15th May 2018

Low Emissions Economy Consultation

Productivity Commission

PO Box 8036

Wellington 6143

To the authors of the draft consultation document,

Submission: Should wastewater treatment plants be included in the Emissions Trading Scheme?

1. Thank you for the opportunity to comment on the Productivity Commission report on transitioning to a low-emissions economy. This submission responds to the question posed in the draft report: Should wastewater treatment plants be included in the Emissions Trading Scheme?
2. The Association would like to meet with the Commission to discuss this submission.

3. Water New Zealand is a not-for-profit organisation that promotes and represents water professionals and organisations. It is the country's largest water industry body, providing leadership and support in the water sector through advocacy, collaboration and provision of technical support. Members are drawn from all areas of the water management industry including regional councils and territorial authorities, consultants, suppliers, government agencies and scientists. Given our memberships interests the focus of this submission is on domestic wastewater treatment and onsite wastewater systems.

4. We are of the view that wastewater treatment plants should not be included in the emissions trading scheme. We acknowledge however that the opportunities for emission reductions presented by wastewater are not insignificant.

5. Our membership has been consulted on the content of this submission. While the majority of our members supported its content, we received three responses from individuals who expressed the view that wastewater treatment plants should be included in the emissions trading scheme. These responses stressed the large impacts of climate change on water and wastewater systems. They shared a common sentiment that to not participate in our principal national vehicle for emissions

reduction would run counter to the sectors best interests and could be seen that the sector doesn't wish to do its fair share.

6. The emissions profile of wastewater treatment plants in New Zealand is poorly understood and little co-ordination exists to unlock emissions reductions. Water New Zealand is of the view that alternative government support measures could assist in unlocking these opportunities, with a plan to transition wastewater treatment plants into the ETS as greenhouse gas management of the sector matures.

7. Reform proposals for the water sector are currently being led by the Department of Internal Affairs and MBIE. Should this result in the management of wastewater treatment plants shifting from local councils to larger entities with sufficient capacity to respond to the demands of the Emissions Trading Scheme, it may be appropriate to reconsider the inclusion of wastewater treatment plants.

8. We suggest mechanisms (alternatives to the ETS) could be put in place to improve management of wastewater emissions.

9. This submission provides detail on; wastewater treatment plant emissions, reasons why they should not be included in the emissions trading scheme, opportunities to realise emissions reductions from wastewater treatment plants and alternative measures that could be could in place to support emissions reduction of wastewater treatment.

Wastewater treatment plant emissions

10. The contribution of wastewater treatment to New Zealand emissions is not insignificant. New Zealand's gross greenhouse gas emissions were 78.7 Mt CO_2-e in 2016. We estimate the contribution of wastewater treatment plant fugitive emissions and wastewater system energy use to national emissions at 0.35% and 0.05% respectively. Further detail on these estimations is outlined below.

11. In 2016-17 fugitive emissions from wastewater treatment and discharge contributed 396.8 kt CO_2-e to national emissions (Ministry for Environment, 2018). Of this, an estimated 157.64 kt CO_2-e was attributable to fugitive emissions of methane and nitrous oxide from domestic wastewater treatment plants, and a further 106.04 kt CO_2-e from onsite wastewater systems (Ministry for the Environemnt, 2018).

12. The energy consumption of wastewater treatment systems (which includes pumping in reticulation networks in addition to wastewater treatment) was measured through Water New Zealand's National Performance Review (Water New Zealand, 2018). In 2016-17 some 1,302,007 GJ of energy was used for wastewater treatment and pumping by participants in the review (whose jurisdictions cover approximately 90% of New Zealand population). The majority of this energy related to electricity use. Using an emissions factor of 0.119 kg CO_2-e /kWh (Ministry for the Environment, 2016) this corresponds with emissions of 43 kt CO_2-e.

Wastewater treatment plant emission reduction opportunities

13. Wastewater treatment emissions reduction opportunities can be divided into two areas; recovery of energy embodied in wastewater and improving the energy efficiency of wastewater processes. Costs of wastewater treatment are born by rate payers. Accordingly investments in energy efficiency and fuel substitution can result in long term power savings to the communities served. Investing in onsite energy reuse can contribute to more resilient wastewater treatment systems.

Energy Recovery Opportunities

14. The Water Environment Research Foundation estimate that the energy contained in wastewater and bio-solids exceeds the energy needed for its treatment by 10-fold (Water Environment Research Foundation, 2011). However, our ability to harness that energy presents complex challenges which vary based on facility size, operations, surrounding energy users and influent characteristics.

15. Anaerobic digestion is the most commonly employed process for capturing and reusing energy in wastewater. An example is New Zealand's largest wastewater treatment plant in Mangere, operated by Watercare, which has gas engines that burn waste methane gas from the sewage treatment process. This co-generates heat which is used within the sewage treatment process and electricity which is used within the overall site. This project generates up to 6.8MWe electricity and 8MW (th) hot water from methane gas from the digestion process (Bioenergy Facilities Directory, 2018).

16. Colder climates can benefit from recapturing heat contained in waste-water, a practice employed internationally, most commonly in Scandinavia and has been researched in New Zealand (Hua, 2005). Water New Zealand is aware of a project intending to heat a swimming pool from the heat contained in wastewater at a New Zealand town.

17. Biosolids (the solid fraction of sewage) contain energy that can be recovered through a number of processes including; anaerobic digestion, co-digestion of bio-solids with other organic wastes, bio-solids incineration, or conversion of bio-solids to other fuels through processes such as gasification and pyrolysis.

18. Other renewable fuel sources from wastewater are in development. Ammonia extracted from wastewater can be burned directed in internal combustion engineers or converted to fuel cells. Other organics present in wastewater are also being investigated for use in fuel cells that generate electricity. Recovery of phosphorus from wastewater is another recent international development but is energy intensive.

Energy efficiency opportunities at domestic wastewater treatment plants

19. Many domestic wastewater treatment plants use energy-demanding processes. By far the most common energy demand for wastewater treatment is to provide oxygen for a biological system such as activated sludge treatment. Other common energy uses include mechanical pumping to move water around a treatment plant, operate mechanical equipment such as screens, scrapers and mixers.

One of the largest studies on energy efficiency in the wastewater sector compiled a list of potential energy savings from a range of case study sites. Opportunities included; wastewater pumping optimisation, aeration system optimisation, addition of pre-anoxic zone for BNR, flexible sequencing of aerations basins, high efficiency UV and lighting system improvements (Water Environment Research Foundation, 2011).

Possible nitrogen reduction opportunities at domestic wastewater treatment plants

20. Wellington City Council has a comprehensive air discharge treatment system at the Moa Point Wastewater Treatment Plant and all plant air emissions are scrubbed before being discharged to the atmosphere. Nitrous oxide, if present would be readily removed in one of the scrubber stages (probably the first) and returned to the pump station wet well where it could be reduced to ammonia or even nitrogen gas. Other such nitrogen emission reduction opportunities may exist at other wastewater treatment plants. Limitations to realising such opportunities are addressed in the "Barriers to including wastewater treatment plants in the emissions trading scheme" section of this submission".

Efficiency opportunities for onsite wastewater systems

21. Onsite wastewater treatment systems are poorly regulated in New Zealand. These are those septic tank and related secondary aeration systems not connected to a reticulation network. There is however a range of products in the market consumers may select from and environmental considerations are likely to be one driver of choice. There is no national inventory for onsite wastewater systems, Water New Zealand understands that in many cases a regional inventory does not exist either.

    It is estimated that there are over 600,000 New Zealanders relying on onsite wastewater systems excluding holiday homes. There is an opportunity to provide consumers with information on the emissions efficiency of their onsite wastewater systems. We explore this opportunity in the "Alternative pathways" section of this submission.

Barriers to including wastewater treatment plants in the emissions trading scheme

Wastewater treatment emissions in New Zealand are poorly understood

22. Many of New Zealand's councils do not currently account for wastewater treatment plant emissions in their greenhouse gas inventories. There is no mandatory requirement for this, nor are methods greenhouse gas estimation from wastewater treatment included in voluntary greenhouse gas reporting guidance (Ministry for the Environment, 2016).

23. Most councils who have calculated fugitive wastewater emissions have used methodologies outlined in the Intergovernmental Panel on Climate Change, 2006, Guidelines for National Greenhouse Gas Inventories (National Gas Inventories Programme, 2006).

24. These methodologies are not always relevant to types of treatment in New Zealand. In particular New Zealand is one of few countries in the developed world where wastewater discharges to land are common. These are not addressed by the IPCC guideline (although land application of sludge is addressed) (National Gas Inventories Programme, 2006). At present Water New Zealand is not aware of any well-established emission factor for the conversion of nitrogen from land applied wastewater to nitrous oxide (Coster, 2009).

25. At a national level New Zealand greenhouse gas emissions estimates for wastewater are based on a number of assumptions. As wastewater influent loads to treatment plants are not universally available, indirect nitrous oxide emissions have been based on per capita protein consumption at a national level (Ministry for the Environment, 2016). The reported uncertainties are high, ranging from ±10% and uncertainty in emissions factors of ±40%.

Wastewater operators generally lack the resources to cost effectively realise emissions reductions

26. There are approximately 317 municipal wastewater treatment plants in New Zealand and approximately a further 50 government or privately owned treatment plants serving populations of more than 100 people (exact numbers are unknown as there is no central agency responsible for collection of data or management of wastewater treatment plants in New Zealand).

    Water New Zealand maintains an inventory of wastewater treatment plants in New Zealand (Water New Zealand, 2017) which provides details of 262 of the country's municipal plants. The majority of treatment plants are small with 210 of the smallest plants treating less than 1 million m3/year of wastewater. These small plants lack the scale to cost effectively realise emissions reduction opportunities.

    Many of these small plants utilise waste stabilisation ponds, the maintenance cycle (particularly desludging) of waste stabilisation ponds have long intervals (typically ten years) resulting in the actual emissions values for a particular year not being known for a considerable number of years afterwards. A recent round of workshops on waste stabilisation ponds has identified that a number of utilities were unaware of the requirement to de-sludge ponds, which in turn has emissions impacts.

27. The majority of New Zealand's domestic wastewater treatment plants are operated by 67 territorial authorities. Wastewater management teams within these entities are often small and staff are generally lacking the capacity and resources for beyond business as usual functions involved in operating wastewater treatment plants. It is the view of Water New Zealand that most small councils currently lack the capacity to act on emissions reduction opportunities that exist.

28. Large treatment plants (treating greater than 10,000,000 million cubic meters a year of wastewater) are responsible for treating 70% of the wastewater recorded in the inventory. It is Water New Zealand's view that selectively including only large wastewater treatment plants (who may reasonably be expected to have the capacity

to realise emissions reductions opportunities) would place an unfair cost disadvantage on those communities which they service.

Greenhouse gas management of wastewater treatment plants could involve trade-offs between emissions and waterway protection

29. Beyond the energy efficiency and energy recovery opportunities mentioned, greenhouse gas management of wastewater treatment can involve a balance between greenhouse gas emissions and resulting effluent quality. Wastewater treatment systems need to treat all domestic and trade wastes to levels that allow them to be safely discharged to receiving environments without causing a nuisance or a risk to public health. This should always be at the top of the priority list for operating wastewater treatment plants.

    Treatment plant design and operation involves trade-offs in terms of fugitive emissions, energy and final effluent quality. Energy intensive process routes such as high rate, or forced aeration systems use more electricity but produce a higher quality effluent and avoid methanogenic process routes. Low energy process methods such as passive pond systems use significantly less power but may produce lower quality effluent and use methanogenic process routes.

    In some cases energy intensive processes may be necessary to protect public health and receiving environments. Processes such as ultra violet light disinfection (and aforementioned aeration systems) are commonly used in wastewater treatment plants to reduce the pathogens in effluent. This has significant public health and environmental benefits but requires a trade-off against emissions created. If wastewater treatment plants are included in the emissions trading scheme there is a risk that a system with higher energy use is perceived as less favourable resulting in perverse public health and environment outcomes.

    These trade-offs apply equally to municipal wastewater facilities as well as to onsite wastewater systems.

Alternative pathways for supporting emissions reductions to wastewater treatment plants

Development of fugitive emissions methodologies for wastewater

30. Improving the understanding of wastewater fugitive emissions in New Zealand is an important first step to managing this emissions source. Inclusion of methodologies covering the range of wastewater treatment processes employed in New Zealand would usefully be included in the Ministry for Environments Voluntary Greenhouse Gas Reporting Guidance. This would facilitate the assessment of fugitive emissions from wastewater for those councils who wish to include this in their greenhouse gas inventories.

31. Correct determination of nitrogen emissions requires the various stages of the nitrogen cycle to be addressed. This is a complex process, which varies depending on wastewater treatment plant configuration and effluent quality. There are international guidelines for such determinations. Tailoring these to a New Zealand context is

beyond the job scope of most water treatment operators, who in general lack either the time or expertise for such determinations. The development of appropriate fugitive emission factors for the New Zealand would require third party support, either from central government or academia.

32. With time, greenhouse gas understanding (at both a local and national level) could be encouraged through mandatory reporting of emissions through mechanisms such as the Local Government Non-Financial Performance Measure Rules if mature methodologies for its determination were established.

Sector focus through the Energy Efficiency Conservation Authority (or other agency)

33. The large number of Councils in New Zealand means authorities often lack the scale or joined up thinking to effectively realise energy efficiencies within wastewater treatment plants. Existing sector and technology support streams at the Energy Efficiency and Conservation Authority could focus on wastewater treatment to facilitate such linkages.

Emissions efficiency labelling of onsite wastewater systems

34. Standards, ratings and labels are managed by the EECA to encourage manufacturers to develop, import and sell superior energy efficient products, and assist consumers to make informed choices in product selection. A similar labelling system for onsite wastewater system emissions would support the management of onsite wastewater systems emissions.

35. Water New Zealand co-manages an effluent testing centre for onsite wastewater systems at the Rotorua Wastewater Treatment Plant. The centre undertakes performance testing of onsite wastewater treatment systems to certify compliance against *AS/ NZS 1546.3:2008 On-site domestic wastewater treatment units: Secondary treatment systems* and also acts as a test site for manufacturers undertaking research and development of their products. The next round of testing scheduled for October 2018 will be testing against AS 1546.3:2017, this standard tests to more real world conditions and also includes an energy use component. With adequate support this facility could be expanded to assess and develop the emissions efficiency of onsite wastewater systems.

36. A limitation of the test facility is that there is no obligation on Councils to require that systems being installed by homeowners have been tested against the Standard.

Need to Make a Contribution

37. The Association is aware that there is a realistic expectation that the wastewater sector should make a contribution to emissions reductions. We have noted some of the barriers to achieving meaningful progress, and some areas where progress might be made.

38. We would be pleased to meet with Commission staff to discuss the matter in more detail if required.

Sincerely

John Pfahlert

Chief Executive