Greenpeace Aotearoa, Forest & Bird, Fish & Game, Cancer Society, Choose Clean Water, Wise Response, Environmental Defence Society, Organics Association of NZ, ECO, Coal Action Network, Senior Climate Action Network, Generation Zero

Submission on Proposed Amendments to National Environmental Standards for Sources of Human Drinking Water consultation 2022[1]

Wai Hauora Mō Tātau Katoa

Healthy Water For All

"Access to safe water is a fundamental human need and, therefore, a basic human right. Contaminated water jeopardises both the physical and social health of all people."

- Kofi Annan, UN Secretary-General.

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[1] In response to the consultation document *Kia kaha ake te tiakina o ngā puna wai-inu - Improving the protection of drinking-water sources* on Proposed amendments to the Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2007

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Overview

Everyone should have access to clean and safe drinking water. No one should get sick, let alone risk developing cancer, because the water from their kitchen tap is contaminated.

But in Aotearoa, people are getting sick from their drinking water. The increase in intensive livestock farming, in particular dairying, and the synthetic fertiliser that fuels it, is contaminating our water with pathogens and nitrates.

Our water systems are interconnected - rivers and lakes feed aquifers that replenish the groundwater supplies that 40% of New Zealanders rely on for their drinking water[2] - Therefore sick rivers lead to sick people. While the most impacted communities are rural people on household bore water supplies, contamination threatens all groundwater supplies including reticulated water such as the Christchurch town supply sourced from the Canterbury aquifer.

Nitrate is the most widespread contaminant found in our water and is linked to acute and chronic illness. The biggest sources of nitrate contamination into Aotearoa's water is urine from dairy cows, urine from sheep, and synthetic nitrogen fertiliser. The largest sources of pathogens in our water are grazing livestock.

If levels of nitrate in drinking water are at or above 11.3mg/L (NO3-N) it can cause blue baby syndrome. We know that there are household drinking water supplies in Aotearoa where nitrate contamination is above that level.[3]

Nitrate in drinking water at levels far below the current 11.3mg/L limit is linked to increased risks of colorectal cancer and preterm birth. Scientists warn that 100 cases of colorectal cancer and 40 deaths per year in New Zealand could be attributed to nitrate in drinking water.[4] US scientists found that there was nearly a 50% increase in risk of preterm birth for pregnant people drinking water with nitrate concentrations above 5 mg/L.[5]

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[2] ESR, Groundwater Science in New Zealand, (link):

[3] Stats NZ, Regional Council Data: "For the five-year period 2014–18:19 percent of 433 sites failed to meet the nitrate-nitrogen drinking water standards on at least one occasion, based on having concentrations above the maximum acceptable value of 11.3 g/m3 set by the Ministry of Health (2018)." retrieved from StatsNZMarch 2022: https://www.stats.govt.nz/indicators/groundwater-quality

[4] J Richards, T Chambers et al. "Nitrate contamination in drinking water and colorectal cancer: Exposure assessment and estimated health burden in New Zealand." https://www.sciencedirect.com/science/article/abs/pii/S0013935121016236

[5] Sherris Allison R, et al. Nitrate in Drinking Water during Pregnancy and Spontaneous Preterm Birth: A Retrospective Within-Mother Analysis in California. *Environmental Health Perspectives.* 2021;129(5):057001 https://pubmed.ncbi.nlm.nih.gov/33949893/

Groundwater nitrate contamination is worsening in dairy intense regions such as Canterbury.[6] Of utmost concern is the fact that there can be a long lag time between nitrate being leached into water from land, and it then showing up in aquifers used for drinking water.

Contaminated water causes between 18,000 and 34,000 cases of gastrointestinal illness in New Zealand each year.[7] But, these confirmed numbers are almost certainly underestimated as many cases are undiagnosed and unreported.

There are many pathogens that can be transmitted from livestock to humans, known as zoonoses, that can cause gastrointestinal illness. In New Zealand, infections from zoonoses "are among the highest reported for any developed country and are a major public health concern".[8]

The purpose of the review of the National Standards for Drinking water (NES-DW) is to make improvements to "How activities that pose risks to source water are regulated or managed. The overall aim is to ensure higher-risk activities are managed either through more stringent controls or direction where necessary."

However the proposed controls outlined in the consultation document are far from sufficient to protect drinking water. To ensure healthy water for all people it is vital that there are strict controls on the main causes of water contamination - synthetic nitrogen fertiliser and dairy stock intensity. As such the NES-DW should include a sinking cap on synthetic nitrogen fertiliser and stocking rate limits.

While the consultation document recognises that synthetic nitrogen fertiliser is a contaminant that poses risks to our drinking water it only proposes five metre setbacks for fertiliser application as a remedy. Direct runoff from synthetic nitrogen fertiliser is not the primary pathway for nitrate infiltration of waterways - leaching is. While it is also a direct source of leachate, it also enables more cows to be stocked on land, which increases nitrate leaching from urine patches - the largest source. As the Ministry for the Environment noted in its submission on cutting synthetic nitrogen fertiliser to the Environment Select Committee in September 2021:[9]

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[6] "However, nitrate concentrations in Canterbury groundwater are generally increasing and this can affect some rivers and streams fed mostly by groundwater." - ECAN, April 2020, https://www.ecan.govt.nz/get-involved/news-and-events/2019/nitrate-in-waterways-whats-the-story/

[7] . Ball A (2006). Estimation of the burden of Water-borne disease In New Zealand: Preliminary report. Wellington: Ministry of Health

[8] . Lal A, Lill A, Mcintyre M, Hales S, Baker M and French N (2015). Environmental change and enteric zoonoses in New Zealand: a systematic review of the evidence. Australian and New Zealand Journal of Public Health, 39(1), p.63-68.

[9] Sara Clarke to Eugenie Sage, 20 September 2021, Appendix 1, The Ministry for the Environment response to the Environment Select Committee's request for evidence regarding the petition from Greenpeace NZ and 30,000 others, for a phase out of synthetic nitrogen fertiliser by 2024, Accessd Feb 2022: (link)

> “Fertiliser's role is largely an indirect one. By enriching pasture and forage crops, it enables a higher number of animals to be supported on the land.”
>
> “In the case of nitrate leaching, less than 5 percent is directly due to fertiliser nitrogen moving through soil into waterways while more than 80 percent is from animal urine.”

A five metre setback for synthetic nitrogen fertiliser application won’t fix the problem. The Ministry for the Environment's technical guidelines for the NES-DW highlights the need for a “catchment wide approach” to nitrate concentrations. Only a national sinking cap on synthetic nitrogen fertiliser - applied to all land - will do this.

> “Exceedances of the MAV [Maximum Allowable Value] for nitrate-nitrogen at a number of sites around New Zealand indicate that non-point source nitrate contamination is not being attenuated sufficiently to reduce concentrations in groundwater to acceptable levels. Dispersion is in general not an effective attenuation mechanism for nitrate in non-point-source discharge situations. This is partly due to the loading of the groundwater system with nitrate, and the slow groundwater flow velocities. Nitrate concentrations require a catchment-wide approach to management.”[10]

The consultation document has also failed to address the fact that the number of livestock and the intensity to which they are farmed is a fundamental problem. The sheer volume of livestock excreta produced daily overwhelms natural attenuations and designed barriers. Livestock numbers matter. Too many cows is a crucial problem for attenuation and has chronic and acute consequences for the safety of our drinking water.

The only controls proposed rely on stock exclusion from waterways. But as with synthetic nitrogen fertiliser, excluding livestock from surface waterways is insufficient to address the primary source for the most common water contaminant - nitrate - 80% of which is catchment-wide leachate from livestock urine.

Only with a catchment wide sinking cap on synthetic nitrogen fertilisers and a limit on livestock intensity can we ensure that present and future generations will be protected from water borne pathogens and contaminants that cause sickness.

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[10] Page C-2, ministry for the Environment - Technical Guidelines for Drinking Water Source Protection Zones, retrieved March 2022: (link)

Summary of Key Recommendations:

1. Ensure that the NES-DW gives effect to Te Tiriti o Waitangi and Te Mana o te Wai
2. The NES-DW needs to recognise both synthetic nitrogen fertiliser and livestock urine (particularly from dairy cows) as direct, indirect, or source contaminants and address them as such
3. Recognise:
    a. Livestock urine (particularly dairy cow urine) and synthetic nitrogen fertiliser[11] as the primary causes of nitrate contamination of water in Aotearoa
    b. Livestock numbers and intensity and associated ecreta (facilitated by extensive use of synthetic nitrogen fertiliser and imported feed and industrial-scale irrigation) as the primary cause of pathogenic contamination of water in Aotearoa
4. Limit the application of synthetic nitrogen fertiliser and apply a sinking cap to reduce the limit over time towards a phase out.
5. Enact stocking rate limits to protect source water
6. Prohibit new dairy conversions
7. Protect everyone's drinking water, including rural communities on small supplies servicing fewer than 25 people
8. Ensure rural people don't carry the costs of decontaminating their households' drinking water
9. Extend the size and controls within proposed 'zones' around source water to better protect public health and the environment - see **Key Recommendations** section for detail.

A full list of recommended changes are provided at the end of this document under Key Recommendations. A response to the MfE consultation questions appears in Appendix 2.

First Principles for Safe Drinking Water

1) Protecting source water

Humans are part of an interconnected environment. Contaminants and pollution that enter our environment soon find their way into our bodies - whether microplastics, air pollution, radiation,

[11] Urea is just one type of synthetic nitrogen fertiliser. While the majority of synthetic nitrogen is applied via urea it's also applied in diammonium phosphate (DAP) and ammonium sulphate (SOA). And other smaller scale fertilisers. Urea contains 46% synthetic nitrogen, DAP 17.6% and SOA 20%. All synthetic nitrogen must be controlled as a contaminant.

heavy metals or leached nitrate. The degradation of Aotearoa's freshwater leads inevitably to a degradation of our drinking water. It is self-evident that if the water is sick the people will be sick.

Taking the approach of protecting source water for the good of human health is deeply logical and fundamentally ecological. As stated in the Consultation document, for the protection of human drinking water, "**The first and most important step is protecting the source water – our rivers, lakes, and aquifers – from contamination**."[12]

We support the affirmation that protecting drinking water at source is also necessary for giving effect to Te Mana o te Wai.

> "Source water protection is also important for giving effect to Te Mana o te Wai (see paragraph 10.1), as it addresses **first and foremost, the health of the water bodies from which drinking water is extracted**."[13]

And further that,

"Protection of source water is important, not only because improving water quality is consistent with New Zealand's freshwater management framework, but because **it is not always possible to remove contaminants through treatment processes**."[14]

Indeed, as stated by NIWA, "Nitrate (oxidised nitrogen) is the most widespread contaminant present in New Zealand groundwater" and is "a concern for human health, [and] the environment."

Nitrate is highly soluble in water, making it readily transported through the soil to groundwater. Nitrate is difficult[15] and expensive[16] to remove and known methods are potentially unreliable.

Currently no registered water supply services are equipped to remove nitrate. Rural householders are spending thousands of dollars to decontaminate their bore water supplies and source safe water.[17]

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[12]MFE 2021 , Draft interim Regulatory Impact Statement: proposed amendments to the NES-DW, pp. 11 https://environment.govt.nz/assets/publications/FINAL-interim-RIS-for-proposed-amendments-to-NES-DW-signed-25-Nov-2021.pdf pp. 11

[13] MFE 2021 Draft interim Regulatory Impact Statement: proposed amendments to the NES-DW, pp 5 https://environment.govt.nz/assets/publications/FINAL-interim-RIS-for-proposed-amendments-to-NES-DW-signed-25-Nov-2021.pdf

[14] Ibid

[15] "Nitrate is difficult to remove from water. Common household cartridge or carbon filters, boiling water and chemical treatments (e.g. chlorine) will not remove nitrate." - Canterbury District Health Board, https://www.cph.co.nz/wp-content/uploads/drinkwaterfaqnitrates.pdf

[16] The Christchurch council found that it would cost 1.5 billion to remove nitrate from the Christchurch drinking water supply

[17] "Graeme Tweedie… had already spent $15,000 on a filter that would at least lower the amount in his drinking water" https://www.rnz.co.nz/news/national/442950/nitrate-level-test-overwhelming-demand-for-drinking-water-check-in-leeston

2) Universal access to safe drinking water

We (the submitters) strongly support the principle articulated by the Minister that "**everyone should have access to safe drinking water**." (pg6). Indeed, access to safe drinking water has been stated as a basic human right by the United Nations and notes that water contamination threatens the wellbeing of all people.

> "Access to safe water is a fundamental human need and, therefore, a basic human right. Contaminated water jeopardises both the physical and social health of all people."[18]
> - Kofi Annan, UN Secretary-General.

Further, we strongly support the principle that "Everyone deserves safe drinking water, whether from a large or small supply." (pg11). This should imply that everyone deserves access to safe drinking water whether on a registered or unregistered supply, including those on rural household supplies.

We note that "smaller communities are particularly vulnerable to poorer quality drinking water" (pg11)[19] and in fact those on unregistered supplies, with no formalised system of monitoring, are the most vulnerable.

We strongly support changes to the NES-DW (National Environmental Standard for Sources of Human Drinking Water) that would make drinking water safe for all New Zealanders.

Currently in Aotearoa, access to safe drinking water is something of a postcode lottery. This is due to the lack of regulatory measures which effectively stop contamination of all drinking water supplies including unregistered bores. While quoting the findings of the Havelock North Inquiry, which acknowledge that "The size of a water supply should not determine the level of first barrier protection, and there are challenges in basing application of the regulations on the population serviced by a supply," (Inset box Pg13), the proposed changes still fail to extend the principle of protection of all people's water to unregistered supplies.

Source water protection rules must address this inequality of access to safe drinking water for all people.

[18] https://www.un.org/press/en/2001/sgsm7738.doc.htm

[19] "for small supplies (supplying 101 to 500 people), only about 31 per cent met these standards. This suggests that smaller communities are particularly vulnerable to poorer quality drinking water. In New Zealand, smaller water supplies (to populations of fewer than 500 people) serve an estimated one in five people."

Presently, the often significant costs of testing water and attempting to decontaminate household bore supplies of diffuse pollutants falls unjustly to those household bore owners mainly in rural areas.

While the NES-DW should take actions that protect source water for all supplies, it must not place greater cost burdens on households supplied by groundwater to address diffuse contamination of their water supplies and there must be reasonable redress for household bore owners for contamination of their groundwater supplies from external activities.

3) Giving effect to Te Tiriti o Waitangi

We support recognition of Te Mana o te Wai, “acknowledging the fundamental importance of water to the health and wellbeing of our people and our environment” (Pg6). Te Mana o te Wai is an approach to water management that recognises the fundamental relationship between the health of the water and wider societal outcomes, placing the health of the water before all else (Te Aho, 2019).

Furthermore, strategies adopted by the Government to protect sources of drinking water must also give effect to and uphold Te Tiriti o Waitangi by recognising the centrality of water to Māori culture and wellbeing and meaningfully addressing the primary causes of its contamination.

We also observe the requirements in ss 8 and 45 of the Resources Management Act 1991 that decision-makers take into account the principles of Te Tiriti o Waitangi. We note in particular the principle of active protection, which obliges the Crown to proactively identify and take steps to protect Māori interests, which include spiritual and cultural interests. Protection of these interests necessarily requires a holistic approach to considering what “contamination” is, as well as what the response to contamination should be. The NES-DW proposal does not engage with the relevant interests at that level.

An overview of water contamination

The discussion document fails to acknowledge the primary cause of drinking water contamination in New Zealand, which is intensive livestock farming and the synthetic nitrogen fertiliser that enables it. Such a failure to recognise the most significant cause of source water contamination threatens the success of the NES-DW.

For the NES-DW to succeed in its objective of protecting source water, the primary sources of contamination of water must be identified and understood and the methods of addressing and mitigating these must be scientifically credible and effective. The current discussion document and proposed controls fail to do this.

While water can be contaminated by metals and non-agricultural industrial chemicals, the biggest source of water pollution - responsible for pesticide, and most bacterial, pathogenic and nitrate contamination - is agriculture.

Agricultural water pollution globally recognised

1. “Agriculture, not human settlements or industry, is the biggest source of water pollution. Nitrate from farming is the most common chemical contaminant found in groundwater aquifers.”[20]

2. “Agriculture is the single largest producer of wastewater, by volume, and livestock generates far more excreta than do humans. As land use has intensified, countries have greatly increased the use of synthetic pesticides, fertilisers and other inputs.” - UN Food and Agriculture Organisation[21]

3. Biogeochemical flows, including nitrogen and phosphate application, are one of the worst of the nine planetary boundary exceedances according to the Stockholm Resilience Centre.

   > “The biogeochemical cycles of nitrogen and phosphorus have been radically changed by humans as a result of many industrial and agricultural processes. Human activities now convert more atmospheric nitrogen into reactive forms than all of the Earth's terrestrial processes combined. Much of this new reactive nitrogen is emitted to the atmosphere in various forms rather than taken up by crops. When it is rained out, it pollutes waterways and coastal zones or accumulates in the terrestrial biosphere. Similarly, a relatively small proportion of phosphorus fertilizers applied to food production systems is taken up by plants; much of the phosphorus mobilized by humans also ends up in aquatic systems. These can become oxygen-starved as bacteria consume the blooms of algae that grow in response to the high nutrient supply.
   > A significant fraction of the applied nitrogen and phosphorus makes its way to the sea, and can push marine and aquatic systems across ecological thresholds of their own. One regional-scale example of this effect is the decline in the shrimp

[20] IISD article on ‘More People, More Food, Worse Water? A Global Review of Water Pollution from Agriculture,’report published by the Food and Agriculture Organization of the UN (FAO) and the International Water Management Institute (IWMI) on behalf of the CGIAR Research Program on Water, Land and Ecosystems. Report retrieved March 2022: https://sdg.iisd.org/news/report-identifies-agriculture-as-greatest-source-of-water-pollution/

[21] Mateo-Sagasta, J., S. Zadeh, and H. Turral. 2018. "More people, more food, worse water? a global review of water pollution from agriculture." Food and Agriculture Organization of the United Nations, Rome: https://www.fao.org/news/story/pt/item/1141534/icode/

catch in the Gulf of Mexico's 'dead zone' caused by fertilizer transported in rivers from the US Midwest."[22]

Biggest polluter in Aotearoa

4. In New Zealand "diffuse pollution from agricultural land use is the main cause of water quality degradation. Dissolved nitrogen, phosphorus, faecal microbes and sediments are the key contaminants from diffuse sources. Animal urine is a source of nitrogen and agricultural fertilisers are a source of both nitrogen and phosphorus." - Department of Conservation[23]

5. Grazing livestock are considered to be the dominant source of faecal contamination to New Zealand's freshwaters (Collins et. al, 2007:p.2)

6. he largest sources[24] of nitrogen contamination in New Zealand's rivers, in order of magnitude, are; urine from dairy cattle, urine from sheep followed by synthetic nitrogen fertiliser itself.[25] [26]

7. The use of synthetic nitrogen fertiliser has enabled the intensification of dairy farming. This has increased pollution from dairying and particularly diffuse nitrogen pollution from urine patches.[27]

8. Synthetic nitrogen fertiliser is a water pollutant itself, notwithstanding its effect on intensification.[28]

9. According to MfE, "Between 1990 and 2012, the estimated amount of nitrogen that leached into soil from agriculture increased 29 percent. This increase was mainly due to

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[22] Stockholm Resilience Centre, The nine planetary boundaries, Nitrogen and phosphorus flows to the biosphere and oceans, retrieved March 2022: https://www.stockholmresilience.org/research/planetary-boundaries/the-nine-planetary-boundaries.html

[23] Department of Conservation, Water Quality, Protecting NZ Rivers, retrieved March 2022: (link)

[24] Ministry for the Environment & Stats NZ 2017: New Zealand's Environmental reporting series : Freshwater and nitrogen leaching. (link)

[25] Ibid

[26] Noting that these figures have not been updated since 2012 and given that the sheep population has declined by around 5 million animals since 2012 (around 16%) and the use of SNF has increased from 363,000-452,000 tonnes (89,000 tonne increase) or by around 20% between 2012 and 2020. It is conceivable that leachate from synthetic nitrogen fertiliser is on par or even exceeds that from sheep urine which, if true, would make it the second largest source of nitrogen pollution after dairy urine.

[27] Parliamentary Commissioner for the Environment 2013: Water quality in New Zealand: Land use and nutrient pollution. Page 16 (Link)

[28] Ministry for the Environment & Stats NZ 2017: New Zealand's Environmental reporting series : Freshwater and nitrogen leaching. (link)

increases in dairy cattle numbers (and therefore urine which contains nitrogen) and nitrogen fertiliser use." [29] (See diagram Appendix 1)

The suggestion that stock exclusion from waterways or setbacks alone solves the problems of agriculture (i.e. the overuse of synthetic nitrogen fertiliser and overstocking of dairy cows) betrays a lack recognition by the Ministry of the pathways for water contamination which, in the instance of nitrate, is primarily via dairy cow excreta, which floods the soil with nitrogen-rich urine circles that leach nitrates down into the aquifer and people's groundwater drinking supplies. Though surface runoff is also a factor - it is not the primary source of nitrate contamination.

While riparian planting and expansion and protection of denitrification zones is valuable and supported, these are not capable of addressing direct nitrogen leached from the sheer volume of livestock excrement - primarily urine - of over six million dairy cows and other livestock and the impact of 450,000 tonnes of synthetic nitrogen fertiliser[30] spread over the land annually, and a consequent 200 million kg of nitrate-nitrogen leached from livestock annually and millions of litres of pathogenic excreta.

The only scientifically credible way to reduce the chronic and acute risks of diffuse faecal and nitrate contamination of source water is to directly address the main causes of the contamination at a regional and national scale by cutting synthetic nitrogen fertiliser and reducing livestock intensity.

Nitrate contamination from livestock and synthetic fertiliser

"Nitrate (oxidised nitrogen) is the most widespread contaminant present in New Zealand groundwater—a concern for human health, the environment, and a potential barrier for primary sector exports." - NIWA[31]

Nitrate dissolves and moves easily in water (i.e. is highly soluble) and so it can be easily carried into streams, rivers, lakes and estuaries or leach through the soil into groundwater.[32] The process of leaching is characterised by MFE in this way:

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[29] Ministry for the Environment & Statistics New Zealand (2015). New Zealand's Environmental Reporting Series: Environment Aotearoa 2015. Page 54. (Link)

[30] Estimates of nitrogen applied to land in fertiliser increased from 62,000 to 452,000 tonnes (629 percent) Between 1991 and 2019 https://www.stats.govt.nz/indicators/fertilisers-nitrogen-and-phosphorus

[31] Retrieved March 2022: https://niwa.co.nz/publications/isu/instrument-systems-update-22-june-2018/time-for-a-closer-look-at-nitrates

[32] MFE and Stats NZ, 2019. "New Zealand's Environmental Reporting Series: Environment Aotearoa 2019." Wellington: Ministry for the Environment, pp. 47

> "Leaching occurs when the concentration of nitrogen in the soil (from animal urine and fertiliser) is greater than the amount that soil and plants can absorb."[33]

Once in the groundwater nitrate can persist for many years and travel long distances.[34]

The largest sources of nitrogen leaching from soil in Aotearoa, in order of magnitude, are dairy cattle, sheep and synthetic nitrogen fertiliser itself (as at 2012).[35]

Direct and indirect water impacts of synthetic nitrogen fertiliser

Urea is just one type of synthetic nitrogen fertiliser. While the majority of synthetic nitrogen is applied via urea it's also applied in diammonium phosphate (DAP) and ammonium sulphate (SOA). And other smaller scale fertilisers. Urea contains 46% synthetic nitrogen, DAP 17.6% and SOA 20%. All synthetic nitrogen must be controlled as a contaminant.

Hundreds of thousands of tonnes of synthetic nitrogen fertiliser is applied onto farmland annually.[36] According to the OECD, NZ has had the highest percentage increase in its use out of all of the OECD countries since 1990.[37]

67% of all New Zealand's synthetic nitrogen fertiliser is used by the Dairy industry.[38] There has been a 629% increase in synthetic nitrogen fertiliser use between 1991 and 2019 (from 62,000 tonnes to 452,000 tonnes).[39] [40] Over this time dairy cattle numbers increased by 82 percent nationally from 3.4 million in 1990 to 6.3 million in 2019.[41]

Synthetic nitrogen fertiliser plays a dual role in the pollution of Aotearoa's drinking water sources. Firsty, it allows for a higher number of cows to be stocked on land, and this increases the nitrate leaching from urine patches (known as indirect effects). Secondly, it is a direct contaminant of water. When applied to land it can leach or run-off directly into water where it increases nitrate contamination (known as direct effects).

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[33] MFE and Stats NZ, 2020. "New Zealand's Environmental Reporting Series: Our freshwater 2020." Wellington: Ministry for the Environment pp.42

[34] LAWA "Factsheets - Nitrogen" (2019) Accessed May 2021 at https://www.lawa.org.nz/learn/factsheets/nitrogen/

[35] MFE and Stats NZ 2015 "Environmental Reporting: Nitrogen leached from soil 1990–2012" - from the dataset accessed May 2021 at https://data.mfe.govt.nz/table/2530-nitrogen-leached-from-soil-total-1990-2012/data/

[36] Statistics NZ, Infoshare LookUp tables.
http://archive.stats.govt.nz/infoshare/ViewTable.aspx?pxID=e4b2f308-e80b-4157-931a-810effedd3a0

[37] OECD 2008 Environment Performance of Agriculture in OECD countries

[38] StatsNZ, "In 2019 Farms that were dominantly dairy had the largest amount of nitrogen applied to agricultural land; 223,000 tonnes (67 percent of the New Zealand total)." (link)

[39] Stats NZ: https://www.stats.govt.nz/indicators/fertilisers-nitrogen-and-phosphorus

[40] NZ Greenhouse Gas Inventory, retrieved:
https://www.google.com/url?q=https://environment.govt.nz/assets/Publications/New-Zealands-Greenhouse-Gas-Inventory-1990-2019-Volume-1-Chapters-1-15.pdf&sa=D&source=docs&ust=1646249998761083&usg=AOvVaw29R0Cfpw5BsSuiQ9wAT0nq

[41] StatsNZ livestock numbers, April 2021, retrieved March 2022: https://www.stats.govt.nz/indicators/livestock-numbers

Direct effects refer to leaching or run-off of the fertiliser product itself which contains nitrate.[42] Synthetic fertiliser's direct pollution is the third largest source of nitrate to water in Aotearoa.[43] MFE states that:

- "Nutrients applied as fertiliser enter freshwater if too much is applied."[44]
- "Fertilisers like nitrogen and phosphorus can pollute waterways."[45]

Indirect effects refer to the nitrate pollution that occurs not from the synthetic fertiliser itself, but from the intensification that synthetic fertiliser enables.[46] As explained below:

- In NZ the main plant growth that is enabled by synthetic nitrogen fertiliser is grass. This provides more food for cows and enables more cows to be placed on the land. [47] [48] [49]
- The more animals there are per hectare, the more leaching tends to occur. MFE explains this process as: "More animals per paddock can increase the amount of nitrogen released into the environment… When animals are closer together, urine patches are more frequent and overlap, and a greater likelihood that the absorption of nitrogen by soil and plants will be overloaded." [50]
- The Parliamentary Commissioner for the Environment explains: "the increased use of urea fertiliser has, along with irrigation and supplementary feed, enabled higher stocking rates, and more animals mean more urine."[51]

As the Ministry for the Environment noted in its submission on cutting synthetic nitrogen fertiliser to the Environment Select Committee in September 2021:[52]

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[42] Carran, R. A., and T. Clough. "Environmental impacts of nitrogen in pastoral agriculture." *NZGA: Research and Practice Series 6* (1995): 99-102. Pp. 101

[43] MFE and Stats NZ 2015 "Environmental Reporting: Nitrogen leached from soil 1990–2012" - from the dataset accessed May 2021 at https://data.mfe.govt.nz/table/2530-nitrogen-leached-from-soil-total-1990-2012/data/

[44] MFE and Stats NZ, 2020. "New Zealand's Environmental Reporting Series: Our freshwater 2020." Wellington: Ministry for the Environment. Pp. 31

[45] MFE and Stats NZ, 2019. "New Zealand's Environmental Reporting Series: Environment Aotearoa 2019." Wellington: Ministry for the Environment. Pp 52

[46] Shepherd, M. and Lucci, G. "Fertiliser advice–what progress can we make? Adding to the knowledge base for the nutrient manager." *Occasional Report* (24). (2011) pp. 1 Accessed at https://www.massey.ac.nz/~flrc/workshops/11/Manuscripts/Shepherd_2_2011.pdf

[47] Ibid

[48] Williams, I.D., Ledgard, S.F., Edmeades, G.O. and Densley, R.J. "Comparative environmental impacts of intensive all-grass and maize silage-supplemented dairy farm systems: a review." *Proceedings of the conference of the NZ Grassland Association,* Vol. 69 (2007) pp. 137

[49] PCE - Parliamentary Commissioner for the Environment. "Water quality in New Zealand: Land use and nutrient pollution."Wellington (2013) pp 6

[50] MFE and Stats NZ, 2020. "New Zealand's Environmental Reporting Series: Our freshwater 2020." Wellington: Ministry for the Environment.pp 45

[51] PCE - Parliamentary Commissioner for the Environment. "Water quality in New Zealand: Land use and nutrient pollution."Wellington (2013) pp 6

[52] Sara Clarke to Eugenie Sage, 20 September 2021, Appendix 1, The Ministry for the Environment response to the Environment Select Committee's request for evidence regarding the petition from Greenpeace NZ and 30,000 others, for a phase out of

> “Fertiliser's role is largely an indirect one. By enriching pasture and forage crops, it enables a higher number of animals to be supported on the land.”
>
> “In the case of nitrate leaching, less than 5 percent is directly due to fertiliser nitrogen moving through soil into waterways while more than 80 percent is from animal urine.”
>
> “In fact, the main contributor to most of New Zealand's priority environmental issues is livestock farming.”
>
> “This means that the main environmental benefit from a synthetic nitrogen phase-out would be to lower the carrying capacity of grazing land, resulting in fewer urinating animals.”

Despite this well articulated case for cutting synthetic nitrogen fertiliser and lowering livestock intensity and acknowledgement of animal urine as the main cause of nitrate contamination of water, the Ministry’s currently proposed mere five metre setbacks in the NES-DW fails to address the 80% of nitrate leaching that they highlight as coming from animal urine.

Health impacts of nitrate contamination

At elevated levels, nitrate in drinking water risks impacts to human health in several ways.

Blue Baby Syndrome

For decades, methemoglobinemia, or blue baby syndrome, was considered the primary health concern in regard to nitrate in drinking water.[53]

> “The use of nitrate-contaminated drinking water to prepare infant formula is a well-known risk factor for infant methemoglobinemia. Affected infants develop a peculiar blue-gray skin colour and may become irritable or lethargic, depending on the severity of their condition. The condition can progress rapidly to cause coma and death if it is not recognized and treated appropriately.”[54]

synthetic nitrogen fertiliser by 2024, Accessd Feb 2022: https://www.parliament.nz/resource/en-NZ/53SCEN_EVI_108163_EN7774/0534e7b53e5a5e30c85df4460627898c248bdcef

[53] Temkin, Alexis, Sydney Evans, Tatiana Manidis, Chris Campbell, and Olga V. Naidenko. "Exposure-based assessment and economic valuation of adverse birth outcomes and cancer risk due to nitrate in United States drinking water." *Environmental Research* 176 (2019): 108442. Pp 1

[54] L Knobeloch, B Salna, A Hogan, J Postle, and H Anderson , Blue babies and nitrate-contaminated well water, retrieved March 2022: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1638204/

Our drinking water standards have a maximum allowable value (MAV) for nitrate-nitrogen (NO3-N) of 11.3mg/L, which was established by the World Health Organisation as the limit necessary to avoid methemoglobinemia.[55]

In Aotearoa, there are already drinking water sources that exceed this 11.3mg/L limit[56]. This proves that, as it stands, there are insufficient regulatory controls on the sources of nitrate contamination and this must be remedied.

Colorectal Cancer

Additionally, nitrate levels much lower than the current MAV of 11.3mg/L have been linked to increased risk of colorectal cancer (CRC).[57] [58]

Public health physician Professor Michael Baker says the MAV for nitrate is "hopelessly out of date" because It does not account for chronic illnesses like cancer.[59]

"A large body of epidemiological research has found an elevated risk of cancer, adverse birth outcomes and other health impacts associated with the presence of nitrate in drinking water… These effects are often observed at drinking water nitrate concentrations significantly lower than the levels associated with methemoglobinemia."[60] [61]

The World Health Organisation (WHO) has now classified ingested nitrate as probably carcinogenic to humans, specifically when nitrate is ingested under conditions that promote endogenous nitrosation.[62]

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[55] MoH "Guidelines for drinking-water quality management for New Zealand Chapter 10: Chemical compliance" (2019) pp. 20

[56] Stats NZ, Regional Council Data: "For the five-year period 2014–18:19 percent of 433 sites failed to meet the nitrate-nitrogen drinking water standards on at least one occasion, based on having concentrations above the maximum acceptable value of 11.3 g/m3 set by the Ministry of Health (2018)." retrieved from StatsNZMarch 2022: https://www.stats.govt.nz/indicators/groundwater-quality

[57] Espejo- Herrera, et al. 2016 "Colorectal Cancer Risk and Nitrate Exposure through Drinking Water and Diet." International Journal of Cancer, vol. 139, no. 2, 2016, pp. 334–346.

[58] Schullehner, J., Hansen, B., Thygesen, M., Pedersen, C.B. and Sigsgaard, T., 2018. Nitrate in drinking water and colorectal cancer risk: A nationwide population-based cohort study. *International journal of cancer*, *143*(1), pp.73-79.

[59] RNZ, 28 July, 2019, Health expert renews call for study on nitrates in drinking water (link)

[60] Temkin, Alexis, Sydney Evans, Tatiana Manidis, Chris Campbell, and Olga V. Naidenko. "Exposure-based assessment and economic valuation of adverse birth outcomes and cancer risk due to nitrate in United States drinking water." *Environmental Research* 176 (2019): 108442. pp.1

[61] Chambers et al, "Nitrate in drinking water and cancer risk: the biological mechanism, epidemiological evidence and future Research," https://doi.org/10.1111/1753-6405.13222

[62] Temkin, Alexis, Sydney Evans, Tatiana Manidis, Chris Campbell, and Olga V. Naidenko. "Exposure-based assessment and economic valuation of adverse birth outcomes and cancer risk due to nitrate in United States drinking water." *Environmental Research* 176 (2019): 108442. Pp. 2

Many experts are very concerned about the high rates of nitrate and high rates of CRC found in Aotearoa, including the New Zealand College of Public Health Medicine and Public Health Association, which state in their joint submission to the Government:

> "Excessive levels of nitrate pollution, from dairy farms, in drinking water is a direct threat to human health."[63] "Setting strong limits around nitrogen is critical not only for ecosystem but also public health. The association of nitrates with colorectal cancer is of major concern, given that this cancer is the second most common cause of cancer deaths in New Zealand" [64]

Globally, scientists are also raising the alarm.

> "Cancer risk related to nitrate pollution in drinking water, as a consequence of intensive agriculture using fertilizers, is of particular concern."[65]

Aotearoa's human health limit of 11.3 mg/L (NO3-N) is more than twelve times higher than the 0.87 mg/L of nitrate that the Danish study found statistically significant increased risks of CRC.[66]

Aotearoa has one of the highest colorectal cancer rates in the world and it is the second highest cause of cancer death in the country. [67]

Common risk factors for CRC include obesity, alcohol consumption, physical inactivity, smoking, and red and processed meat consumption (Bray et al., 2018). Emerging epidemiological evidence has shown that high nitrate concentrations in drinking water may also be a risk factor for CRC (Temkin et al., 2019; Ward et al., 2018).

A study published in 2021[68] attributed 100 cases of colorectal cancer and 40 deaths per year in New Zealand to nitrate in drinking water and concluded that:

> "A substantial minority of New Zealanders are exposed to high or unknown levels of nitrates in their drinking water. Given the international epidemiological studies showing an association between cancer and nitrate ingestion from drinking water, this exposure may cause an important burden of preventable Colorectal cancer cases, deaths, and economic costs. We consider there is sufficient evidence to justify a review of drinking

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[63] NZCPHM - New Zealand College of Public Health Medicine and PHA - Public Health Association. "Submission to the Ministry for the Environment: Action for Healthy Waterways" (2019)

[64] Ibid.

[65] Schullehner, Jörg, Birgitte Hansen, Malene Thygesen, Carsten B. Pedersen, and Torben Sigsgaard. "Nitrate in drinking water and colorectal cancer risk: A nationwide population‐based cohort study." *International journal of cancer* 143, no. 1 (2018): 73-79. Pp.74

[66] Ibid

[67] Moh. "Bowel cancer." (2018) Accessed May 2021 at https://www.health.govt.nz/your-health/conditions-and-treatments/diseases-and-illnesses/bowel-cancer

[68] J Richards, T Chambers et al. "Nitrate contamination in drinking water and colorectal cancer: Exposure assessment and estimated health burden in New Zealand." https://www.sciencedirect.com/science/article/abs/pii/S0013935121016236

water standards. Protecting public health adds to the strong environmental arguments to improve water management in New Zealand."

Preterm Birth

New Zealand scientists including Dr Tim Chambers and Prof Michael Baker outlined international research on preterm births from nitrate in water in a recent Public Health article:

> "Two recent studies published in 2021 link prenatal nitrate exposure to low birth weights and preterm births. These studies build on existing evidence linking prenatal nitrate exposure and adverse birth outcome including neural tube defects, small for gestation age, low birth weight and preterm births. However, what differentiates these two new studies from previous research is their scientific quality. For example, Sherris et al (2021) was a US study that looked at 1.4 million births between 2001 and 2011. Their analysis included consecutive births from the same mother, effectively accounting for differences observed between participants in other studies. The authors found nitrate above 5 mg/L increased the odds of a preterm birth (20-31 weeks) by 47%, while exposure above 10 mg/L increased the odds of a preterm birth 2.5 times. This finding is consistent with other studies looking at preterm and low birth weights."[69]

This is highly concerning indications of nitrate health risk given that all pregnant people drink water.

Faecal and pathogenic contamination from livestock

Scientists estimate that contaminated water causes between 18,000 and 34,000 cases of gastrointestinal illness in New Zealand each year.[70] But, these confirmed numbers are almost certainly underestimated as many cases are undiagnosed and unreported.

There are many pathogens that can be transmitted from livestock to humans, known as zoonoses, that can cause gastrointestinal illness. These include *Escherichia coli, Campylobacter* spp*., Salmonella* spp*., Giardia* spp*.* and *Cryptosporidium* spp*.*

In New Zealand, infections from zoonoses "are among the highest reported for any developed country … and are a major public health concern".[71]

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[69] Dr Tim Chambers, Prof Nick Wilson, Prof Simon Hales, Prof Michael Baker, Nitrate contamination in drinking water and adverse birth outcomes: emerging evidence is concerning for NZ, *Posted on May 24, 2021 (link)*

[70] . Ball A (2006). Estimation of the burden of Water-borne disease In New Zealand: Preliminary report. Wellington: Ministry of Health

[71] . Lal A, Lill A, Mcintyre M, Hales S, Baker M and French N (2015). Environmental change and enteric zoonoses in New Zealand: a systematic review of the evidence. Australian and New Zealand Journal of Public Health, 39(1), p.63-68.

The same is true for *Shiga toxin-producing E. coli*, which is a group of *E. coli* bacteria that cause infection in humans, also known as *verocytotoxigenic E. coli.*[72] and *giardiasis*.[73]

"Reported cases of *cryptosporidiosis* are higher in New Zealand than in Australia, the UK, Germany and the USA".[74]

Although there are several possible sources of exposure to these pathogens, farm animals are important carriers.[75] For rural New Zealanders, ruminants (like cows, sheep and deer) are now the leading cause of *Campylobacter* infections. This is especially true for rural pre-school children.[76]

Pathogens can also spread from livestock to humans in many different ways. Contaminated drinking water is one of them. Grazing livestock are considered to be the dominant source of faecal contamination to New Zealand's freshwaters.[77]

With increasing contamination of surface waters (and to a lesser extent groundwater) with these pathogens, public health experts are increasingly focussing on the potential human health impacts of the expansion of livestock farming.[78]

Researchers have found that higher cattle stocking densities appear to be associated with increases in reported *cryptosporidiosis* in children under the age of five. They conclude that this relationship is likely to be a causal one[79].

Of all the livestock considered in a study of *Cryptosporidium*, only dairy cattle density was associated with an increased risk of cryptosporidiosis in New Zealand.[80] The researcher also

[72] Thorburn D (2011). Ruminant density, verocytotoxigenic Escherichia coli and cryptosporidiosis in New Zealand: descriptive and ecological analyses. (Doctoral dissertation, University of Otago)
[73] . Winkworth C, Learmonth J, Matthaei C and Townsend C (2008). Molecular characterization of Giardia isolates from calves and humans in a region in which dairy farming has recently intensified Applied and environmental microbiology, 74(16), p. 5100-5105.
[74] . Snel S, Baker M and Venugopal K (2009). The epidemiology of cryptosporidiosis in New Zealand, 1997-2006. The New Zealand Medical Journal (Online), 122(1290).
[75] . Lal A, Dobbins T, Bagheri N, Baker M, French N and Hales S (2016). Cryptosporidiosis Risk in New Zealand Children Under 5 Years Old is Greatest in Areas with High Dairy Cattle Densities. EcoHealth, 13, p.652- 660.
[76] Lal A, Lill A, Mcintyre M, Hales S, Baker M and French N (2015). Environmental change and enteric zoonoses in New Zealand: a systematic review of the evidence. Australian and New Zealand Journal of Public Health, 39(1), p.63-68
[77] Collins, R.,et al., 2007. Best management practices to mitigate faecal contamination by livestock of New Zealand waters. *New Zealand Journal of Agricultural Research*, *50*(2), pp.267-278.
[78] McDaniel CJ, Cardwell DM, Moeller RB, Gray GC (2014). Humans and cattle: a review of bovine zoonoses. Vector-Borne and Zoonotic Diseases. 14(1):1-9.
[79] Lal A, Dobbins T, Bagheri N, Baker M, French N and Hales S (2016). Cryptosporidiosis Risk in New Zealand Children Under 5 Years Old is Greatest in Areas with High Dairy Cattle Densities. EcoHealth, 13, p.652- 660.
[80] Lal A (2014). Evaluating the Environmental and Social Determinants of Enteric Disease in New Zealand (Doctoral dissertation, University of Otago).

looked at sheep, poultry, pigs and deer. Another study did find a positive association between sheep density and cryptosporidiosis.[81]

Another study found that high dairy cattle density was associated with an increased risk of *campylobacteriosis* in two of the three regions which were investigated[82].

Other research has found that cases of illness caused by *E. coli* were significantly higher in dairy farming areas where livestock density is correspondingly high. By comparison, cases of illness did not appear to be affected by sheep stocking density and did not vary significantly with beef cattle density[83].

Another study found that "[drinking water abstraction sites] on rivers draining predominantly agricultural catchments… had all four microbes [Campylobacter spp., Escherichia coli, Cryptosporidium spp. and Giardia spp.] present, often in high numbers, through-out the sampling interval. Other sites…which drain catchments of native vegetation, never had pathogenic microbes detected, or unsafe levels of E. coli ."[84]

Increased dairy cattle density has also been associated with a rise in cases of Shiga toxin-producing *E coli*, a very serious pathogen which has caused fatalities around the world. According to Dr. Michael Baker, professor of public health at Otago University, "We have by far the highest documented rate in the world of this infection." There are now around 400 cases a year, compared to virtually none 20 years ago.[85]

Exacerbating Issues

Climate change

[81] . Thorburn D (2011). Ruminant density, verocytotoxigenic Escherichia coli and cryptosporidiosis in New Zealand: descriptive and ecological analyses. (Doctoral dissertation, University of Otago

[82] . Spencer S. E., Marshall, J., Pirie, R., Campbell, D., Baker, M. G., & French, N. P. (2012). The spatial and temporal determinants of campylobacteriosis notifications in New Zealand, 2001–2007. Epidemiology 0. Radio New Zealand (2017) New coalition forms to tackle freshwater quality. Retrieved from: http://www.radionz.co.nz/news/national/332592/new-coalition-forms-to-tackle-freshwater-quality and Infection, 140(9), p.1663-1677.

[83] . Thorburn D (2011). Ruminant density, verocytotoxigenic Escherichia coli and cryptosporidiosis in New Zealand: descriptive and ecological analyses. (Doctoral dissertation, University of Otago).

[84] Phiri, B. J., Pita, A. B., Hayman, D. T. S, Biggs, P. J., Davis, M. T., & Fayaz, A., Canning, A. D., French, N., & Death, R. (2020). Does Land Use Affect Pathogen Presence in New Zealand Drinking Water Supplies?. Water Research. 185. 116229. 10.1016/j.watres.2020.116229.

[85] Snel S, Baker M and Venugopal K (2009). The epidemiology of cryptosporidiosis in New Zealand, 1997-2006. The New Zealand Medical Journal (Online), 122(1290).

Radio NZ piece by Kate Gudsell: "New coalition forms to tackle freshwater quality" 8 June 2017. (Link)

It is pertinent to note that there is a strong interaction between the climate change extremes of rainfall and increasing health risks,[86] as outlined in detail in Chapter 7 of the recent IPCC WGII Sixth Assessment Report.[87] This has been recently evidenced here in Aotearoa by the confluence of factors in Havelock North, including a long period of dry followed by heavy rain.[88]

It is also noted that our recommended controls on livestock numbers and synthetic nitrogen fertiliser would have the co-benefit of leading to gross cuts in the emissions of potent global heating gases (particularly methane and nitrous oxide). Such cuts are a direct mitigation for climate change and therefore future extreme weather events.

Industrial-scale irrigation

Irrigation is a vital facilitator in livestock intensification and a driver of water pollution and contamination. This is particularly prevalent in low rainfall regions such as Canterbury where mass irrigation has rapidly transformed land use from traditional arable and sheep and beef to high intensity dairy and has enabled far more livestock than land and waterways can handle. Freshwater ecosystems bear the brunt of extra pollution including nutrient and pathogenic contamination from the intensification of livestock. Abstraction from rivers deals a double blow due to water flow diminishment and return of nutrient rich post-irrigation water to rivers, lakes and aquifers. In summary:

- Irrigation makes it possible for more land areas to be used for intensive agriculture - areas that would normally be too dry to support livestock, especially dairy cattle
- It leads to the replacement of natural vegetation, including forests, with pastures that allow for greater runoff
- It saturates the soil, encouraging runoff and leaching of contaminants into waterways
- Through water extraction and abstraction, it reduces groundwater levels and river flow, changing natural processes that would normally help dilute contaminants.[89]

[86] Prüss-Üstün, Annette, and Carlos Corvalán. "*Preventing disease through healthy environment*s." Geneva: World Health Organization (2006).
[87] Cissé, Guéladio and McLeman, Robert et al. (2022) IPCC WGII Sixth Assessment Report, "*Chapter 7: Health, Wellbeing, and the Changing Structure of Communities".* 7-1 - 7-69 (Link)
[88] Stevens, L., Poutasi, K., Poutasi, Karen Poutasi & Wilson, A. (2017). Report of the Havelock North Drinking Water Inquiry: Stage 2. (Link)
[89] Canterbury District Health Board (2014). Public Health Implications of Land Use Change and Agricultural Intensification with respect to the Canterbury Plains: A Literature Review.

The Canterbury District Health Board's health impact assessment for the Central Plains Water Scheme (CPWS) found that "the potential risks of the CPWS to the health of Cantabrians as a whole outweigh the probable financial benefits to a few people".[90]

Professor Jenny Webster-Brown, Director of Waterways at Lincoln University, said "[it] will be very difficult for more intensive irrigation and dairying to occur on the plains without the legacy of nitrate in groundwater increasing for future Cantabrians".[91]

Imported feed such as PKE

Imported feed such as palm kernel expeller (PKE) is an important facilitator in overstocking along with synthetic nitrogen fertilisers and irrigation. Additional nutrients are added to farming systems allowing dense stocking and a more intensive farming system. Via livestock excreta the natural environment is loaded with waste nutrients. It is specious to imagine that all losses to the environment can be mitigated by barriers and attenuation without addressing the sheer volume of source inputs - fertiliser, animals, irrigation and imported feed.

Equity in safe water access

Redress for rural households

Regulation to protect source water and manage health risks for all people's drinking water supplies must include the hundreds of thousands of people on private and unregistered household bore water supplies who are the most at risk from unrecognised nitrate, faecal and other contamination.

Even when contamination exceeds national limits in private supplies there is no redress for household bore owners for the costs of decontamination of their bores or finding safe sources of drinking water for their families, - because of the diffuse and regional scale of the agricultural activities or practices that are the causes of pollution and contamination there.

Many rural householders are spending thousands of dollars[92] in attempts to remove or mitigate nitrate contamination that is patently not a consequence of present-day activities on their property (whether owned or rented). Regional councils - having issued consents to permit

[90] Humphrey A, Walker M, Porteous A, Pink R, Quigley R, and Thornley L (2008). Health Impact Assessment of Central Plains Water Scheme. Christchurch: Canterbury District Health Board.
[91] Press Release Lincoln University: Call for Cantabs to think about future of water. (2015, April 13). Retrieved from http://community.scoop. co.nz/2015/04/call-for-cantabs-to-think-about-future-of-water/
[92] E.g. "Graeme Tweedie… had already spent $15,000 on a filter that would at least lower the amount in his drinking water" https://www.rnz.co.nz/news/national/442950/nitrate-level-test-overwhelming-demand-for-drinking-water-check-in-leeston

pollution in the first instance - have no liability for addressing the consequences on householders of the consequent contamination of their drinking water.

To omit this mainly rural constituency from NES-DW priorities would be to ignore those communities of people most vulnerable to health-threatening water contamination.

Impact of water contamination on Tangata Whenua

Water is life. At the most profound level and in the simplest terms, this is how water is recognised by Māori.

Te Ara - The Encyclopaedia of New Zealand states:

> "In Māori culture, many tribes directly or indirectly consider water as the source or foundation of all life. This is reflected in traditions which speak of te taha wairua, often translated as 'the spiritual plane (of existence)'.
>
> The term te taha wairua is widely used to refer to the 'real world', which lies both behind and within the world of normal experience. Much of life, according to the traditional world view, is concerned with coming to see, experience and understand the interplay of this 'real world' with our more limited everyday life. Te taha wairua can literally be translated as 'the dimension of two waters', a conception that likens spirituality to water.
>
> However, it might be argued that te taha wairua does not mean 'the spiritual plane' at all. Instead, references to te taha wairua might be saying that there is a fundamental dimension to all life and it takes the form of water."[93]

The Department of Conservation articulates a Māori world view of water as follows:

> "For Māori, water is the essence of all life, akin to the blood of Papatuanuku (Earth mother) who supports all people, plants and wildlife. Māori assert their tribal identity in relation to rivers and particular waterways have a role in tribal creation stories. Rivers are valued as a source of mahinga kai, hāngi stones and cultural materials, as access routes and a means of travel, and for their proximity to important wāhi tapu, settlements or other historic sites.[32] Indicators of the health of a river system (such as uncontaminated water and species gathered for food, continuity of flow from mountain source to the sea) can provide a tangible representation of its mauri.

[93] https://teara.govt.nz/en/tangaroa-the-sea/page-5

> The relationship between Māori, and their culture and traditions, and their ancestral lands, water, sites, wāhi tapu (sacred place) and other taonga is a matter of national importance under RMA section 6(e), which decision-makers must recognise and provide for. Giving effect to the principles of the Treaty of Waitangi is a requirement of the Conservation Act 1987.[33]
>
> Several notable Waitangi Tribunal claims, such as Whanganui and Waikato, have sought redress for Treaty breaches in relation to rivers. The Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010 provides redress through a new co-governance entity to oversee river management and give effect to a vision and strategy to protect the health and wellbeing of the river for present and future generations."[94]

TE RŪNANGA O NGĀI TAHU SUMMARY REPORT Te Wai Pounamu Te Mana o Te Wai Case Study outlines the importance of water to Mana whenua:[95]

> Water to Mana Whenua Water is a critical resource to all iwi and is a central part of our identity as iwi, hapū, and whānau. For each of the mana whenua groups, their description of their relationship to water exemplifies its importance. Te Ātiawa Wai (water) is of great significance to
>
> Te Ātiawa
>
> It is an essential element of life. As kaitiaki, Te Ātiawa Iwi believes that the maintenance of the mauri, or life supporting capacity, of water is vital to the physical and spiritual health and wellbeing of all living things. Water is a taonga. Water has been, and remains, an integral political, economic, cultural and spiritual taonga for Te Ātiawa. Te Ātiawa believes that the maintenance of the mauri, or life-supporting capacity of water is fundamental to ensuring the physical and spiritual survival of all living things. A water body with an intact mauri is able to sustain healthy ecosystems. Therefore, the well-being of our people depends on the well-being of river, stream and wetland ecosystem.
>
> Kāi Tahu ki Otago
>
> Water descends from our creation beliefs. The first mention of water is Te Mākū (moisture). Life came into being when Te Mākū mated with Mahoranuiātea, another form of water, and of this Rakinui was born. Rakinui had two wives, Poharuatepō and Papatūānuku. From the unions of Rakinui came the flora and fauna, the mountains and people. Kāi Tahu descends from Raki and his wives. Kāi Tahu is therefore bound to the

[94] (link)
[95] Donna Flavell, Te Rūnanga o Ngāi, Case study 2015, Tahuhttps://iwichairs.maori.nz/wp-content/uploads/2015/06/Case-Study-Te-Waipounamu-Te-Mana-o-Te-Wai-June-2015.pdf

waters of Te Wai Pounamu through whakapapa. The point of difference for Kāi Tahu is the spiritual relationship with the environment.

Kāi Tahu are connected through spiritual beliefs with the atua and the environment created by those atua. The mana and hauora of Kāi Tahu is inextricably interwoven with the mana and hauora of waterways. Waterways embody the mana of Kāi Tahu, regardless of the extent to which they have been manipulated.

Te Ao Marama

Water is central to all Māori life. It is a taonga left by our ancestors to provide and sustain life. It is for the present generation, as tangata tiaki, to ensure that the taonga is available for future generations in as good as, if not better quality - Mō tātou, a mō ka uri a muri ake nei – for us and our children after us. Ensuring the health and wellbeing of water is a prerequisite for ensuring the continued health and wellbeing of mahinga kai resources and ultimately the people. While these brief statements are by no means full articulations of the relationship of each iwi with water, they give an insight into the critical importance of water to the wellbeing of iwi.

Waitangi Tribunal

The Waitangi Tribunal has recognised that as at 1840 water bodies were a taonga over which hapū or iwi exercised te tino rangatiratanga and customary rights, and with which they had a relationship under tikanga Māori (including kaitiaki obligations to care for and protect the water resource).[96] Water had importance not only for humans (as a means of sustenance of both body and spirit) but as something with its own mauri. In this connection, the Tribunal has held that rivers are a "taonga essential to the identity, culture and spiritual well-being of the people".[97] The Tribunal has recognised that Māori interests in water bodies were guaranteed under article 2 of Te Tiriti o Waitangi.[98]

The Ministry's proposal takes a segmented view of rivers with different controls applying to different parts of a river and associated riparian land depending on its proximity to a source water intake. This is inconsistent with a te ao Māori understanding of rivers as holistic and indivisible entitlies, and the Tribunal has held that it is "inconsistent with Māori river interests, according to their philosophy, that those interests might be determined according to … the severance of water, banks and bed".[99]

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[96] Waitangi Tribunal "The Stage 1 Report on the National Freshwater and Geothermal Resources Claim" (WAI 2358, 2012) at 75 (**WAI 2358**).
[97] Waitangi Tribunal, "Whanganui River Report" (WAI 167, 1999) at 25 (**WAI 167**).
[98] WAI 2358 at 77.
[99] WAI 167 at 23.

Moreover, to uphold Te mana o te wai and Te Tiriti O Waitangi it is untenable for the Ministry for the Environment to propose solutions to pollution and contamination of drinking water sources that are patently insufficient and which fail to address the primary causes of contamination.

International examples of synthetic fertiliser caps and prohibitions

Many jurisdictions have adopted synthetic fertiliser caps or prohibitions to avoid adverse effects to water. The following outlines some of these international examples and associated improvements in water quality.

a. The European Union: The European Union (EU) Nitrates Directive[100] came into force in 1991. It designates Nitrate Vulnerable Zones (NVZs) which now cover about 47% of the total EU area and are set largely due to the importance of groundwater in the drinking water supply. The directive requires EU member states to guarantee that the annual farm application of nitrogen, as animal manure, does not exceed 170 kg per hectare, equivalent to a stocking rate of one cow per ha.[101] It also requires member states to have action plans that can include periods when the land application of certain types of fertilisers is prohibited and limits to the quantity, timing and mode of fertiliser application. It also allows states to completely prohibit fertiliser use in certain periods in NVZs. The data on nitrate concentration shows that water quality has improved in 2012-2015 compared to the previous reporting period (2008-2011). [102]
b. Denmark presents a case study that is very relevant to the New Zealand Government's nationwide cap, as the whole agricultural area in Denmark is a NVZ. There has been a 40% reduction in the nitrogen surplus of the country by 2010 from its peak in the 1980s. [103] Danish rules considered successful with regard to the input control of fertiliser have included farm monitoring and obligatory reporting from fertiliser suppliers.[104]
c. *The state of Sikkim in Northern India*: Completely prohibited not only the use of but also the import and sale of chemical fertilisers and pesticides in 2014. Sikkim began its programme to go fully organic, state-wide, in 2003. It started by reducing government subsidies on synthetic inputs by 10% each year coupled with major public funding, education and investment in transitioning its 66,000 farmers to certified organic. It has now achieved this transition, all farmers are certified organic and synthetic inputs are

[100] European Commission: The Nitrates Directive. URL: http://ec.europa.eu/environment/water/water-nitrates/index_en.html
[101] Mateo-Sagasta, J., S. Zadeh, and H. Turral. 2018. "More people, more food, worse water? a global review of water pollution from agriculture." Food and Agriculture Organization of the United Nations, Rome.
[102] Report from the Commission to the Council and European Parliament on implementation of the Nitrates Directive (article 11 report) 2012-2015 Report {SWD(2018) 246 final} found at:
https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52018DC0257
[103] Dalgaard, T., Hansen, B., Hasler, B., Hertel, O., Hutchings, N. J., Jacobsen, B. H., Jensen, L. S., Kronvang, B., Olesen, J., Schjorring, J. K., Kristensen, I. S., Graversgaard, M., Termansen, M. and Vejre, H. (2014) Policies for agricultural nitrogen management - trends, challenges and prospects for improved efficiency in Denmark. Environmental Research Letters 9, 115002. URL: http://iopscience.iop.org/article/10.1088/1748-9326/9/11/115002/meta
[104] *A case study of agricultural nitrogen management policy in Denmark, Vera Eory, Scotlands Rural College; N.J Hutchings, Aarhus University* (March 2017).

banned. There has been a marked increase in water quality, which has in turn led to a significant rise in tourism, as the state now successfully markets itself as a health destination[105].

d. *Minnesota:* Minnesota has prohibited the use of synthetic fertiliser in autumn and when the ground is frozen in designated "vulnerable groundwater areas" and "drinking water supply management areas.[106] It also allows for the Government to set regional caps and other controls on fertiliser in areas with consistently high nitrate levels in groundwater. [107] It is applicable to synthetic fertiliser only [108]. The rule came into effect in January 2020 so we are not able to report anticipated water quality benefits yet.
e. *Nebraska:* The state of Nebraska has set up 23 Natural Resource Districts (NRD), organised around river basin boundaries, with locally elected governing bodies. Eight of the NRDs have prohibited the use of synthetic nitrogen fertiliser in the autumn and/or winter. Monitoring shows that "in some areas, water quality has improved significantly after the initiation of governance actions by the NRDs to reduce fertiliser applications."[109]
f. Netherlands: The new Netherlands coalition Government has agreed to a radical plan to cut stocking rates by one third to address the nitrogen crisis in recognition of the fundamental role of livestock intensity in pollution.[110]

The urgent need for Input controls and unambiguous rules.

a. Aotearoa has been primarily using an effects-based approach to regulating environmental harm through the Resource Management Act. This has not proven to be an adequate approach to environmental management on its own, as evidenced by the ongoing degradation of the environment across most indicators.[111]
b. Effects-based management must now be coupled with input controls when there is substantive evidence of a pollutant causing environmental harm, as is the case for synthetic nitrogen fertiliser.
c. Relying solely on effects-based management is problematic for agriculture, because diffuse nutrient loss from farms is difficult to measure.[112]
d. The main software used to measure nutrient loss on farms and increasingly being used in monitoring and enforcement is Overseer. It is part-owned by the fertiliser industry[113] which has a vested financial interest in maintaining and growing the use of large

[105] Ibid.
[106] With higher nitrate levels than 5.4 mg/L in the last ten years.
[107] For a level 2 area Subp7,
[108] With higher nitrate levels than 5.4 mg/L in the last ten years.
[109] Bleed, A. and Babbitt, C.H., 2015. Nebraska's Natural Resources Districts, University of Nebraska.
[110] Guardian, Netherlands announces €25bn plan to radically reduce livestock numbers (link)
[111] Ministry for the Environment & Stats NZ 2017: Infographic - New Zealand's Environmental at a Glance (Link)
[112] Parliamentary Commissioner for the Environment, 2018 *Overseer and regulatory oversight: Models, uncertainty and clianing up our waterways*. Page 15 (Link)
[113] Ibid. Page 9.

volumes of synthetic nitrogen fertiliser. This is a clear-cut example of regulatory capture. The 2021 independent review of Overseer found that it was not fit for purpose[114].

e. A solely effects-based regime also puts the bulk of the responsibility for meeting regulations on to farmers, of which there are nearly 30,000. The volume of farmers, coupled with complexity of measuring nutrient loss, makes monitoring and enforcement difficult for Government bodies to deliver.
f. The first global meta-analysis on nitrogen policy, which examined more than 2,700 nitrogen policies in 186 countries, states that: "*most policies to address agricultural nitrogen pollution focus on changing farmer behaviour, and doing so is extremely difficult because of challenges in monitoring and enforcement*."[115]
g. Measuring, controlling, monitoring and enforcing inputs is significantly simpler.
h. This is especially the case for synthetic fertiliser as there are essentially only two companies selling 98% of it in New Zealand.
i. The meta-analysis recommends: "*policymakers focus on agri-food chain actors beyond the farm capable of influencing farm-level N management, from the fertiliser industry to wastewater treatment companies. This would shift the regulatory burden away from farmers and thereby transform an intractable non-point-source problem into a series of more manageable point-source approaches*"[116]

Key Recommendations

Our recommendations on the NES-DW are provided in two parts: (1) key recommendations, and (2) full responses to the MfE consultation document questions (Appendix 2).

The NES first and foremost needs to recognise both synthetic nitrogen fertiliser and livestock urine (particularly from dairy cows) as direct, indirect, or source contaminants and address them as such. This is because if synthetic nitrogen fertiliser is recognised as a contaminant and cow urine is not, then there will be no controls on cow urine as a source of water contamination and therefore no way to address the contamination.

Flowing from this are:

- Te Tiriti issues: ensuring active protection by preventing contamination of drinking water. See section above: ***Impact of water contamination on Tangata Whenua***

[114]https://environment.govt.nz/assets/publications/government-response-to-the-findings-of-the-overseer-peer-review-report-final-.pdf
[115] Kanter, D.R., Chodos, O., Nordland, O., Rutigliano, M. and Winiwarter, W., 2020. Gaps and opportunities in nitrogen pollution policies around the world. *Nature Sustainability*, Page 5. (Link)
[116] Ibid

- NZ Bill of Rights issues, including the right to life (Section 8).

- The current 190 kg cap is not fit for purpose Notably, it does not apply to market gardening, and for dairy farming is clearly not sufficient to protect people from nitrate contamination which needs to be specifically addressed in the NES.

- The NES needs to (1) introduce a sinking cap on synthetic nitrogen fertiliser and (2) introduce cow stocking rate limits. Nothing else will meaningfully reduce nitrates in the drinking water and pathogenic contamination.

As the consultation document states "The first barrier for preventing waterborne illness is to protect the water bodies from which drinking water is taken – rivers, lakes and aquifers – from contamination. " (Pg7)

Proposal 2: concerns how activities that pose risks to source water are regulated or managed. As is noted "The overall aim is to ensure higher-risk activities are managed either through more stringent controls or direction where necessary, or through consistent consideration of source water effects."

So far, the preferred solutions to amend the NES-DW are limited to the scope provided to national direction instruments under sections 43 and 43A of the RMA, and to the protection of source water. However the proposals made are not far reaching enough.[117]

Better is the aim stated to "Ensure risks to source water are considered for all activities within a SWRMA, with appropriate conditions imposed" (p. 32) As is noted, “Some contaminants, such as nitrates, persist for a long time in the environment. Once an aquifer has been contaminated beyond a certain level, the treatment options are both expensive and complex. Minimising contaminants in our aquifers in the first place will reduce future costs of investigating and dealing with cumulative contamination and emerging contaminants.”

The example given is illustrative:

[117] "Proposed changes To improve how activities that pose risks to source water are regulated or managed, the following matters are being considered:
• restricting activities in the immediate vicinity of source water intakes (SWMRA 1), while enabling water suppliers to undertake intake management Improving the protection of drinking-water sources
• removing any permitted activity status for high-risk activities within SWRMA 2
• improving bore management, and land disturbance over vulnerable aquifers, to ensure potential adverse effects on groundwater are managed
• ensuring risks to source water are considered for all activities within SWRMA, with appropriate conditions imposed
• incentivising engagement with water suppliers.

"Under the amended NES-DW, Sarah will no longer be able to apply fertiliser to the 5 metre strip of land beside the river. However, there will be no change in how Sarah applies fertiliser elsewhere on her land, as long as she continues to apply no more than 190 kg/ha/year." (page 49)

Given the primary sources of nitrate pollution and contamination of water is not overland flows, it is obvious that simply preventing farmers from applying fertilisers 5m from the river will not prevent nitrate contamination from reaching the water supply.

A sinking cap on synthetic nitrogen fertiliser, to minimise and reduce nitrogen and nitrate reaching water catchments alongside stocking rate limits based on catchment soil porosity are the only plausible ways to protect the public.

Clearly s 43 is wide enough to include controls on the use of synthetic nitrogen fertiliser and stocking density under S 9 Restrictions on use of land:[118]
Subject to the above:

1. We support the proposal to use three SWRMAs. However, we submit that the NES-DW should regulate activities in all three areas (rather than just SWRMAs 1 and 2). We consider these should operate as follows:

SWRMA 1:

a. Should extend 20m 'landward' from the edge of a river/lake (rather than the proposed 5m).
b. Should extend to a radius of at least 30m (rather than the proposed 5m) around source water bores, with larger areas applied where a bore sits in a natural depression in a landscape (e.g. where it has a 'critical source area' for contaminants upslope).

[118] "Regulations, to be known as national environmental standards, that prescribe any or all of the following technical standards, methods, or requirements:
(a) standards for the matters referred to in section 9, section 11, section 12, section 13, section 14, or section 15, including, but not limited to— (i) contaminants: (ii) water quality, level, or flow:
(2) The regulations may include:
(a) qualitative or quantitative standards:
(b) standards for any discharge or the ambient environment:
S 9 includes
Restrictions on use of land
(1) No person may use land in a manner that contravenes a national environmental standard unless the use—
(a) is expressly allowed by a resource consent; or
(b) is allowed by section 10; or
(c) is an activity allowed by section 10A; or
(d) is an activity allowed by section 20A.

c. Other aspects of the zone (extend 1000m upstream, 100m downstream, etc. should be retained)
d. Most activities (including the holding of stock, discharge of fertiliser and wastewater, and earthworks) should be prohibited in this zone. Provision should only be made for activities that are necessary to maintain or restore the quality and safety of source water and the water intake.
e. Apply a hard 'avoid adverse effects'; approach to activity in SWRMA 1.

SWRMA 2:

f. Should be made clearer about how the 2.5km around a bore is measured.
g. Should be clear about how the 8-hour travel time for water is measured (e.g. what flow should be used to calculate it?).
h. Other aspects of the zone (100m landward, include the entire lake, etc.) should be retained.
i. Remove permitted activity status for any activity in SWRMA 2 (as proposed).
j. Prohibit or apply a high test (non-complying) to high risk activities in SWRMA 2 (e.g. direct discharges of contaminants to water, land disturbance over vulnerable aquifers, feedlots, etc.) and provide full discretion for consideration of effects on source water quality and quantity.
k. Prohibit the conversion of land to more intensive uses.
l. Limit the application of N fertiliser (to well below the existing NESF limit of 190kg/ha/yr, which is not fit for purpose) and introduce a stepped regular decrease in that limit through time towards phase out
m. Limit stocking rates.

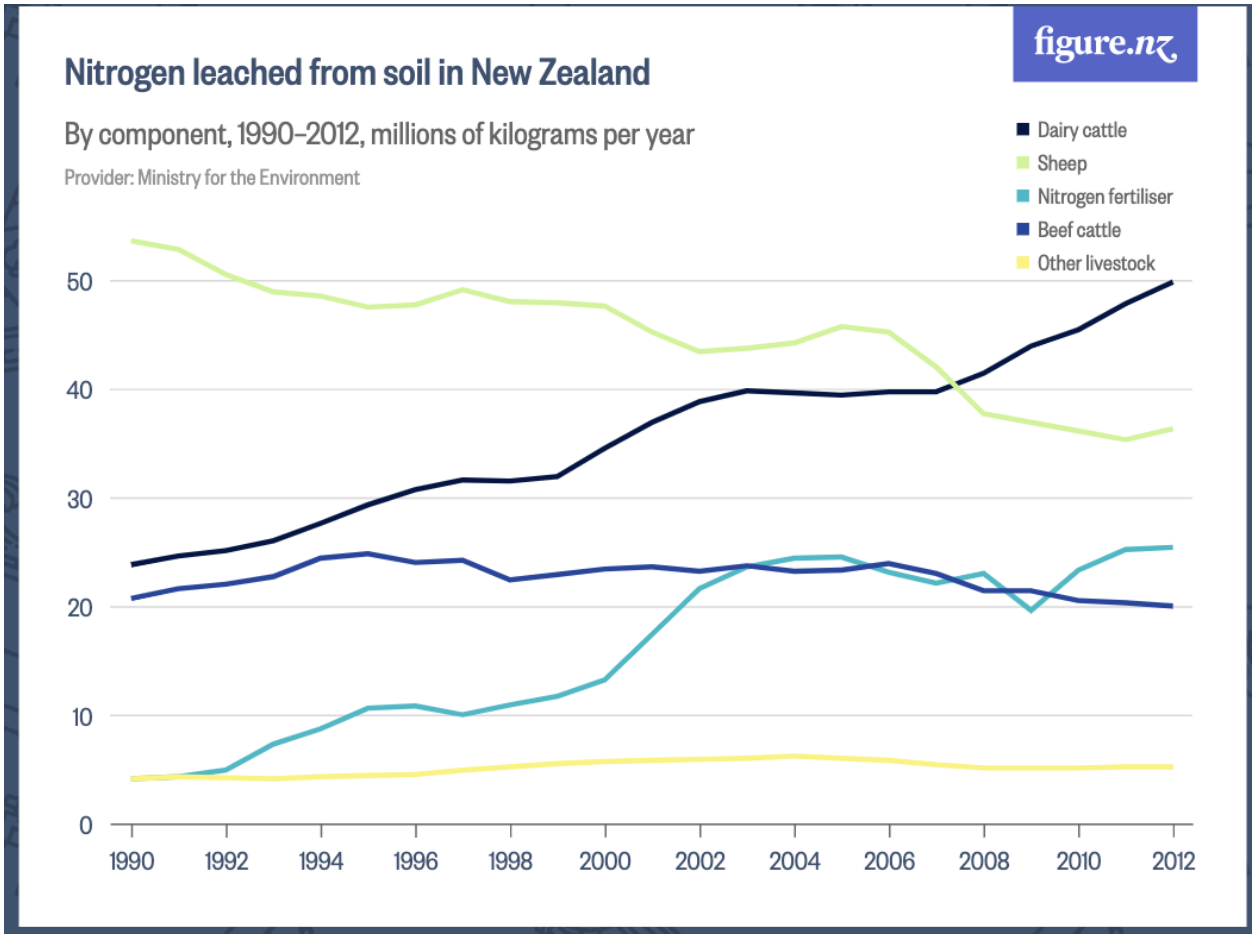
SWRMA 3:

n. Should include the entirety of a catchment used as a source of drinking water (as proposed) but including all water supplies including household bores.
o. Provide full discretion for consideration of effects on source water quality and quantity.
p. Prohibit the conversion of land to more intensive uses (as per SWRMA 2).
q. Limit the application of N fertiliser (to well below the existing NESF limit of 190kg/ha/yr, which is not fit for purpose) and introduce a stepped regular decrease in that limit through time towards phase out (as per SWRMA 2).
r. Limit stocking rates (as per SWRMA 2).

Effectively, this means stockholding and fertiliser application would not be provided for in SWRMA 1. Stockholding, fertiliser application, and intensification of land use would be regulated in SWRMAs 2 and 3. High risk activities would be severely limited in SWRMA 2, but could be

provided for more readily in SWRMA 3. Permitted activity status could effectively only be used in SWRMA 3.

Appendix 1



Noting that these figures have not been updated since 2012 and given that the sheep population has declined by around 5 million animals since 2012 (around 16%) and the use of SNF has increased from 363,000-452,000 tonnes (89,000 tonne increase) or by around 20% between 2012 and 2020. It is conceivable that leachate from synthetic nitrogen fertiliser is on par or even exceeds that from sheep urine. If true, synthetic nitrogen fertiliser would be the second largest source of nitrogen pollution after dairy urine.

Appendix 2

Response to Consultation Questions on NES-DW

Subject to our Key Recommendations (above): In regard to the questions presented in the NES-DW consultation document, we have the following specific feedback with consultation questions in red, our responses in black:

The default method for delineating SWRMA

1. *Domestic and international evidence suggests that delineating three at-risk areas is a good approach for protecting sources of drinking water. Do you think this is a good approach for protecting our source waters? What other approach can you think of that could contribute to protecting our drinking water sources? Do you think that three areas (and therefore levels of control) are sufficient to protect our drinking water sources?*

   While we appreciate and support the 'three at-risk areas' approach to protecting sources of drinking water, we consider that all water should be protected for human and ecosystem health. For example, the level of nitrate pollution above which ecosystem health starts to collapse 1.0mg/L (NO3-N) is around the same level above which there is an increased risk to humans of developing certain cancers (0.87 mg/L).

   Using an ecosystem-health-first approach to protect human health would also be consistent with Te Mana o te Wai and the NPSFM (2020).

   While we can see merit in having three zones across which different levels of control can be applied, we think that if these zones are to be used as proposed then more stringent controls are required in all zones, but particularly in SWRMA 3 - see our Key Recommendations above.

2. *In your view, is the method to determine each SWRMA, for each type of water body, the best option?*
   - *Should other factors be considered in determining size?*
   - *What challenges can you foresee in delineating SWRMAs?*
   - *Do you have any comments or feedback on the detail contained in the technical guidance materials?*
   - *Should SWRMA for all aquifers be bespoke so their unique features, depth and overall vulnerability can be considered?*

SWRMA 1

SWRMA 1 for rivers and lakes should extend 20m 'landward' from the channel/lake (rather than 5m). This is the minimum width of buffer required for self-sustaining, no-maintenance indigneous vegetation (with 20+ probably required for large waterways - e.g. rivers, lakes), and provides a reasonable buffer to stop the flow of overland contaminants directly into the channel/lake. Using a buffer of this size would reduce the need for maintenance, including weed control, which often involves spraying (and risks contamination itself).[119] It also provides significant biodiversity, climate and water quality gains.

The radius around SWRMA 1 for source water bores should be increased to be 30m at minimum, as suggested in question 5 below. Larger areas should be applied case-by-case to bores that sit in a depression in the landscape (effectively those downstream of a 'critical source area'), with the area extended to include the area upslope the bore.

SWRMA 2:

Clarification needs to be provided to make it explicit that SWRMA 2 extends 100m landward from river channels (at this stage it is unclear because it is only shown in the diagram, and not mentioned in the text of the proposal).

Clarification is also required how the 2.5km from a bore is measured for aquifers (it doesn't appear to simply be a radius).

Clarification is needed about how the 8-hour travel time for water is measured (e.g. what flow should be used to calculate it?).

SWRMA 3:

We support the entirety of a catchment being included as SWRMA 3.

Challenges:

Will councils have the ability to determine flow times in rivers to abstraction points? What default would be applied in the interim if they do not have the technical abilities or resources to have this modelling done? What flow does this assume (median)? Contamination of the Havelock North supply occurred during

[119] Parkyn, S.; Shaw, W.; Eades, P. (2000). Review of information on riparian buffer widths necessary to support sustainable vegetation and meet aquatic functions. Prepared by NIWA for Auckland Regional Council. Auckland Regional Council Technical Publication Number 350, 38 pages

rainfall, and this is likely to be when other contamination events would occur (because it's when pollutants are washed into waterways). MfE should consider using flows above the median to model this 8-hour travel time.

SWRMAs for aquifers

SWRMAs for aquifers should be defined AS A MINIMUM in the NES. Regional councils should then apply more stringent approaches to defining them using unique features as appropriate. This will ensure that councils who cannot undertake this 'bespoke' work at least apply minimum levels of protection.

3. *For lakes, do you agree that SWRMA 2 should include the entire lake area?*
    - *What might be an alternative approach?*

    Yes, SWRMA 2 should include the entire lake area.

4. *SWRMA 1 for lakes and rivers is proposed to extend 5 metres into land from the river/lake edge. This contrasts with 3 metres setback requirement of the Resource Management (Stock Exclusion) Regulations 2020. SWRMA 1 is proposed to be used as a basis for controlling activities close to source water intakes, and applies to a wide range of activities. Do you think these differing setbacks will cause confusion or result in other challenges?*

    The setback should be increased to 20m, as per above answer. This provides a higher level of protection (and reduces maintenance needs for these riparian areas) and clearly differentiates it from the Stock Exclusion Regulations, which would help avoid confusion. Alternatively, the Stock Exclusion Regulations could have the setback increased to match a higher setback in the NES-DW.

5. *There is evidence suggesting that a 10–30-metre radius around source water bores is a preferable way to delineate the area where activities would be heavily restricted (SWRMA 1). However, expert advice suggests a 5-metre radius is the most workable option.*
    - *Do you agree that a 5-metre radius around a source water bore gives enough protection? Why or why not?*
    - *If not, what alternative would you suggest?*

    No. As above, we support a minimum of 30m. Human health should be prioritised over what is considered 'workable'. Exemptions could be sought on a case-by-case basis if genuinely required and justifiable.

6. While water takes from complex spring systems or wetlands may require a bespoke SWRMA to ensure consideration of any contamination pathways present, a default method is necessary to ensure interim protection. Do you think a default method is practicable in most situations?
    - Do you think a regional council should determine (on a case-by-case basis) the most applicable default method: for a river, lake or aquifer, or is a different default approach necessary?
    - If so, what alternative would you suggest?

    Yes, a default method should be established as the absolute minimum. It would seem reasonable to apply the default 'lake' approach to wetlands.

Regional council mapping of SWRMA

7. How long do you think is necessary for regional councils to delineate SWRMAs for currently registered water supplies in each region, using the default method?

    This does not seem like it should take long, and should be completed before or alongside current NPSFM (2020) plan changes (i.e. before the end of 2024) at the latest.

8. What challenges do you foresee in delineating SWRMAs, when previously unregistered supplies are registered with Taumata Arowai (see Proposal 3 for more details)?

    We recommend that all human drinking water supplies be protected which should include unregistered household bores. It will therefore expand the SWRMA areas. This will take conscientious work to delineate.

9. What support could enable regional councils to delineate SWRMAs within shorter timeframes?

    Resourcing or technical support from Taumata Arowai or MfE to undertake the work. (e.g. using internal MfE staff to map these areas).

10. Do you think consideration should be given to mapping currently unregistered supplies as they register (but before the four-year deadline provided under the Water Services Act), or do you think that waiting and mapping them all at the same time is a better approach?

    All supplies including unregistered household supplies to fewer than 25 people should be mapped and monitored and mapping should begin immediately. It is clear that unregistered bores are likely to have some of the highest rates of

unacknowledged contamination (as observed by J Richards et al.). This would be the most precautionary approach to protect public health.

Bespoke method for delineating SWRMA

11. If a regional council has already established local/regional source water protection zones through a consultative process, should there be provision to retain that existing protection zone as a bespoke method without further consultation or consideration against new national direction?

    Existing zones/methods should only be retained where they are more stringent than that required by the NES. If they are not as stringent, they should be brought up to the minimum requirement in the NES.

SWRMA 1 controls

12. Do you think national direction on activities within SWRMA 1 is necessary?
    - If so, what activities should it address?
    - How restrictive should controls be in SWRMA 1, for resource users other than water suppliers?
    - Are there any activities you believe should be fully prohibited in this area?
    - Are there any activities you believe should be permitted or specifically provided for or acknowledged in this area?

    Yes. It should address any activity that could have an adverse effect on the quality of the water source. For example, land uses (agriculture, feedlots, stocking intensity) and discharges (fertiliser, chemicals, wastewater/effluent, stormwater).

    Restrictions should be extremely stringent in SWRMA 1 - i.e. a hard ‘avoid’ in terms of adverse effects. There should not be scope for mitigation of effects. All activity statuses should be prohibited, except for activities related to the maintenance and operation of the intake to ensure a safe water supply, and anything that might be required to maintain or restore water quality in the waterbody.

13. For water suppliers, are there any other activities beyond intake maintenance/management that should be provided for?

Only essential maintenance work to ensure safe supply of water, or activities that will help to maintain or restore water quality (e.g. riparian planting, wetland restoration).

14. In and around freshwater, control of pest species (including aquatic pest species) may be necessary, including through physical control (removal, that may include bed disturbance) or chemical control (discharge).
    - How much of an issue is this in and around abstraction points?
    - How critical is that work?
    - How often is this work mandated by other regulation or requirements?
    - How frequently is this work undertaken by parties other than the drinking-water supplier (or their contractors)?

    Having larger (20m+) setbacks for SWRMA 1 alongside rivers and lakes would reduce the need for control of pest plant species in riparian areas. Provision should be made for permissions to be sought for aerial pest control operations such as those using 1080 (as per existing Medical Health Officer requirements).

SWRMA 2 controls

15. Do you think national direction on activities within SWRMA 2 is necessary?
    - If so, what activities should it address?

    Yes.

    Remove permitted activity status for any activity in SWRMA 2 (as proposed).

    Prohibit or apply a high test (non-complying) to high risk activities in SWRMA 2 (e.g. direct discharges of contaminants to water, land disturbance over vulnerable aquifers, high stock intensity, feedlots etc.) and provide full discretion for consideration of effects on source water quality and quantity. Direction should control the application of synthetic nitrogen fertiliser, stocking rates, and conversions to more intensive land uses.

    Synthetic N fertiliser: Should be limited to a maximum below that of the NES Freshwater (190kg/ha/yr) and be decreased regularly until synthetic N fertiliser is phased out. For example, the EU applies a limit of 170 kg/ha/yr (incl. non-synthetic N), and a state in India applied a reduction requirement of 10% per year for synthetic inputs (see body of submission for references). A similar, more stringent approach (since we're 'behind' the world on this) should be applied in Aotearoa.

Stocking rates: Should be limited and reduced over time. For example, the EU stocking rate to protect freshwaters is about 1 dairy cow per ha.[120]

Conversion of land use to dairy: Conversion to dairy should be prohibited

16. In your view, how much will this proposal impact the current situation in your region?
    - What discharges to water are currently permitted?
    - Should provision be made to continue to permit those activities? What controls are typically used to ensure potential adverse effects are managed?

    Activities that are currently permitted in these areas should be phased out. This will have benefits for source water protection, but also for biodiversity and climate change, among other things (recreation, cultural values, etc.).

17. Are there any other activities that should not be permitted within SWRMA 2?

    Covered above.

18. The original intent of SWRMA 2 was to manage microbial contamination. However, there are indications that protections against other contaminants may be required. What contaminants do you think should be controlled in SWRMA 2?

    As above - nitrate.

    However, it would also be appropriate to consider how the NES-DW can manage emerging contaminants (antibiotics from wastewater/feedlots/agriculture, microplastics), stormwater pollutants (heavy metals, plastics) and chemicals (from horticultural spraying, agriculture, military areas, airports, fracking, etc.), sediment, etc.

19. What other challenges do you see when making a consent application within SWRMA 2?

    It should be a challenge (i.e. a high test applied) to undertake any intensive land uses in these areas.

SWRMA 3 controls

20. Do you think any additional controls, other than broad consideration of the effects of the activity on source water, are required in SWRMA 3?

[120] Mateo-Sagasta, J., S. Zadeh, and H. Turral. 2018. "More people, more food, worse water? a global review of water pollution from agriculture." Food and Agriculture Organization of the United Nations, Rome

Yes. As above re SWRMA 2 controls, for all the reasons set out in the body of this submission. In this case, it would effectively mean the NES-DW would apply a catchment-wide approach to protecting source water for the entirety of any catchment that supplies drinking water in any capacity to any number of people. The NES Freshwater would then apply to other catchments (and provide a less stringent set of rules, though these could be adjusted in future (e.g. through Resource Management law reform) to become consistent (with the more stringent rules becoming the new minimum). For ease of reference:

> Direction should control the application of synthetic nitrogen fertiliser, stocking rates, and conversions to more intensive land uses. Full discretion should also be provided to consider any potential effects of an activity on source water quality and quantity.
>
> **Synthetic N fertiliser:** Should be limited to a maximum below that of the NES Freshwater (190kg/ha/yr) and be decreased regularly until synthetic N fertiliser is phased out in these zones. For example, the EU applies a limit of 170 kg/ha/yr (incl. non-synthetic N), and a state in India applied a reduction requirement of 10% per year for synthetic inputs (see body of submission for references). A similar, more stringent approach (since we're 'behind' the world on this) should be applied in Aotearoa.
>
> **Stocking rates:** Should be limited and reduced over time. For example, the EU stocking rate to protect freshwaters is about 1 dairy cow per ha.[121]
>
> **Conversion of land use to dairy:** Should be prohibited nationally.

Groundwater bore management

21. What is your view on how to address issues with bores – should it be enough to amend the NZS 4411:2001 (with reference to that standard in the NES-DW), or should greater direction be given in the NES-DW itself?

    No specific comments.

22. For existing bores:
    - What is your view on requiring unused bores to be decommissioned?
    - Should bores of poor quality be required to be upgraded or decommissioned? What timeframe might be reasonable to do this?

[121] Mateo-Sagasta, J., S. Zadeh, and H. Turral. 2018. "More people, more food, worse water? a global review of water pollution from agriculture." Food and Agriculture Organization of the United Nations, Rome

- For many older bores there are no records. What sort of evidence could be used to support the ongoing use of these bores, or demonstrate they pose a low risk to the security of the aquifer?

No specific comments.

23. What is your view on prohibiting below-ground bore heads?

No specific comments.

24. Regional councils are responsible for control of the use of land for the purpose of maintenance and enhancement of the quality of water in water bodies (RMA section 30(1)(c)(ii)). Do you think territorial authorities have a role in land management over aquifers, and if so, what is that role?

Yes - at least as per the existing RMA framework. TAs are responsible for managing many relevant activities, including earthworks, stormwater and wastewater discharges (or at least their conveyance and treatment systems, which often end up discharging to source waters, intentionally or otherwise…), reserves and parks (which 'drain' to aquifers and streams), industrial/residential land uses (and all zoning), and biodiversity (which is inherently linked to source water quality). Ensuring their responsibility and role is clear is vital to protecting source water.

Identifying and managing activities over vulnerable aquifers

25. It is not clear which approach might be best for ensuring risk to vulnerable aquifers is appropriately managed. Do you think that an NES-DW is the right channel for addressing this? If not, what approach might be better?

Yes. These areas could be treated as SWRMA 2 by default. Activities, particularly intensive land use through more intense and rapid fertiliser application limits and phase out and stocking rate limits, should be heavily regulated in these areas.

26. Would it be helpful if guidance on vulnerable aquifers was provided to support freshwater planning as the NPS-FM is given effect?

Yes

Retrospective application of the NES-DW to existing activities

27. What activities do you believe the NES-DW should retrospectively apply to / not apply to, and why?

    It should apply retrospectively to all activities. Human health and Te Mana o te Wai should be prioritised.

28. In your view, what are the key challenges and benefits to retrospective application?

    Reverse sensitivity effects and established use rights (including perceived rights).

Criteria when considering effects on source water

29. Do you agree with the proposed list of criteria?
    - Are any additional criteria needed, or clarification?

    Yes, we agree with the list of criteria (assuming full discretion can't just be provided instead).

Proactive response planning

30. What types of activity might pose a significant risk to a water supply in an accident, emergency, or other natural event?

    Agriculture (including holding of animals in feedlots), chemical application and use, earthworks, stormwater networks/discharges, wastewater networks and treatment facilities, industrial zones, oil/gas/mining activities (all because flooding moves contaminants from these activities, and others, into source water bodies).

    Storage of chemicals (e.g. Mataura Paper Mill storage of toxic waste, collapse of tank on Mt Ruapehu which led to fuel entering pristine waterways coming off the mountain, etc.).

    Dams and damming.

    Earthworks (especially those associated with large scale projects such as roads or large infrastructure).

31. Do you think it is reasonable to require all activities with some potential to affect source water to undertake response planning, or just those with a higher risk (likelihood and consequence)?

    Yes, it is reasonable to require all activities with some potential to affect source water to undertake response planning. We consider it is consistent with Te Mana

o te Wai and protecting human health, to ensure high risk activities do not occur in those areas 'upstream' of source waters including within the catchment of source waters if those activities risk groundwater. Rather than having 'response plans' which are an 'ambulance at the bottom of the cliff' type approach, which MfE has already identified as being a fundamental flaw to the existing NES-DW (e.g. where it states in the consultation document that the NES has an unreasonable reliance on treatment).

Water supplier involvement

32. Do you agree that resource users should engage with water suppliers in consenting matters, within SWRMA 1 and 2?

    Yes, but notification of consent applications in SWRMAs should not be limited. In many cases, those making decisions can have vested interests (e.g. regional and district councils) in keeping an activity operating in a SWRMA – e.g. industrial factories, farms, wastewater treatment facilities, which provide jobs and economic activity in the region – and their decision making could be compromised as a result. Notification should be out to the public for input in these decisions.

    Resource users should also engage with householders whose water supply are within the catchment affected by the consent.

33. What hurdles do you see in promoting this engagement with water suppliers?

    No specific comment.

34. What support might small water suppliers need to effectively engage in the consent process?

    No specific comment.

General matters relating to managing source-water risks

35. A National Environmental Standard is a regulation under the Resource Management Act 1991 (RMA) that requires, among other things, that regional councils make changes to their regional plan rules. Making these changes can add costs (eg, financial, administrative) for regional councils.
    - In your view, how might regional councils be affected by the NES-DW's new requirements to change regional plan rules?

- Do these effects outweigh the expected benefits of better source water protection?

  We consider the required changes can be made relatively easily given the current context of other changes already required (NES Freshwater, NPSFM (2020), etc.). It will not be much more of a burden to make additional changes.

  The benefits of these changes SIGNIFICANTLY OUTWEIGH any effects on regional councils. (e.g. if these regulations were in effect, we potentially could have prevented the loss of several lives in Havelock North - which is a substantial and priceless benefit). With the regulations - providing they contain our Key Recommendations - we will protect all New Zealanders from existing and emerging drinking water quality-related health issues. There will also be significant gains for biodiversity and the climate.

36. In your view, how could the amendments to the NES-DW better align with farm plans?
    - Is reliance on the NPS-FM, NES-F and Stock Exclusion Regulations enough to manage the long-term effects of farming activities on underlying aquifers and waterbodies?
    - Can you identify potential duplication between the NES-DW and other regulations that control land use?

    This is extremely hard to comment on given the farm plan arrangement is not yet finalised. However, this regulation should link clearly to requirements at a farm level (e.g. knowing what zone a farm is in, what the rules are).

    There is overlap in regulations, but if the NES-DW was amended as we suggest, then those resource users operating in SWRMAs could effectively operate under the more stringent rules of the NES-DW, rather than being concerned about the NESF (with some exceptions).

37. If you are a water supplier, do you think these amendments will affect your ability to supply water (positively or negatively)? Would they influence whether you continue to provide water?

    No specific comment.

38. If you are a resource user, do you think these amendments will affect how you currently use your land or undertake activities? Will you have to change how you do things as a result?

No specific comment.

Which water supplies should be protected by the NES-DW

39. Do you think the protections of the NES-DW should apply to all registered water supplies?
    - If not, what types of supplies should be included, and why?

    Yes but not only all registered supplies. They should be designed bo protect all supplies of drinking water for all people. As per the body of our submission, everyone should have access to safe, clean water. However this should be designed in a way so as to not bring a greater cost burden on householders.

40. The WSA has a registration time frame of four years for currently unregistered supplies.
    - Do you agree with aligning application of the NES-DW with the WSA? If not, why?
    - In your view, what are the challenges resulting from including these newly registered supplies within the NES-DW framework?

    Yes.

Other comments

41. Do you have any other comments you wish to make?

The substantive submission and Key Recommendations should be read as our primary response.

ENDS