UNDER	the Environment Canterbury (Temporary Commissioners and Improved Water Management Act) 2010 and the Resource Management Act 1991
AND	
IN THE MATTER OF	the hearing of submissions on the Proposed Land and Water Regional Plan.
BY	**CANTERBURY PRIMARY SECTOR POLICY GROUP**
	<u>Submitters</u>
TO	**CANTERBURY REGIONAL COUNCIL**
	<u>Local authority</u>

SUPPLEMENTARY EVIDENCE OF IAN MCINDOE

Dated: 30 April 2013

INTRODUCTION

Qualfications and experience

1. My full name is Ian McIndoe. I have described by qualifications and experience in my evidence in chief dated 4 February 2013.

Background

2. Following the presentation of my evidence on 26 February 2013, I was asked by the hearing Commissioners to provide a brief statement of evidence giving my thoughts on the process for how groundwater allocation limits in Canterbury should be set. This request followed discussions and questions from the Commissioners on my evidence in chief where I had given my reasons for making the exceeding of groundwater allocation limits non-complying rather than a prohibited activity.

3. The main concern raised in my evidence was that the limits as proposed in the LWRP were not based on the best available information and that further work was needed to be in a position to set final robust limits. My evidence gave several examples of where, based on additional information, consents have already been granted in excess of the proposed LWRP allocation limits.

4. I pointed out that the current limits were essentially based on several rules of thumb and did not properly account for the effects of taking groundwater on the environment.

5. In addition, I also raised the issue of the current fixed allocation method. My view is that it is an inefficient and ineffective approach, primarily because the fixed allocation methodology fails to recognise the dynamic nature of the groundwater resource. This means that in some years/locations, values will not be protected and depending on how conservatively the allocation has been set, in some years and locations the water available will not be used.

SCOPE OF EVIDENCE

6. In responding to this request for further information, I have provided a process for how I think allocation limits could be set at a regional level within a dynamic allocation framework.

7. This process is focussed on water quantity limits. Although I have not expressly included water quality limits in the process, water quality targets are included in the process.

8. Although I have discussed this supplementary evidence with Aqualinc colleagues and members of the Canterbury Primary Sector Policy Group, the views I have expressed are my own.

OUTLINE OF PROCESS

9. The basic approach I have taken is to start at the values the community need, determine how much groundwater is required to meet those values and work out how best to use the water to achieve those values.

10. My view is that the following general process should be implemented.

    A. Describe specifically what is being provided for (i.e. what groundwater is being used for or needs to be used for).

    B. Set targets for those uses/ needs.

    C. Develop an understanding of the groundwater balance.

    D. Calculate how much water can be abstracted while meeting the agreed targets.

    E. Determine the impact of currently allocated takes (based on use, not paper allocation) on the groundwater system.

    F. Determine the difference between volumes currently used and volumes able to be abstracted (Step D.), while meeting the agreed targets (Step B.).

    G. Determine an allocation regime to best allocate the available water.

    H. Determine actual allocation criteria/ values.

    I. Develop a priority system for allocation.

11. Although I have outlined a stepwise, linear process, in reality, some aspects will have to be revisited as the process is completed. For example, realistic targets may not be able to be confirmed for some things until initial work further down the process has been completed.

DESCRIPTION OF THE PROCESS

Step A: Determine what is being provided for.

12. This is about describing specifically what must be provided for (i.e. how groundwater needs to be used), e.g.:
    - Maintaining flows and water quality in spring-fed streams.
    - Maintaining flows and water quality in rivers.
    - Maintaining flows and water quality to wetlands.
    - Providing water for domestic purposes, stockwater, public water supplies.

- Providing water for irrigation, industry, etc.
- Providing water for recreation, social and cultural needs.

13. These will vary significantly from one location to the next.

Step B: The targets.

14. This requires setting targets for uses. It will require community input – what values does the community want, e.g.:
    - Flow regimes for spring-fed streams.
    - Flow regimes for rivers.
    - Given volumes of water for municipal, stock, domestic.
    - Target reliabilities for municipal, stock, domestic.
    - Target reliabilities for industry and irrigation.

15. Flow regimes should be set so that the needs are provided for, e.g. environmental, social, recreational, and cultural. Minimum flow targets or minimum groundwater level targets on their own will not work in this context because of the dynamic nature of the hydrological systems. Unless minimum flows are set below naturally occurring flows, flows will naturally fall below those targets. For that not to happen, additional water would have to be introduced into the system.

16. Because of the variability in the natural system, I expect that targets will vary over time. There should be no presumption that they will be single fixed values.

17. Following that, reliability for abstractive use needs to be set in a way that also accounts for the variability. Both timing and variability are important.

18. There needs to be certainty around limits to be able to make compliance, allocation and investment decisions. If changes to targets or water availability are proposed, it is important that they will not derogate the rights that current consent holders have, that is, they should not make things worse for abstractors.

Step C: The groundwater balance.

19. Using groundwater modelling, develop an understanding of the groundwater balance and the relationships between flows into and flows out of the groundwater system, e.g.:
    - Rainfall recharge.
    - River recharge.
    - Stock water and irrigation race recharge.
    - Irrigation use recharge, including conversion from border-dyke to spray irrigation.
    - Outflows to rivers.
    - Outflows to streams.
    - Outflows to lakes.

- Outflows to the ocean.
- Priority abstraction – domestic, stock, municipal.
- Existing abstraction – industrial, irrigation.

20. Transient groundwater models have been developed and used for most of Canterbury. There is already a very good understanding of the general nature of how the groundwater system works and how to respond to changes. Further detail such as better knowledge of actual use for irrigation is becoming available and can be used to refine the models now and in the future.

Step D: Allowable abstraction.

21. The next step is to use groundwater modelling to calculate how much water can be abstracted while meeting the agreed targets, e.g.:
    - Volume of abstraction.
    - Locations of takes.
    - Timing of takes.
    - Future changes in recharge (both climatic and water use changes).

22. Although some aspects of this have already been done, the analysis has not been specifically aimed at meeting agreed targets such as flow regimes in streams or reliability of supply to groundwater abstractors. Analysis to date has been aimed more at seeing whether certain targets can be achieved.

23. Finding our whether targets can be realistically achieved is an important part of the process. There is no point in setting targets that cannot be achieved. I expect that some iteration will be required to determine robust targets and allowable abstractions.

Step E: Impact of current use on the groundwater system.

24. Transient groundwater modelling needs to be used to determine the impact of currently allocated takes (based on reasonable and efficient use, not paper allocation) on the groundwater system, e.g.:
    - Flow regimes for spring-fed streams.
    - Flow regimes for rivers or other water bodies
    - Volumes and reliabilities of water for municipal, stock, domestic.
    - Volumes and reliabilities of water for industry and irrigation.

25. The analysis needs to take into account diversity of use – the fact that actual use is always less than paper allocation when large numbers of abstractors, e.g. more than 100, are involved. A lot of this work has been done. However, it needs to be updated with current abstraction records.

26. In taking this approach, there is no intent to derogate from the rights of existing consents. The reality is that consent allocations are based on meeting demand in high demand years (1 in 10 year or 2 in 10 year demand typically).

27. Applying the full paper allocation to assessments in other (lower demand) years, i.e. assuming consent holders take water beyond what is required to meet demand, is not efficient, and would probably contravene consent conditions in any case. In those years, use should be less than the paper allocation. Efficient use, not paper allocation, is what must be included in assessing the impact of current use on groundwater.

Step F: Determine the amount of water able to be used.

28. This is about determining the difference between volumes currently used (based on efficient use, limited by paper allocation) and volumes able to be used while meeting the agreed targets and considering;
    - Volume of abstraction.
    - Locations of takes.
    - Timing of takes.

29. The outcome here is to produce a spatial time-series of water available for abstraction, rather than working to a single fixed volume, as the basis for setting allocation limits. The time-series would take into account different availability in different locations and variations in availability over time.

30. History tells us that groundwater may have been overused in some locations in some years. In low recharge years, targets such as minimum flows in streams cannot always be met, regardless of abstractive limits. This would have been the case in 2005/06 in the Rakaia-Selwyn lowland streams area due to zero rainfall recharge in the 2005 winter coinciding with low groundwater levels. In other years, more groundwater may have been able to be used without having any adverse environmental effects. For that reason, allocation limits need to accommodate the temporal variability in both supply and demand and the variability in target values.

Step G: Determine the most appropriate allocation method.

31. Determine an allocation regime to best allocate the available water (including through time). Options depend on the results of Step F and could be;
    - Retain a fixed allocation method and reduce some of the existing allocation in specific areas that are found to be over-allocated.
    - Revise the way existing water is allocated – introduce a fixed and variable, or dynamic allocation.
    - Maintain the existing allocation as is, and provide additional fixed allocation.
    - Maintain existing allocation as is, and provide additional dynamic allocation.
    - Dynamically allocate all water, existing and new.

32. The difference determined in Step F has three possible outcomes. The first is that current use, constrained by reasonable use limits in high demand years, exceeds current availability at all times. The second is that current use, again constrained by reasonable use limits in high demand years, is less than availability some of the time and greater at other times. The third is that current use is always less than availability. The outcome of Step F will help to determine which of the above allocation regimes is most appropriate.

Step H: Determine the allocation criteria.

33. This step is about determining the criteria/ values to be specifically used to set allocation limits to best allocate the available water. This could include:
    - A fixed allocation, such as 50% for example, converted to volumes.
    - Criteria for the dynamic component related to the state of the environment, such as groundwater levels on a specific date, or % of recharge in the preceding winter.

34. Depending on the allocation regime chosen, limits have to be set within the overall bounds of available water. A single number could be used, i.e. 100% fixed allocation to all users, but will result in less users overall and a lot of allocated but unused water, potentially stifling future development.

35. I note that the current allocation limits are based on a 100% fixed allocation. If a fixed allocation method is retained, the allocation limits determined by following the process I have outlined will not be the same as what is currently proposed in the LWRP because the methods used to determine allocation limits are completely different.

36. It is my view that the allocation volumes need to change according to the state of the environment and according to agreed environmental, social and cultural targets. The overall allocation limits remain unchanged, but the water available for use in any particular year should be varied if necessary.

Step I: Develop a priority system for allocation.

37. This could be;
    - All existing users get full entitlement (A permits). New user allocation is set at a volume that provides a defined level of reliability (B permits). C permits could also be granted that provide a lower level of reliability, or,
    - All users, existing and new, get the same reliability. The total volume able to be abstracted will be determined by that level of reliability, or,
    - Existing users get a lower level of entitlement with an agreed high level of reliability and new users get a lower level of reliability.

38. The water availability determined in Step D won’t all be able to be used in all years if water is used at the same time that abstraction from groundwater occurs. There will always be times when water, although available, will be uneconomic to use (as it is not reliable enough to justify investment in infrastructure), or it is simply not needed.

39. It is important that the allocation rules are certain for consent holders. Statistical information about the reliability of water availability under a dynamic regime can be made available on that basis.

40. If groundwater is able to combined with water from other sources, (which could happen for surface water with a lower than acceptable reliability), it would be able to be used when surface water was unavailable. That situation needs to be accommodated in the allocation regime.

41. If all users, existing and new, in a particular locality are given the same reliability through a mix of fixed and dynamic allocation or 100% dynamic allocation, the total area that can be irrigated will be determined by the reliability target. The further the water is spread, the lower the reliability.

Ian McIndoe
30 April 2013