BEFORE THE PROPOSED NATURAL RESOURCES PLAN HEARINGS PANEL

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of Water Allocation
AND	
IN THE MATTER	of the submissions and further submissions set out in the S42a Officer's Report

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STATEMENT OF SUPPLEMENTARY EVIDENCE OF

DR DOUGLAS MZILA ON BEHALF OF WELLINGTON REGIONAL COUNCIL

TECHNICAL – WATER ALLOCATION: COMMUNITY DRINKING WATER SUPPLY PROTECTION AREAS

8 December 2017

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1. INTRODUCTION

1.1 My name is Dr Douglas Mzila. I work as Senior Environmental Scientist for Wellington Regional Council. I wrote the technical report '*Water Allocation – Aquifer integrity and dewatering'* dated 7 August 2017, released in advance of Hearing Stream 3 (hereafter referred to as my primary evidence).

1.2 My qualifications and expertise are described in my primary evidence.

2. CODE OF CONDUCT

2.1 I confirm that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note and that I agree to comply with the code. My evidence in this statement is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions which I express.

3. SCOPE

3.1 This supplementary evidence relates to matters raised by submitters and the Panel since my primary evidence was released and covers the following:

(a) Mapping of community drinking water supply areas;

(b) Saline intrusion trigger levels, climate change and sea level rise;

(c) Investigation and monitoring bores as a permitted activity to a depth of 5m in drinking water supply areas;

(d) Mapping of Wellington Harbour springs.

4. WHY ONLY COMMUNITY DRINKING WATER SUPPLY AREAS HAVE BEEN MAPPED AND NOT GROUP SUPPLY AREAS:

4.1 It is expected that due to significantly lower abstraction rates group groundwater supply capture zones will be much smaller than those for community drinking groundwater supply. Therefore relative error in mapping group groundwater supply capture zones could be much larger than those for community groundwater supply.

4.2 Mitigation measures to supply smaller communities in case of aquifer contamination are easier and more manageable than larger communities as there are fewer people to provide alternative water supplies such as through tanks or small packaged water treatment plants. Hence higher standards of source protection should be implemented on groundwater drinking water supplies for more than 501 people).

5. SALINE INTRUSION TRIGGER LEVELS, CLIMATE CHANGE AND SEA LEVEL RISE

5.1 I agree that management effects of climate change should be taken into account in managing abstractions to prevent saltwater intrusion into the Hutt aquifer. Further to my submission points 33-37 of the PNRP hearing which I will detail below. I have compared projected sea level changes used in the allocation models and those from relevant detailed current studies on the causes and magnitude of sea water level rises.

Literature Review on Current and Projected Sea Level Changes

5.2 Factors that cause long-term changes in mean sea level can be analysed by examining the role of the various factors affecting mean sea level (Mimura, 2013). The two basic factors are change of total volume of sea water, and movements of ground and ocean bottom that result in changes to the size and shape of the ocean basins. In addition to these, dynamic factors such as winds, atmospheric pressures, ocean currents, and waves, play a role. Thus there are many factors, with various temporal and spatial scales (Cazenave, 2010) as discussed below.

Discussion:

5.3 Sea level rise estimates presented in Earth In Mind (2016) for the Waiwhetu aquifer are consistent with latest literature (Mimura, 2013; Table 1 and Figure 5). This showed that the HAM3 Model was based on current information that took into account various factors contributing to sea level rises. The HAM3 model recognized a 0.2m sea level rise over the last 100 years averaged at 2mm per year in agreement with Figure 5 in Mimura (2013). The HAM3 model projects a 0.8m rise by 2090 or 1m by 2115. The HAM3 model adopts a high sea rise scenario of 1.5m as a basis for assessing the vulnerability of the Waiwhetu aquifer. This worst case scenario will result in reduction of approximately 30% in aquifer yield. These values are consistent with the worst case scenario presented by the blue shaded area in Figure 5 of Mimura (2013). The HAM3 model has also recognized additional effects due to sea floor subsidence as a result of seismic activities.

5.4 I am of the opinion that the current groundwater management for the Waiwhetu represents best practice that has taken into account all currently known variables that contribute to sea level rise and more so effects of climate change. Other mitigating factors such as maintenance of positive discharge heads to the sea and also systems of saline water monitoring wells are incorporated to detect early movement of the saltwater interface.

5.5 Other potential causes of ingress of saltwater and loss of artesian pressure includes activities such as removal wharf piles that penetrate the aquifer. These are consented activities that are covered by other policies and rules (particularly the coastal sections) of the proposed plan.

6. INVESTIGATION AND MONITORING BORES AS A PERMITTED ACTIVITY TO A DEPTH OF 5M IN DRINKING WATER SUPPLY AREAS

6.1 In my opinion properly constructed investigation and monitoring wells to a depth of 5m in drinking water supply areas should be a permitted activity. The bores are small annulus and specifically for the purpose of investigations and monitoring. The bores are likely to be for a short period and only to 5m deep as the confining layers are mostly found at greater depth than 5m as further discussed in paragraphs below regarding excavation rules. In addition the bores need to be drilled and decommissioned in accordance with the NZS 4411:2001 Environmental Standard for Drilling of Soil and Rock, I am comfortable that the effects of bores can be managed through the conditions in Rule R146. The standards are best practice and should further minimise any potential adverse effects to groundwater resources.

7. CONSTRUCTION AND EXCAVATION ACTIVITIES DEEPER THAN 5M BELOW GROUND LEVEL IN COMMUNITY DRINKING WATER SUPPLY PROTECTION AREAS

7.1 The section 42A report: Water allocation recommended including a new rule (Rule R146A) requiring consent for construction and excavation activities deeper than 5m in the Hutt Valley. The reasons for this were two-fold:

(a) Protection of the confining layer/aquitard to prevent contamination of the groundwater resource;

(b) Protection of the confining layer/aquitard to prevent artesian pressure losses from the confined aquifer.

7.2 I consider similar provisions should also apply in the other community drinking water supply areas because:

(a) The vulnerability of confined aquifers to microbial contamination is increased by deep excavations that could go through the confining layer/aquitard as excavations are a special pollution hazard because contaminants can find their way directly into the aquifer. Once a contaminant enters groundwater, it is very difficult to remove.

(b) Deeper excavations could also cause a rupture or breach of the confining layer (aquitard) which comprises mainly of silty horizons. Groundwater can flow vertically across these silty horizons and if the surface area of an excavation is large, upward vertical flow from the underlying artesian aquifer can be significant.

7.3 An analysis of groundwater capture zones for community supply for example the Potts bore (R26/6151) within the capture zone of the KCDC Otaihanga community supply bore has a depth to the productive aquifer of approximately 8m bgl. The depth to the productive aquifer at the Paekakariki treatment plant (Kapiti) bore (R26/7158) is approximately 10m. Bores (S26/0144, S26/0962, S26/0841) within the capture zone for Carterton (Wairarapa) community supply bore is between 6m bgl and 13m bgl depending on the location of the bores upstream of the supply bore.

7.4 From the above observations I therefore regard that a 5m depth criteria should be adequate in mitigating against contamination in all community supply capture zones in the Region. Excavations deeper than 5m can have appropriate consent conditions to minimise adverse effects to the groundwater resource.

8. MAPPING OF THE SPRINGS IN WELLINGTON HARBOUR

8.1 A report on geophysical interpretation of the Waiwhetu Gravel Aquifer in Wellington Harbour by Nodder (September, 2015) discussed previous investigations on submarine spring discharges on the Wellington Harbour. Pressurisation of the aquifer has been interpreted at certain locations in the harbour by the discharge of freshwater springs at the seafloor. These springs are characterised by the formation of large (10's of metres diameter and depth), near-circular depressions in the soft marine muds (e.g., off Petone near the Hutt River mouth, off Matiu/Somes Island, off Point Howard/Lowry Bay; (Pallentin, Verdier et al. 2009) and at locations where artesian freshwater is documented to be seeping into the overlying marine environment (e.g., Falcon Shoals near the Wellington Harbour entrance) (Carter and Mitchell 1988; LINZ / New Zealand Hydrographic Authority 2014), or close to known faults (Davy and Wood 1993).

8.2 These artesian springs are known to open and close in response to changing sea bed conditions. While it is important to identify and map these springs, it is more practical to assume that the springs can occur anywhere within the Harbour as shown in Map 30. Specific investigations for the locations of these springs should be project based.

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