BEFORE THE INDEPENDENT HEARING COMMISSIONERS FOR GISBORNE DISTRICT COUNCIL

IN THE MATTER: of the Resource Management Act 1991

AND

IN THE MATTER: of an application by Gisborne District Council for resource consent associated with wastewater overflows

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STATEMENT OF EVIDENCE OF DR CHRISTOPHER AYOKUNLE DADA – QUANTITATIVE MICROBIAL RISK ASSESSMENT

13 July 2021

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1 **INTRODUCTION**My full name is Dr Christopher (Chris) Ayokunle Dada. I am an Environmental Health Microbiologist at QMRA Data Experts where I provide specialist expertise in microbiology, quantitative microbial risk assessment (**QMRA**) and predictive modelling. I have outlined my qualifications and experience in my Evidence in Chief (**EIC**).

2 **SUMMARY OF EVIDENCE**Quantitative microbial risk assessment (**QMRA**) is a tool for estimating human health risks from exposure to pathogens via various environmental sources, e.g. water. As documented in literature, QMRA is typically described as a sequence of four steps: (A) Hazard identification; (B) Exposure assessment; (C) Dose-response assessment; and (D) Risk characterisation. I have explained this framework in my EIC. Using this QMRA framework, I undertook an assessment and produced a Report for GDC titled 'Quantitative Health Risk Assessment for Wet-Weather Wastewater Discharges into City Rivers and Poverty Bay, Gisborne, which was included as Appendix M to the Application. Consistent with other NZ QMRAs, the focus was on gastrointestinal illness and acute respiratory illness risks (abbreviated as GI and AFRI illness risks, respectively).

2.2 Summarily, to calculate the likelihood of the health outcome, pathogen concentrations in recreational water potentially impacted by wastewater are converted into exposure doses which are then applied to established dose-response function for each pathogen considered. Risk characterization was conducted using Monte Carlo simulations, which model a variety of scenarios and help to account for variability and uncertainty in estimated health risks. Predicted risks are expressed as individual illness risk (**IIR**) and classified into four groups in relation to the New Zealand recreational water quality guidelines (MfE/MoH 2003)[1]. These groups are: No observable adverse effects level **(NOAEL),** Low illness risk, Moderate illness risk, and High illness risk. The ideal health outcome is that predicted illness risks fall below the "No observable adverse effects level" **(NOAEL)** for both GI and AFRI illness risks.

2.3 A precautionary and conservative approach was adopted in the Gisborne overflow QMRA (as was also recognised by the Technical Review). This was achieved by accounting for extremely high influent virus concentrations that occur during on-going but undetected viral illness outbreaks in the community; assuming the wastewater overflow is not diluted by stormwater when in fact WWO are diluted at a rate of at least 4 parts stormwater: 1 part wastewater; reporting children's illness risk as opposed to

[1] Table H1 the New Zealand recreational water quality guidelines (MfE/MoH 2003)

the generally lower adults' risk; including a dilution-only scenario that does not include solar ultraviolet-based inactivation of viruses; and applying a bioaccumulation factor to shellfish.

2.4 A key objective of the QMRA was to estimate health risks before and after improvements to stormwater and wastewater networks. That is, will the proposed future changes delivered through GDC's DrainWise Programme result in an improvement over existing conditions?

2.5 The QMRA results predict that the proposed future changes delivered through GDC's DrainWise Programme will result in a significant improvement over existing conditions. Health risks, based on all responses considered (i.e. in relation to gastroenteric and acute febrile respiratory illness following accidental ingestion or inhalation of water) are significantly reduced and lower than the status quo. Also, the predicted health risks are less than the NOAEL (No observable adverse effects level). This is summarised in Table 1 of my EIC.

2.6 Low to moderate health risks following consumption of raw shellfish harvested from some sites within the receiving environment 24 hours after an overflow event are still predicted in relation to overflow discharges during future improved conditions. Again it is critical to note the very conservative nature of the health risk assessment that has been undertaken, including that there is no dilution of wastewater in a wet weather overflow. It should also be noted that the frequency of overflow events reduces significantly over time, and therefore the likelihood of an overflow event also reduces significantly.

2.7 GDC actions notification of the public and signage when overflows occur, as set out in my EIC. I consider such an approach is appropriate as a key way of managing health risks associated with overflows. I understand that Council is currently considering permanent signages at shellfish gathering locations to discourage shellfish collection. I consider such signage would also assist in managing health risks associated with other inputs unrelated to this Application, including closed landfills, urban and agricultural runoff.

2.8 One issue that I have identified is the persistence of viruses in shellfish following an overflow event. I have recommended that shellfish samples are collected from sites impacted by the discharge and assessed for enteric viruses and *E.coli.* This will assist in better understanding, and managing, health risk associated with shellfish collection

and consumption. In respect of my recommendation, I understand that Council has proposed a condition of consent requiring the undertaking of this assessment.

2.9 It should also be noted that the health risk assessment report predicts the risk of illness during/immediately following an overflow event. GDC has advised that implementation of the DrainWise programme will reduce the frequency of wet weather overflows from an average of 2.5 / year to less than 1 per 2 years. So not only does the health risk following an overflow event reduce, but the likelihood of an overflow occurring also decreases significantly.

2.10 I am aware that there has recently been media reporting regarding concerns about whether WWO events are capable of causing non-enteric or non-respiratory infections among waterway users (such as skin infections caused by contact with the potentially polluted water). These matters are not explicitly raised in submissions . These concerns may include some pre-conceived notions of health risk, as is typical for water-related skin infections documented in literature. Notwithstanding, out of an abundance of caution, therefore, a risk assessment was conducted in relation to a pathogen (*Staphylococcus aureus*) that has been related to skin infections following exposure to potentially polluted recreational water. As explained in my EIC, the predicted infection probability following full body immersion is extremely low. This is not surprising as previous risk assessment studies in New Zealand (for instance, Stott and Hudson, 2019) have reported that *S. aureus* has a relatively low infectivity and that extremely high concentrations of cells would be required to cause skin infection.

2.11 Consistent with the approach used by previous NZ QMRAs for wastewater discharge, the predicted risks reported in the Gisborne QMRA are only incremental risks that occur as a result of an overflow event (i.e. attributable risks). However, it is important to note that the baseline water quality of the city rivers is subject to the influence of land use in the upstream catchments, as well as from other urban discharges. Even without the overflow discharge events, background microbial water quality will continue to be impacted by upstream land use activities and discharges from the urban area. The QMRA does not capture risks present in baseline conditions such as non-event days/periods. For instance, while the QMRA results indicate that attributable risks associated with contact recreation in the future overflow discharge scenario are below the "no observable adverse effects level", risks present in the baseline conditions of the river may already be at high levels due to other discharges from the urban area. I note that Council is already in a process of applying a catchment-wide approach that

considers contamination by wastewater, stormwater, closed landfills, and agricultural runoff.

2.12 GDC has advised that the fourteen QMRA exposure sites used for assessment of health risks associated with recreation and shellfish gathering were quite extensive. Nonetheless, I agree with the recommendation of KIWA Engagement Group Report as stated in Section 9.35 of the s42A Officer's Report, that GDC will need to work more with local groups to identify further at-risk sites and locations relevant to recreation, shellfish gathering, and other Māori resource-use practices. As stated in my EIC, Council already has projects and processes underway in addressing other contaminant sources (i.e. not related to this Application) including wastewater, stormwater, closed landfills, and agricultural runoff, which I support as part of an integrated approach to managing risks.

2.13 In relation to DWO, I note that Council has a multi-faceted approach to overflow prevention, management and response, which I support, to address health risk associated with those wastewater overflows (which are relatively infrequent occurrences). Consent conditions should ensure that these discharges are managed to the extent possible, with appropriate monitoring and reporting if they do occur, along with notification protocols and procedures which will manage any potential health risks in an appropriate manner.

Dr Christopher Ayokunle Dada

13 July 2021