SUBMISSION ON PUBLICLY NOTIFIED PLAN

ENVIRONMENT CANTERBURY
PROPOSED NATURAL RESOURCES REGIONAL PLAN

VARIATION 6 HEARING
EVIDENCE OF NEW ZEALAND PORK
SUBMISSION V6 28
FURTHER SUBMISSION V6 115

MARCH 2010

INTRODUCTION

1. New Zealand Pork (NZPork) has read the Officer Report on submissions on Variation 6 in respect of the Christchurch Groundwater Protection Zone (CGWPZ)

2. We support the following recommendation:
   - WQL v6.15 "*Activities that currently exist, and can reasonably expect to continue, are able to continue provided the potential for contamination of groundwater is mitigated by the implementation of all practicable management measures*"

3. We disagree with recommendation WQL V6.1 in respect of:
   - Rule WQL 24, condition 7, the effect of which is to make new applications of solids/bedding to land a discretionary activity in the CGWPZ
   - Rule WQL 26, condition 8, the effect of which is to make the applications of effluent to land a discretionary activity in the CGWPZ
   - Rule WQL 29, condition 2, the effect of which is to make the storage of effluent, solids and bedding a discretionary activity in the CGWPZ

4. We further disagree with recommendation WQL V6.1 in respect of:
   - Rule WQL 26, condition 7, the effect of which is to provide for a nitrogen loading rate of 200kg/ha/pa for cattle effluent and 150kg/ha/pa for pig effluent. This distinction is based on erroneous data. We attach to this statement relevant extracts from evidence presented at the Hearing on Proposed Variation 1 in September 2008.

REASONS

5. New Zealand Pork supports the concern to protect water quality in the Christchurch Groundwater Protection Zone.

6. We endorse the statement that "*different activities are associated with different levels of risk, ranging from no risk to high risk. This assessment of risk informs the level of intervention required*" (explanation to Policy WQL 13)

7. We note that "*the greatest threat to the current Christchurch water supply comes from land use development, especially commercial and industrial development on the western fringe of Christchurch*" (statement of Carl Hanson).

8. We endorse the statement in respect of the application of fertilisers and pesticides in both urban and rural environments that "*over-application and improper application, in conjunction with irrigation or significant rainfall events, will result in contaminants being readily flushed into the groundwater system"* (explanation to WQL 14).

9. We endorse the purpose of Rule WQL26 (Vol B, pg 123) as being to ensure that animal effluent is applied to land at a rate and in a way which will ensure the application does not exceed the capacity of the soil and plant ecosystems to efficiently assimilate the nutrients in the effluent. We agree that, in this way, the application "*will result in beneficial effects for soil fertility, and crop or pasture growth, while avoiding significant adverse effects on groundwater or surface water quality"*. We note that Rule WQL 26 sets conditions which "*control the method of application, the depth of application, and the rate of application of nitrogen to land"* ; and that similar conditions are set in respect of Rule WQL 24 and for the same reasons, ie, that "*the application will, if managed effectively, provide nutrients and organic matter to pasture, at a rate that will be assimilated by the plants and soil, and not result in contaminants from these sources entering ground water or surface water".*

10. It has previously been our submission that the application of manure to pasture/cropping systems is at the low end of risks to water quality. It is further our submission that the conditions attaching to the storage and spreading of effluent, solids and bedding are sufficient to meet the requirement that *"the potential for contamination of groundwater is mitigated by the implementation of all practicable management measures*".

RECOMMENDATIONS

11. New Zealand Pork recommends that:
    - Rule WQL 24: delete condition 7
    - Rule WQL 26: delete condition 8
    - Rule WQL 26: amend condition 7 nitrogen rate to 200kg/ha/pa
    - Rule WQL 29: delete condition 2 (f)

E McGruddy
Environment Officer
For New Zealand Pork

Attachment

Chapter 4, Water Quality: Proposed Variation 1: Officers Report No. 23

Submission of: NEW ZEALAND PORK, September 2008

Extracts Relevant to Variation 6, consideration of Rule WQL 26, Condition 7

Environmental Commitment

The industry commitment to "100% NZ Pork" encompasses a strong commitment to the sustainability of farming practices. New Zealand Pork has been pro-active in environmental initiatives over the last 30 years, working alongside central government and local authorities to research the environmental impact of industry practices, to develop best management tools, and to support producer uptake. Currently, with the support of the Sustainable Farming Fund, the Board is progressing three environmental projects under its Enviropork umbrella:

- Incorporating pig manure as a modelled fertiliser input in the OVERSEER nutrient budget programme;
- Documenting exceptional stewardship practices within the industry (manure management systems, tree planting programmes etc); and
- Assessing the feasibility of biogas technology for uptake within the industry.

Of particular interest here today is a body of research commissioned by the NZ Pork Industry Board in the early 1990s, assessing leaching from pig slurry applied to Canterbury soils. This research is pertinent to consideration of Rule WQL 26, and is the focus of the following section.

RULE WQL 26: Condition 7

Condition 7 proposes that the nitrogen application rate be set at 150kg/ha/pa for pig effluent, as distinct from a limit of 200kg/ha/pa proposed for dairy effluent. This distinction is made on the basis that "modelling indicates that application of 150kgN/ha/pa of pig effluent produces the same concentration of leached nitrogen as 200kgN/ha/pa of dairy effluent"; and references a report from Lincoln Environmental to Environment Canterbury in 2001.

The Lincoln Environmental report "Methods for the management of nitrogen loading rates from animal effluent onto land" presents results from research comparing N leaching from a range of sources (pig, dairy, urea, urine) on a single soil type (Templeton silt loam).

The pig slurry values presented are as follows:

Application rate (kgN/ha/pa)	Leached N (kgN/ha/pa)
200	30
400	105

The report then proposes:

- "single annual applications of pig slurry resulted in 4-5 times the leached nitrate of comparable annual totals (of split applications) of farm dairy effluent"
- "therefore pig slurry has a greater potential for leaching than farm dairy effluent"
- "at equivalent N application rates onto pasture, farm dairy effluent has significantly less effect than pig slurry or inorganic nitrogen fertilisers on leaching of nitrate".

New Zealand Pork respectfully advises that the data set on which these conclusions are based, is incomplete. This data in fact derives from a body of research commissioned by the NZ Pork Industry Board, and undertaken by Lincoln in the early 1990s. The work was undertaken over 2 years, with the following results:

	Application rate (kgN/ha/pa)	Leached N (kgN/ha/pa)
Year one	200	29.5
Year two	200	0.4
Year one	400	105
Year two	400	11.4

Clearly, the table needs to be re-formulated to include the complete data set, but before doing this we return to the line in the report which states:

- "single annual applications of pig slurry resulted in 4-5 times the leached nitrate of comparable annual totals (of split applications) of farm dairy effluent"

We respectfully suggest that single applications are not "comparable" to split applications. The Lincoln report in fact goes on to state:

- "The amount of N leached per year is reduced when the effluent is applied in a series of split applications rather than in a single application"
- "Split applications of effluent reduce the risk of nitrate leaching and are thus preferable to single applications. Split applications also reduce the risk of surface ponding and run-off".

Acknowledging that many factors influence N leaching rates (soil type, crop type, etc), the Lincoln report notes the influence of seasonal rainfall:

- "In Canterbury, most leaching generally occurs in the winter and early spring months when the soil has reached field capacity, and rainfall exceeds evapo-transpirative loss".

In this context, it is of considerable interest to note that the NZ Pork Industry Board specifically commissioned the Lincoln research to test "worst-case" leaching scenarios, ie, single autumn applications, prior to the winter leaching period.

The results of the research with pig slurry onto Templeton soils were published in 1997 (*Carey et al*), concluding:

- "The application of pig slurry to lysimeters over the 2-year period resulted in substantial responses in pasture growth"

- "Leaching losses from the 200 kgN/ha/pa treatment were generally low over the two years, and certainly lower than those reported under bare fallow lysimeters (137kgN/ha/pa), clover lysimeters (30kgN/ha/pa), and cereal lysimeters, with or without fertiliser N addition (96kg, 70kg, 20-65kg)".

If we now re-look at comparative values for pig slurry and dairy effluent on Templeton soils:

Templeton	**Application KgN/ha/pa**	**Split**	**Timing**	**Leaching KgN/ha/pa**
Pig slurry	200	x1	April 1992	29.5
Pig slurry	200	x1	April 1993	0.4
Dairy effluent	400 (spray)	2 x 200	Dec 1995 May 1996	25
Dairy effluent	400 (flood)	2 x 200	Dec 1995 May 1996	13
Dairy effluent	200	4 x 50	May, Aug, Nov '96, Feb '97	6.3

Clearly these values are not all comparing “apples with apples”. Equally clearly, it is difficult to draw a conclusion about the different leaching potentials of pig slurry vis-à-vis dairy effluent.

To explore the question further, it is useful to look at a further body of work commissioned by the NZ Pork Industry Board, again testing “worst-case” leaching scenarios, this time on Lismore soils in Canterbury. At the time the Lincoln Environmental report was prepared (2001), research on pig slurry had been completed, and work on dairy effluent was underway, but not published at that time. The Lincoln report to Ecan noted that “the amount of N leached is likely to vary between soil types, with the greatest leaching loss likely to occur on shallow free-draining stony soils (eg, Lismores and Eyres)”. That work is now all to hand, and results are summarised below:

Lismore	**Application KgN/ha/pa**	**Split**	**Timing**	**Leaching KgN/ha/pa** **Yr 1** **Yr 2**
Urine ***Di, 2002***	1000	x1	Averaged calculation	129.6 112.2
Control ***Di, 2002***	Pasture			36 4.8
Urea ***Di, 2002***	200	4 x 50	April/May, Aug, Nov, Feb 98/99	30.7 17.1
Dairy effluent ***Di, 2002***	200	4 x 50	April/May, Aug, Nov, Feb 98/99	55 7.6
Pig slurry ***Cameron, 1995***	200	x1	March 91, March 92	10.5 12
Pig slurry ***Cameron 2005***	200	x1	April 1994	0.6

Again, it’s not all “apples with apples”, but it would be difficult – on the strength of this data – to conclude that pig slurry leaches at a greater rate than dairy effluent (in fact, to the contrary). In reviewing the results of the work published in 2002, Di et al concluded:

- “the high leaching losses in the urine treatments clearly illustrate that on these shallow, stony, dairy pasture soils, the greatest threat to groundwater quality comes from those “hot’ urine spots”
- “the total annual leaching losses from the dairy effluent and urea treatments are much lower in comparison, and therefore these N sources do not pose a great direct threat to water quality”.

In reviewing the pig slurry results, researchers commented:

- “The cumulative N leaching loss of 10.5kgN/ha/pa in year one is low…the second application of 200kgN in the autumn of year two had no significant effect on the concentration of N in the drainage water…these results were unexpected, particularly

as the winter of 1992 was wetter than average, with almost twice as much drainage occurring compared with year one" (*Cameron et al, 1995*)

- "At the 200kg rate, a large amount (37%) of slurry N was recovered by the pasture plants, despite the application having occurred late in the growing season…the N leaching losses from pig slurry applied in autumn are less than expected from much of the international literature. These low leaching losses are due to the efficient uptake and use of slurry N by the pasture plants" (*Cameron and Rate, 1992)*
- "The application of pig slurry at 200kgN/ha/pa was found to have minimal impact on the quality of drainage water from an infertile, stony, shallow pasture soil under a cut-and-carry regime" (*Carey et al, 1997*).

Following this last point through, the work reported above was undertaken under a cut-and-carry regime, begging the question as to what levels of leaching might be expected when pig slurry is applied to grazed pasture (ie, in addition to N leaching from urine patches). The NZ Pork Industry Board accordingly commissioned a further body of work, addressing exactly this question. The results (*Cameron & Carey, 1995*) are presented below:

	Pig slurry KgN/ha/pa	**Plus urine**	**Split**	**Timing**	**Leaching KgN/ha/pa**
Lismore	200		x1	April 1994	0.6
Templeton	200		x1	April 1994	7.0
Lismore	200 *(April 1994)*	+ 500 *(July 1994)*	x1		27.6
Templeton	200 *(April 1994)*	+ 500 *(July 1994)*	x1		30.4
Templeton ***Fraser, 1994***		500	x1	July 1990	41

In reviewing these results, the researchers concluded:

- "The results show that, on both soils, the leaching losses from the 200kg autumn application were low"
- "The application of slurry appeared to have little influence on the N leaching loss from the urine treatment"
- "Leaching losses from the urine treatment in July were similar to those recorded in previous experiments where no slurry had been applied".

Before concluding this section, it is pertinent to note, as briefly indicated above, that NZPork has recently been undertaking an exercise to incorporate pig slurry as a fertiliser input in the OVERSEER nutrient budget programme. As part of that project, the data referred to above was compiled and made available to the AgResearch team responsible for the OVERSEER programme. On the strength of the data currently to hand (including that above), the OVERSEER programme assumes N leaching rates for pig slurry at the same level as dairy effluent.

In summary then:

- the proposal to set application rates for pig slurry at 150kgN/ha/pa and dairy effluent at 200kgN/ha/pa was based on incomplete data, and cannot be justified on the data which is to hand
- comparative research on leaching on Canterbury soils indicates highest N leaching under urine patches…significantly lower leaching rates under the application of dairy effluent and urea…and perhaps the lowest leaching rates under application of pig slurry
- the relatively low leaching rates under pig slurry were recorded under **worst-case** leaching scenarios

- **New Zealand Pork recommends that the N application rate for pig slurry to grazed pasture be set at 200kgN/ha/pa**