

In the Matter of the Proposed Central Plains  
Water Enhancement Scheme

To Environment Canterbury and  
Selwyn District Council

Submitter Te Runanga o Ngai Tahu

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DRAFT BRIEF OF EVIDENCE OF PAUL ALBERT WHITE

2<sup>nd</sup> October 2009

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## 1. QUALIFICATIONS AND EXPERIENCE

- 1.1 My full name is Paul Albert White.
- 1.2 My qualifications and experience were presented to the Central Plains Water Commissioners in my primary brief of evidence and are not repeated here.
- 1.3 I have read the Code of Conduct for Expert Witnesses (Rule 330A, High Court Rules and Environment Court Practice Note) and agree to comply with it. I confirm that I have complied with it in the preparation of this statement of evidence.

## 2. SCOPE OF EVIDENCE

- 2.1 I have been asked by Te Runanga O Ngai Tahu to review the brief of evidence by Clifford John Maxwell Tipler 7<sup>th</sup> September 2009 in relation to the revised Central Plains Water Enhancement Scheme.
- 2.2 My evidence will include:
- the Central Plains Water Enhancement Scheme area;
  - groundwater allocation;
  - land drainage with the revised Central Plains Water Enhancement Scheme;
  - nitrate concentrations with the revised Central Plains Water Enhancement Scheme;
  - nitrate leaching with the revised Central Plains Water Enhancement Scheme;
  - land drainage with the revised Central Plains Water Enhancement Scheme and water flows into Te Waihora/Lake Ellesmere;

- nitrate leaching with the revised Central Plains Water Enhancement Scheme and nitrate discharge into Te Waihora/Lake Ellesmere.

### 3. THE CENTRAL PLAINS WATER ENHANCEMENT SCHEME AREA

- 3.1 The Central Plains Water Enhancement Scheme (CPWES) boundaries (Tipler 2009) appear the same as first proposed (Tipler 2008, 2009) so my evidence to the CPWES Commissioners (White 2008a, 2008b) on the potential pathways of groundwater from the Central Plains Water Enhancement Scheme is relevant.
- 3.2 Land use in the CPWES area will probably impact on groundwater quantity and groundwater quality in the catchment of Te Waihora.
- 3.3 Groundwater catchments of Te Waihora spring-fed streams are estimated (White 2009) since my primary brief of evidence (White 2008a, 2008b). These catchments cover most of the Canterbury Plains area between the Waimakariri River and Rakaia River.
- 3.4 Land use in the CPWES area may impact on Christchurch City groundwater, and on Christchurch City spring-fed streams, White (2008 a, 2008b) because part the CPWES area is probably in the groundwater catchment of Christchurch City.
- 3.5 I completed several studies (White 2008c, White et al. 2008) relevant to identification of the groundwater catchment of Christchurch City since my primary brief of evidence (White 2008a, 2008b). These studies give evidence for the hydrogeological boundary of the Christchurch City

groundwater system proposed by White (2008a, 2008b) is south of that proposed by Tipler (2008), for example:

- geological continuity between the surface of Canterbury Plains west of Christchurch and Riccarton Gravel (an important aquifer) under Christchurch City;
- observed groundwater quality in Riccarton Gravel may reflect land use west of Christchurch;
- the hydrogeological boundary of Riccarton Gravel, as indicated by a map of groundwater levels in Riccarton Gravel.

3.6 In my opinion groundwater quality in two aquifers may be impacted by CPWES as CPWES may be within the catchment of these aquifers:

- Springston Formation gravel west of Halkett and groundwater from this area travels towards Christchurch;
- Riccarton Gravel.

3.7 Therefore water quality in Christchurch spring fed streams may be impacted by CPWES as these streams take groundwater from Springston Formation and Riccarton Gravel.

#### 4. GROUNDWATER ALLOCATION

4.1 Tipler (2009, his paragraph 19) states the average use of water by CPWES from the Rakaia River and Waimakariri River is 7.57 m<sup>3</sup>/s or 239 Million cubic metres per year. This is approximately the total water consumed by the scheme of 240 Million cubic metres per year (Tipler, 2009, his paragraph 80). Therefore, according to these measurements, most water consumed by the scheme is from the Rakaia River and Waimakariri River.

4.2 Groundwater allocation in the CPWES area is 145 Million cubic metres per year (Tipler 2009, his paragraph 11). However, the 'mechanisms' (Tipler 2009, his paragraph 11). by which groundwater will become available to CPWES 'have not been resolved' (Tipler 2009, his paragraph 11).

#### 4.3 Therefore:

- the availability of groundwater allocation to CPWES is unknown;
- groundwater between the Rakaia and Waimakariri rivers would most probably remain over allocated (White 2008a and 2008b) with CPWES.

### 5. LAND DRAINAGE

- 5.1 Land drainage with CPWES is estimated as 90 Million cubic metres per year greater than current land use (Tipler 2009, his paragraph 79).
- 5.2 In my opinion the directions of flow of land drainage from CPWES (White 2008a and 2008b) are towards Christchurch City and towards Te Waihora; most of the drainage travels towards Te Waihora.
- 5.3 This land drainage will likely cause an increase in groundwater levels in lower-lying parts of the hydrogeological system.

### 6. NITRATE CONCENTRATIONS

- 6.1 Tipler (2009, his paragraph 59ff) appears to assess nitrate concentrations against the drinking water standard of 11.3 gm/m<sup>3</sup> standard for nitrate-nitrogen and concludes (Tipler 2009, his paragraph 64) 'there is little or no risk to groundwater as a source of potable supply'.
- 6.2 In my opinion (White 2008a, 2008b) local increases in nitrate-nitrogen concentrations are likely with CPWES.
- 6.3 Nitrate-nitrogen concentrations in the area between the Rakaia and Waimakariri rivers show impacts of land use (e.g. White 2008a, Figure 5.63), particularly between State Highway One and Te Waihora. In my opinion extra nitrogen loading from the CPWES area will result in a higher risk that nitrate-nitrogen concentrations in the area will increase in the future.
- 6.4 In my opinion it is inappropriate to assess the groundwater quality effects of CPWES against the 11.3 gm/m<sup>3</sup> standard for nitrate-nitrogen because: 1) regional councils typically

become concerned about nitrate-nitrogen concentrations in groundwater used for drinking water (White 2008a, Section 8.5) when concentrations are one half, or greater than 11.3 gm/m<sup>3</sup> and 2) the groundwater system of Christchurch is of very high value (White 2008b, Section 16).

## 7. NITRATE LEACHING

- 7.1 Tipler (2009, his paragraph 79) estimates CPWES irrigation will increase nitrogen leaching in the CPWES area by approximately 760 tonnes N per year. Note Tipler (2009, his paragraph 79) states this increase is 'nitrate', but I assume this increase is 'nitrogen'.
- 7.2 In my opinion (White 2008a, Section 9.8.1) most nitrogen leached from land in the CPWES area will travel to Te Waihora and some will travel towards Christchurch City.

## 8. LAND DRAINAGE AND WATER FLOWS INTO TE WAIHORA

- 8.1 The estimated groundwater catchments of the area between Rakaia River and Waimakiriri River (White 2009) are consistent with directions of flow of drainage from CPWES as towards Te Waihora and towards Christchurch City.
- 8.2 In my opinion most of the extra estimated drainage of 90 Million cubic metres per year (approximately 2.9 m<sup>3</sup>/s, Tipler 2009, paragraph 80) from CPWES will travel to Te Waihora.
- 8.3 This water will increase the baseflow to Te Waihora. Increased baseflow to Te Waihora probably results in increased nitrate-nitrogen and increased phosphorus concentrations in spring-fed streams (White 2008a, Section 9.8).

## 9. NITRATE LEACHING AND NITRATE DISCHARGE TO TE WAIHORA

- 9.1 In my opinion most of the extra estimated increase in nitrogen leaching of 760 tonnes N per year from CPWES (Tipler 2009, paragraph 79) will travel to Te Waihora. This will increase the nitrogen loading to Te Waihora (White 2008a, Section 9.8.1).
- 9.2 Tipler (2009, paragraph 83) states 'the most likely source of water in lowland streams' is 'associated with local drainage (not from the scheme area)'. I disagree with this statement.
- 9.3 The likely source of water for lowland streams includes the land in the area between the Rakaia River and the Waimakari River and recharge from rivers (White 2008a, Section 5).
- 9.4 The groundwater catchments of lowland streams (White 2009) relevant to Te Waihora surface water inflow, include most of the land in the CPWES area accounting for: average groundwater recharge from the land in the area between the Rakaia River and the Waimakariri River, groundwater recharge from rivers, estimated groundwater use and observed stream baseflow.
- 9.5 Therefore, in my opinion, land use in the CPWES area will impact on nitrogen loading to Te Waihora.

DATED this 2<sup>nd</sup> day of October 2009

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## References.

- Tipler, C. 2007. Effects of Central Plains Water Enhancement Scheme on nitrate contamination of Christchurch water supplies. URS. 15p.
- Tipler, C. 2009. Brief of evidence of Clifford John Maxwell Tipler 7<sup>th</sup> September 2009.
- White, P.A. 2008a. Central Plains Water – Technical Assessment for Te Runanga o Ngai Tahu. Report to Te Runanga o Ngai Tahu. 238p +app.
- White, P.A. 2008b. Brief of evidence of Paul Albert White to the CPWES Commissioners.
- White, P. A. 2008c. Riccarton Formation, Burnham Formation and Windwhistle Formation lithologies in the vicinity of Christchurch City. GNS Science report 2008/157 for Environment Canterbury.
- White, P.A., Della Pasqua, F. 2008. Riccarton Formation, Burnham Formation and Windwhistle Formation lithologies west and northwest of Christchurch City. GNS Science report 2008/169 for Environment Canterbury.
- White, P.A. 2009. Groundwater in Central Plains. Talk to the Selwyn Science Symposium, 9 -1 0 March.