (Springbank Well No. 2, **Well 2**) and a backup well (Springbank Well No. 1, **Well 1**). These are recorded as being 79 and 73 metres

¹ WDC indicated in its comments in response to the draft of this paper that the total coliforms had been traced back to issues that have been remediated and that it can supply an incident report to this effect. However, there was also a positive total coliform at Springbank Well No. 2 which has not been adequately explained.

deep respectively. The screening depth of Well 1 is recorded as 70.3 to 73.0 metres below ground level. The screening depth of Well 2 is recorded as 71 to 79 metres below ground level.

8. The wells are approximately 130 metres apart and are expected to draw water from the same aquifer.
9. Well 1 is used as a drinking water source for the nearby Springbank community and a private water bottling plant which treats all bottled water with UV disinfection.
10. Well 1 is also used as a backup well for the Cust supply.
11. Well 2 is used as a source for the Cust drinking water supply and as a backup well for the Springbank community and the water bottling plant.
12. The treatment plant (e.g. headworks) is located approximately 2.5km from the wells. Raw water is treated with chlorine (sodium hypochlorite) with conservatively calculated chlorine contact time (C.t) of 27.5 min.mg/L. The contact time is provided by a tank farm (6 x 30m³ storage tanks).
13. An upgrade to include UV treatment is in the construction stage. WDC staff have indicated that the UV reactors will be validated and operated to provide for the inactivation of both bacteria and protozoa.
14. In the event an exemption is granted, WDC has indicated that the chlorine dosing would continue to be used in response to incidents or events and moved to a location post-UV treatment.
15. Treated water is distributed to 137 on-demand connections and 3 restricted connections (although see below in relation to the uncertainty around these figures).
16. WDC has indicated that a very low percentage of low hazard water connections would not have backflow prevention devices, but that the actual number of low hazard water connections with backflow devices is unknown. The exemption application indicates that WDC has assessed the Cust drinking water supply to have 4 'medium hazard' properties and 3 'high risk' properties, which each have backflow protection devices installed.
17. Treated water is protected in the network by maintaining positive pressure. The drinking water safety plan (DWSP) indicates that work is being undertaken to install continuous pressure monitoring in the distribution system.
18. The 2020-2021 Annual Drinking Water Report by the Ministry of Health states:

The water supply uses groundwater, without disinfection. A temporary boil-water notice was in place during the reporting period. Cust failed the bacteriological standards because E. coli was detected in 6.8 percent of monitoring samples and the infrastructure was inadequate.

19. The DWSP provides further detail of the “level 3 incident” causing the temporary boil-water notice during the 2020-2021 report, which was likely caused by ingress of shallow groundwater contaminated by a nearby on-site wastewater system.²
20. The DWSP indicates 54 records of total coliforms in the supply up to mid-2021, but this was not a compliance issue under the regime administered by the Ministry of Health through to November 2021. A satisfactory explanation for the recorded presence of total coliforms in the supply has not been provided.³
21. Taumata Arowai has also not received any notifications of non-compliance or potentially unsafe drinking water in relation to the supply since it became the regulator in mid-November 2021.

Information provided by the applicant

22. WDC submitted the following documents in support of its application for a residual disinfection exemption for the Cust supply:
 - Application for Residual Disinfection Exemption.⁴
 - Cust Drinking Water Safety Plan (**Cust DWSP**).⁵
 - WDC’s Source Water Risk Management Plan (**SWRMP**),⁶ which contains:
 - a Regional Overview, and
 - a Cust SWRMP (Appendix H).
 - Cust Water Model Memo.⁷
 - Four incident response plans.⁸
 - Headworks drawings.⁹
 - Backflow Prevention Policy.¹⁰
 - Memo to Taumata Arowai.¹¹

² WDC has indicated this event was due to “buried suction pipework” in close proximity to the old headworks site, and the issue has been remedied.

³ See note 1 above.

⁴ Residual disinfection Exemption Application – Cust Water supply 2022 – FINAL.pdf.

⁵ Cust Drinking-Water Safety Plan – July 2022.pdf.

⁶ SWRMP – Cust.pdf.

⁷ Cust Water Model description and Verification Summary.pdf.

⁸ Covering the four topics of: microbiological contamination, non-microbiological contamination, loss of source/treated water quality, and insufficient supply of water (referred to in this paper by their respective response numbers, IRP001, IRP002, IRP003, and IRP004).

⁹ CON 2036 Drawing 4063 Sheets 1 to 16 Rev C Cust Headworks Upgrade – FOR CONSTRUCTION.pdf.

¹⁰ [QD-3W-Policy-001-Backflow-Prevention-Policy.pdf \(waimakariri.govt.nz\)](#)

¹¹ Memo to Taumata Arowai – Response to Request for Information in Support of Cust Water Supply Residual Disinfection Applicationv2.pdf.

23. Each document contains relevant information. This documentation has been considered by the Exemptions Team with a focus on material specifically referenced in the Application for Residual Disinfection Exemption.

Practical considerations

24. WDC's application states that the reasons for seeking a residual disinfection exemption for the Cust drinking water supply are:
- The views of the Waimakariri District community, including Cust residents, that they would prefer a chlorine-free supply.
 - The risk assessment of the Cust supply and steps put in place by WDC to manage these risks, including an upgrade of the headworks and proposed installation of UV disinfection.
25. The application states that the WDC has had a high level of engagement with the Cust community about their supply, including establishing a Cust Water Supply Advisory Group which worked alongside WDC staff and elected members on matters concerning the supply.
26. The application states that there are limited alternative options available for the Cust supply given the community preference for water to be free of chlorine, as end-point treatment would not be a practical alternative.
27. The time and cost associated with the design, installation and commissioning of residual disinfection systems can be relevant practical considerations for residual disinfection exemption applications. For the Cust supply, the infrastructure to dose chlorine is already present and so the time and cost associated with the equipment required for residual disinfection are not relevant in this case. Other practical considerations include operating costs and ongoing staff or contractor training requirements. However, as the supply is – at the time of this application – chlorinated, these practical considerations do not appear to involve any change to the status quo.

Available compliance pathways

28. The Cust supply does not meet all of the eligibility requirements for drinking water acceptable solutions made by Taumata Arowai as at the date of this paper, which can be adopted as an alternative to complying with the DWQAR and preparing and implementing a DWSP (including the provision of residual disinfection). While the Drinking Water Acceptable Solution for Spring and Bore Drinking Water Supplies could be met by the supply if suitable infrastructure changes were made, WDC has indicated this would not be a practical alternative.

Assessment process

29. Alongside the international panel member for this application, the Exemption Team assessed the documentation provided and met with WDC staff at the treatment plant and bores to discuss the Cust supply. The risk from human pathogenic enteric viruses, uncertainty in leakage

rate of the supply, concerns about the 'semi-confined' nature of the source, the risk that the backup bore presents to the supply, the lack of backflow prevention devices on residential connections and associated risks, and several other issues were discussed.

30. Queries and requests for clarification have been raised with WDC staff and responses provided to the Exemptions Team. Of particular note is the Memo to Taumata Arowai (see footnote 11) which was provided as a response to several of the Exemption Team's queries.
31. A draft of this paper was provided to WDC for review and comment on 22 December 2022. WDC provided feedback on various matters, which the Exemptions Team has considered. Adjustments have been made to the paper where appropriate to address WDC's feedback.

Assessment factors

32. WDC's application has been assessed against the relevant factors arising under the WSA, Taumata Arowai policy and guidance material in relation to exemption applications, and other considerations relevant to decision-making by Taumata Arowai and its staff.
33. Those factors, which shape the structure of this paper, are:
 - (a) The scale, complexity and risk profile of the drinking water supply, which go both to the assessment of drinking water safety risks and also to the proportionality of regulation under the WSA.
 - (b) The Treaty of Waitangi / te Tiriti o Waitangi and its principles, which are relevant considerations under section 19(1)(b) of the Taumata Arowai—the Water Services Regulator Act 2020 (**TAWSRA**).
 - (c) Te Mana o te Wai, to the extent it applies to WDC's application and the associated decision-making of Taumata Arowai.
 - (d) Consistency with the main purpose of the WSA: i.e. to ensure that drinking water suppliers provide safe drinking water to consumers. In accordance with section 58(3)(a) of the WSA, a residual disinfection exemption can only be granted if the decision-maker is satisfied that the exemption is consistent with the main purpose of the WSA.
 - (e) Compliance with legislative requirements and the DWSP (including the SWRMP). In accordance with section 58(3)(b) of the WSA, a residual disinfection exemption can only be granted if the decision-maker is satisfied that drinking water supplied by the supplier will comply with all other legislative requirements and the drinking water safety plan on an ongoing basis.
 - (f) The Taumata Arowai Compliance, Monitoring and Enforcement Strategy 2022-2025 (**CME Strategy**). This is a matter that the Taumata Arowai Chief Executive, and any delegate of the Chief Executive, must have regard to when determining exemption applications.¹²

¹² WSA, s136(7); TAWSRA, s11(2)(b).

Scale, complexity and risk

34. The Cust supply is categorised under the DWQAR as a medium networked supply (101 - 500 people). At a minimum, the Cust supply must comply with the G, S2, T2 and D2 rules modules within the DWQAR, and may elect to comply with higher level rules where appropriate. WDC has elected to comply with the G, S2, T3, and D2 rules modules.
35. Particular risks to the supply's groundwater source stem from land use activities in the groundwater recharge area of Wells 1 and 2. Notably, the risks of contamination from nearby stock grazing and domestic wastewater systems. The Cust DWSP outlines how efforts are made to manage these risks. There are other risks, unrelated to residual disinfection, where the SWRMP recommends improvements to better manage these risks, but the application does not clearly state whether these are to be adopted or, if so, when. These risks increase the complexity of the supply.
36. The relative scale, complexity and risk of the supply has been factored into the Exemption Team's assessment of WDC's application and the commentary and recommendations in this paper.

The Treaty of Waitangi / Te Tiriti o Waitangi and its principles

37. Taumata Arowai and its staff are required to uphold the Treaty of Waitangi (Te Tiriti o Waitangi) and its principles when carrying out their functions.¹³
38. What this means in practice varies from situation to situation, depending on the relevance of Treaty/Te Tiriti provisions and associated principles, including: partnership, self-determination, mutual benefit, honour, active protection, options, right of development, informed decisions, equity and equal treatment, and other principles that may be developed or identified as relevant from time to time. There is also some overlap between these principles and aspects of Te Mana o te Wai, which is discussed in the next section of this paper.
39. WDC's application does include information about the interests of mana whenua, however it is not clear how or whether this directly relates to the Cust supply. The SWRMP outlines the broad interests of mana whenua in the region the Cust supply lies within. WDC has provided evidence of initial engagement with mana whenua indicating support for the application. This has a bearing on the Treaty/Te Tiriti principle of informed decisions.¹⁴ The Exemption Team has taken this into account when considering the proposed exemption.

¹³ TAWSRA, s19(1)(b)(i).

¹⁴ That is, the onus to make a decision that is sufficiently informed as to the relevant facts and law so as to have regard to the impact (if any) on Treaty/te Tiriti principles. As a local authority, WDC is also subject to principles and requirements that relate to the Treaty of Waitangi and the involvement of Māori in its decision-making processes (as set out, for example, in section 4 of the Local Government Act 2002). However, WDC's approach to those principles and requirements is not relevant to the assessment of its exemption application or a matter for the decision-maker to enquire into, to the extent these fall outside the scope of the concept of Te Mana o te Wai.

Te Mana o te Wai

40. For the purposes of the WSA, Te Mana o te Wai is defined in the National Policy Statement for Freshwater Management 2020. Everyone exercising or performing a function, power, or duty under the WSA must give effect to Te Mana o te Wai when doing so, to the extent it applies to the function, power, or duty.
41. Te Mana o te Wai recognises that water has an inherent mauri that must be protected. Protecting the health of water will preserve the health and well-being of the wider environment. Te Mana o te Wai is about restoring and preserving the balance between the water, the wider environment, and the community.
42. The framework for Te Mana o te Wai involves 6 principles relating to the roles of tangata whenua and other New Zealanders in the management of freshwater, coupled with a hierarchy of obligations that prioritises:
 - (a) first, the health and well-being of water bodies and freshwater ecosystems;
 - (b) second, the health needs of people (such as drinking water); and
 - (c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.
43. Te Mana o te Wai is likely to have relatively limited application in the context of a residual disinfection exemption, which is largely focussed on the treatment processes and operations within a drinking water supply.¹⁵ However, each situation must be assessed on its facts and the extent of application of Te Mana o te Wai determined.
44. In its application, WDC states that “Te Mana o te Wai has been given effect to in preparing this application”. The application also states that mauri of the water is given value above all else. WDC has also indicated in its application that it is putting in place an updated SWRMP with the philosophy that the source water must remain pure, rather than allowing it to degrade and then treating it to address the level of degradation that has been allowed to occur.
45. WDC also states in its application that the DWSP demonstrates the steps in place to ensure the high quality of the water is maintained not only within the aquifer, but throughout the rest of the system right through to each consumer. WDC also acknowledges that “Wai within the district it [sic] is treated as a precious taonga with a high amount of value” and that the WDC’s Water Conservation Strategy seeks to minimise the amount that is lost or wasted.
46. WDC acknowledges in its DWSP that it is in the “planning stage of how to best incorporate and implement the six Te Mana o te Wai principles and hierarchy of obligations into Council wide policies, plans, processes and procedures.” WDC also acknowledges that it is essential that local Iwi are involved throughout the planning process to ensure the principles are effectively implemented and given effect to.

¹⁵ Since 15 December 2022, changes made to s14 of the WSA by the Water Services Entities Act 2022 have clarified that Te Mana o te Wai applies, for the purposes of the WSA, to ‘water’ as that term is defined in the Resource Management Act 1991. It consequently includes fresh water, coastal water and geothermal water, but excludes water in any form while in any pipe, tank, or cistern.

47. In the Cust DWSP, WDC states it has an existing relationship with the local Rūnanga and has identified as the first improvement item in the DWSP to “Develop and implement a strategy for integrating Te Mana o te Wai into WDC procedures & policies.”
48. The Exemption Team acknowledges that WDC have taken important steps in an effort to give effect to Te Mana o te Wai. WDC has addressed in its application what the Exemption Team considers the most relevant matters to residual disinfection: water loss and the associated risk of contamination of the supply.
49. Conversely, the uncertainty in water loss figures and high likely water loss rate is arguably inconsistent with the concept of Te Mana o te Wai.

Consistency with the main purpose of the Water Services Act 2021

50. The Exemption Team considers that the Cust drinking water supply appears to be run in a manner consistent with good practice. The care with which the WDC operates its supply is evident in its documentation, but also from discussions with WDC staff.
51. WDC has also demonstrated its approach to satisfying its duty of care, particularly by maintaining residual disinfection while waiting for the outcome of the exemption application for the Cust supply and also by arranging to upgrade the supply to include UV disinfection. This will provide a key barrier to bacteria and protozoa. Many risks in the supply are adequately managed.
52. However, there are several major and minor risk factors (numbered in this section for referencing purposes) which affect the provision of safe drinking water to consumers. Not all of these are adequately addressed in the supply set up, operation, or associated planning. In the Exemption Team’s view, these matters prevent the supply from being able to operate without residual disinfection in a manner consistent with the main purpose of the WSA. The relevant matters are discussed below.

Source Water Factors

53. **Factor 1 – Risk of human enteric viruses:** All risks presented in the SWRMP are marked by WDC as having low certainty (i.e. certainty scored as ‘Estimate’). The Exemption Team considers that the source water monitoring and modelling results are insufficient to understand the risk that viruses pose to the supply. Without chlorination, no effective virus barrier exists for the Cust supply. UV disinfection may or may not provide an effective barrier against viruses. With a material risk that wastewater systems may affect the aquifer, a drinking water supplier must either:
 - (a) provide evidence that there is no or negligible risk of enteric viruses in the source water, or
 - (b) have an effective barrier in place for enteric viruses that may be present in the source water.

54. **Factor 2 – Source water monitoring inconsistency:** Turbidity and age dating of the source water are two examples where monitoring data and analysis is inadequate to provide sufficient certainty about risks to source water. The historical records in Table 2.15 of the Cust DWSP show higher levels of turbidity than would be expected from a deep groundwater source and there is no discussion of these elevated turbidity events in the DWSP. Though age dating has indicated that the water is 175 years old, during the site visit WDC staff communicated that the age testing had been done every 5 years since it became an option in the *Drinking Water Standards for New Zealand 2015 (Revised 2018) (DWSNZ)*, so would have only been done a few times. The Exemption Team has also identified a discrepancy where the recorded level of nitrate may be inconsistent with the water being 175 years old. Again, this issue is not identified or discussed in WDC’s application or the DWSP for the supply.
55. **Factor 3 – Continuous source water monitoring:** Continuous monitoring is a key factor in the assessment of a residual disinfection exemption application. The source water monitoring results, which consist mostly of grab sample results, are not sufficient evidence that the water is always safe. Because of its intermittent nature, grab sampling is of limited value when attempting to prove that water is and has been safe continuously. Grab sampling may not detect rare contamination events that may occur from time to time; continuous monitoring is better suited to detecting rare contamination events. Continuous source water monitoring also allows for a better level of event-based monitoring and can provide assurance that weather and climate are not adversely impacting the supply in ways that affect treatment processes or water quality. Given the nature and performance history of the Cust supply, The Exemption Team considers source water continuous monitoring would need to be implemented and at least one year of continuous monitoring data provided before a residual disinfection exemption could be granted.
56. **Factor 4 – UV Validation conditions:** The turbidity levels recorded in source water may not always meet the manufacturer-specified UV validation conditions and/or requirements of any treatment processes downstream. Turbidity can shield pathogens from being disinfected by both UV and chlorine. In light of the historic turbidity information for the Cust supply, the Exemption Team considers at least one year of continuous monitoring data should be available to assess whether the validation conditions of the UV treatment to be installed will be met, particularly with respect to turbidity.
57. **Factor 5 – Well construction and risks:** Neither source well (Well 1 nor Well 2) would meet requirements of ‘sanitary bore’ as defined in the S3 Module of the DWQAR, which represents best practice for construction of bores and associated infrastructure. Additionally, back up sources are expected to be constructed to a high standard. Well 1, the backup source for the Cust supply, is at much greater risk of contamination than Well 2 as it is connected to two other supplies, and the Exemption Team does not consider that the risk of Well 1 being used, even if rarely, has been addressed adequately. In its application, WDC has not made it clear how the supply would be operated differently to address the change in risk profile when using Well 1 as a back-up source.

58. **Factor 6 – References to secure bore status:** WDC references “secure” and “confined” (see page 2-3 of the Cust DWSP) status of groundwater sources. This is inappropriate in the current regulatory framework which does not recognise bore water as being “secure” and has the potential for risks to have not been assessed effectively due to reliance on terms and ideas that are no longer applicable.
59. **Factor 7 – Source water risk management gaps:** The SWRMP identifies several recommendations for potential additional solutions to manage risk and it is not clear if or when any of these will be adopted. It is noted that the SWRMP was prepared after the Cust DWSP and some aspects of the two documents are inconsistent. In addition, there are several risks identified in the Cust DWSP or SWRMP that the Exemption Team considers are not addressed adequately:
- (a) Risk of human viruses to the source water, particularly from the domestic wastewater systems in the area which could impact the source water recharge zone.
 - (b) Risk of Well 1 contaminating the aquifer, affecting the quality of water abstracted from Well 2 or affecting the operation of the supply when Well 1 is used as a back-up.
 - (c) Risk of unknown private wells contaminating the aquifer.
60. The onus is on the WDC to provide satisfactory evidence that the risks to source water are managed sufficiently to operate a supply safely without the continuous maintenance of a residual disinfectant. In order to exclude chlorination – which is ordinarily a critical barrier to bacteria and human viruses in reticulated supplies – the factors above must be addressed.
61. Some of the issues arising from source water risks could potentially be mitigated through appropriate treatment processes (even though that would be inconsistent with the philosophy that underpins WDC’s SWRMP), this is discussed next.

Treatment Factors

62. Currently the supply is treated with chlorine which provides protection against bacteria and viruses. No additional treatment barriers are currently in place. The existing treatment plant has left room for UV treatment to be installed which may be effective against protozoa, bacteria, and some viruses.
63. **Factor 8 – Lack of multiple barriers:** Chlorine treatment is a primary barrier that reduces the risk that human enteric viruses pose to a water supply. If chlorine treatment is removed and replaced by UV disinfection, the Exemption Team considers the application did not contain appropriate evidence that the supply will always produce demonstrably safe water since UV treatment may not be effective for certain human enteric viruses. This relates to Factor 1, as the level of human enteric viruses in the source water has a direct effect on the level of treatment needed to provide an effective barrier. Additionally, the high turbidity values documented in the DWSP are concerning for disinfection, whether by chlorine or UV disinfection.
64. **Factor 9 – Responsive chlorination:** A high standard of care must be adopted by all staff, contractors, and other agents involved in the operation of the Cust supply. For a supply to operate safely without chlorination, clear and conservative incident response plans are a key

factor in ensuring public health is protected. Staff training is essential, particularly on rapid initiation of chlorine dosing and flushing to purge the entire distribution zone of water that may be or is unsafe (including health and safety at work considerations for staff and contractors when administering chlorine dosing processes). The Exemption Team considers that WDC has not provided sufficient information to demonstrate that it would reliably and rapidly respond with “responsive chlorination” to any indication of:

- a contamination event in the source
- a treatment plant failure (including failure arising from excessive turbidity), or
- distribution system contamination event.

Distribution Factors

65. **Factor 10 – Limited backflow prevention programme:** The Exemption Team considers that the status of backflow prevention in the Cust distribution system could be improved, and it does not appear that the Cust supply aligns with WDC’s Backflow Policy of low hazard sites (residential) having a non-testable dual check backflow prevention devices. The Exemption Team considers that the WDC has not implemented a backflow prevention programme suitable for operating a supply without residual disinfection.
66. **Factor 11 – Hygiene Practices:** Hygienic practices when performing physical work on the Cust supply should be implemented with the highest standard of care; the risks around this are particularly pronounced when a supply does not have residual disinfectant. This includes undertaking all work, where practicable, on the distribution system under positive pressure where ingress of contamination is a risk to the distribution system. The Exemption Team considers that a Hygiene Code of Practice for a supply that operates without a residual disinfectant should account for the change in risk profile associated with not having residual disinfection in the distribution system. This may include initiating responsive chlorination, additional testing, and other control and assurance measures during planned and unplanned repair and maintenance works within the supply as precautionary measures to ensure and check the quality of the water in the distribution system.
67. **Factor 12 – Maintenance of Distribution System:** The Exemption Team considers that flushing a distribution system every 5 years – as set out in the Cust DWSP - is too infrequent to ensure the quality of treated water in the distribution system is maintained when operating a supply without residual disinfectant, especially given the elevated turbidity levels that have been present in the Cust supply.
68. **Factor 13 – Monitoring of Distribution System Integrity:** WDC’s application states that it will install pressure monitoring in the network in the current financial year. The assessment of this application has taken account of this being undertaken. The Exemption Team considers continuous monitoring of the distribution system a key factor in deciding whether to grant an exemption.
69. **Factor 14 - Water Loss Uncertainty:** While residual disinfection provides some protection when distribution incidents (e.g., pipe bursts, maintenance, pressure transients, etc.) allow ingress of contaminants, being able to measure the chlorine residual (and changes to it) also allows for the

detection of incidents and provides assurance that the microbiological quality of the drinking water is maintained to a high standard. Distribution incidents have been linked to gastrointestinal illness¹⁶ and pressure transients that could lead to ingress of contamination into the supply have been shown to occur in pressurised networks.¹⁷

70. Without a residual disinfectant, the Exemption Team considers that other measures, like ensuring low water loss, are needed to provide additional assurance as to the integrity of the distribution system and its operation. The water loss estimate given by WDC lacks quantitative certainty and may be too high to ensure the distribution system is not at risk of major ingress of contamination during low pressure events. The Exemption Team considers that WDC needs to be able to demonstrate greater understanding of where how and why water loss is occurring in a relatively small pipe network.
71. **Factor 15 – Network renewals and assessment:** The pipe work has not been installed recently and may be nearing the end of its expected life. The Exemption Team considers that the current pipe replacement methodology does not provide sufficient assurance that pipes will be replaced proactively before they fail and that allowing for failures and pipe bursts to determine when pipes should be replaced is not best practice in any drinking water supply, particularly in a supply that does not maintain a residual disinfectant.

Drinking Water Safety Plan

72. The exemption team reviewed the Cust DWSP, with particular focus on sections referenced within WDC's residual disinfection application.
73. There are various inconsistencies and discrepancies between some parts of the Cust DWSP. The Exemption Team considers that the Cust DWSP may not be fully implemented and may already be out of date, referring to the recently revoked DWSNZ. The Exemption Team notes that the Cust DWSP is a relatively large, complex document for a small supply and consider this may be a partial reason why it is not up to date. WDC has noted that, at the time of the exemption application, the Cust DWSP was consistent with the operative standards at that time. WDC is working through a process to update their documentation to reflect the introduction of new legislation and the requirements contained therein.
74. In broad terms, it is not clear how WDC, through the Cust DWSP, will manage the additional risks of not having a residual disinfectant. During the Exemption Team's site visit, a WDC staff member commented that WDC's focus was not on necessarily doing more, but rather doing things really well. The Exemption Team considers all supplies should do their duties well;

¹⁶ See Säve-Söderbergh et al. Gastrointestinal illness linked to incidents in drinking water distribution networks in Sweden, *Water Research*, Volume 122, 2017, Pages 503-511, ISSN 0043-1354, <https://doi.org/10.1016/j.watres.2017.06.013>.
(<https://www.sciencedirect.com/science/article/pii/S0043135417304876>)

¹⁷ Yang et al. Managing risks from virus intrusion into water distribution systems due to pressure transients. *J Water Health* 1 June 2011; 9 (2): 291–305. doi: <https://doi.org/10.2166/wh.2011.102>

however, in the case of a supply operating without residual disinfection, the supplier should also consider what additional measures and controls must be in place to manage the risks of not maintaining residual disinfectant in their supply (which effectively removes a contamination barrier that would otherwise be present).

75. The SWRMP for the Cust supply was also reviewed; while a separate document, this is technically part of the Cust DWSP. The SWRMP is generally thorough in its assessment of the particular risks that it identifies. However, a key risk was not included – the risk of human enteric viruses entering the supply. This risk needs to also be addressed appropriately in the Cust DWSP to ensure treatment is appropriately managing the risk of human viruses.
76. As pointed out in Factor 7, the SWRMP sets forth a number of potential solutions that could not be addressed in the Cust DWSP, as the Cust DWSP pre-dates the SWRMP. The Exemption Team considers that the Cust DWSP should be updated to reflect the SWRMP, and also to ensure that the documentation is internally consistent and effectively integrated.

Incident Response Plans

77. Incident response plans were provided by WDC and the Exemption Team has assessed these for appropriateness.
78. Broadly speaking, the content in the plans addresses the issues, and includes the kind of information that the Exemption Team would expect to see. However, the Exemption Team considers that the structure of the response plans is not detailed, nor specific, enough to show how and when actions are to be undertaken.
79. For example, flushing to remove contamination from a supply without a residual disinfectant and without understanding the cause of the contamination may result in further contamination of the supply. The Exemption Team considers that an appropriate response to any indication of microbial contamination would be to automatically trigger responsive chlorination, then flushing. Flushing to bring in water with a residual disinfectant is considered appropriate by the Exemption Team.
80. The Exemption Team considers that the responses for some parameters are not conservative enough even for a supply with residual disinfection (e.g. the response for *E. coli* < 10 cfu per 100 mL being a level 3 as opposed to a level 4).
81. Finally, the Exemption Team considers that the responses are not appropriately conservative for “unchlorinated” supplies (e.g. triggers and water quality limits for enacting “responsive chlorination” – see Factor 9).
82. Until these broader response planning issues are resolved, the Exemption Team considers that without residual disinfection some risks to this supply are unlikely to be able to be adequately managed on a continuous basis, meaning the operation of the supply without residual disinfection would not be consistent with the main purpose of the WSA.

Monitoring Plans

83. The monitoring plans for the Cust supply are not based on the DWQAR, but rather the now revoked DWSNZ.¹⁸
84. Not only does the monitoring plan need to be updated to account for the DWQAR, but non-chlorinated supplies also require additional monitoring. For example, the Exemption Team considers that the DWSP should provide for heterotrophic plate counts to be carried out at appropriate locations within the supply. These should be provided for as part of regular monitoring and also in response to total coliform or *E. coli* detection or other incidents.
85. Maintaining staff capacity and competency is particularly important for unchlorinated supplies. WDC should be actively working to ensure staff do not become complacent about supply risks or operation. WDC can look to formalise a means to maintain organisational and technical capacity (staffing levels, training, competency, capacity, awareness) for both the WDC and principal contractors. This should include awareness-raising at senior executive and councillor level of need to maintain this capacity. This extends to frontline worker contractors who do the higher risk work, and how risks associated with staff and contractor turnover are mitigated. The matter of staff capacity and competency in relation to the operation of a water supply without a residual disinfectant was not outlined in the application.

Compliance with legislative requirements

86. A residual disinfection exemption cannot be granted unless the decision-maker is satisfied that the drinking water supplied will comply with all 'other' legislative requirements (i.e. other than the usual requirement to provide for residual disinfection) on an ongoing basis.
87. 'Legislative requirements' has a particular meaning¹⁹ that covers requirements imposed by the WSA, most secondary legislation made under the WSA (such as drinking water standards and the DWQAR), and some enforcement instruments (directions or compliance orders issued under the WSA).
88. The Cust supply's previous compliance history is noted under the 'Supply information' heading above.
89. This showed that issues with the headworks led to the contamination of the supply and that domestic wastewater systems in the area were contaminating shallow groundwater in the town of Cust.
90. It is apparent that WDC has put in place appropriate improvement actions to remedy the source of that contamination.
91. WDC is also putting in place measures to ensure that the supply is compliant with the WSA and the requirements of the DWQAR.

¹⁸ Revoked and replaced from 14 November 2022 by the Water Services (Drinking Water Standards for New Zealand) Regulations 2022, the DWQAR, and the Aesthetic Values for Drinking Water Notice 2022.

¹⁹ WSA, s5.

92. The Exemption Team also considers that the Cust supply may eventually comply with the legislative requirements in the WSA, if proposed UV treatment equipment is installed and operates in accordance with design parameters and other improvement items are satisfactorily addressed. Having regard to the supply's previous compliance history and monitoring results, and the Cust DWSP and the decisions it reflects, the Exemption Team considers that there are significant gaps that will need to be addressed before a decision-maker can reasonably be satisfied that the drinking water supplied will comply with all 'other' legislative requirements on an ongoing basis.

Compliance with drinking water safety plan

93. A residual disinfection exemption cannot be granted unless the decision-maker is satisfied that the drinking water supplied will comply with the relevant DWSP on an ongoing basis.
94. The Exemptions Team is not aware of any information or issues that suggest drinking water supplied by the Cust supply would not comply with the Cust DWSP on an ongoing basis.
95. However, the Cust DWSP in its current form is out of date and the Exemptions Team considers it is not suitable to enable the granting of a residual disinfection exemption.

Compliance, Monitoring and Enforcement Strategy

96. The CME Strategy outlines the approach Taumata Arowai will take to exemption applications. It provides part of the backdrop for the more detailed provisions in other Taumata Arowai policy and guidance material.
97. Amongst other things, the CME Strategy provides that Taumata Arowai will be guided by the following principles when determining exemption applications:
- consumption of safe drinking water by consumers is paramount; and
 - the scale, complexity and degree of risk associated with a drinking water supply will affect the assessment of whether an exemption would be consistent with the main purpose of the WSA, to ensure that drinking water suppliers provide safe drinking water to consumers.
98. The Exemption Team has had regard to the relevant parts of the CME Strategy when conducting its assessment and preparing this paper. The principles recorded in the CME Strategy are reflected in the discussion above.

Additional comments

99. The Exemption Team considers that the Cust supply cannot currently be operated without residual disinfection in a way that is consistent with the main purpose of the WSA.
100. There are a number of matters, some major and some of lesser significance, set out above that, if satisfactorily addressed and accompanied by appropriate conditions, might enable the Exemption Team to recommend the granting of a residual disinfection exemption for the supply.

101. This would also be contingent on:
- (a) No new issues emerging that materially change the assessment of the supply; and
 - (b) Information or commentary from WDC being made available to enable further assessment of the operation of the supply without residual disinfection from the perspective of Te Mana o te Wai (and consequently the Treaty/Te Tiriti and its principles).

Approval

The Exemption Team recommends that you:

- (a) **note** the Exemptions Team's views that, having regard to the scale, complexity and risk profile of the Cust supply:
 - the supply cannot currently be operated without residual disinfection in a way that is consistent with the main purpose of the WSA;
 - aside from residual disinfection, there are grounds to be satisfied that the drinking water supplied by the supply may not comply with all other legislative requirements on an ongoing basis;
 - on the information available, granting a residual disinfection exemption would arguably be inconsistent with, and therefore not give effect to, Te Mana o te Wai.
- (b) **agree** to decline the residual disinfection exemption application for the Cust drinking water supply.

Yes / No



Ray McMillan
Head of Regulatory

Date: 14 June 2023