

19 March 2009

**Memorandum to  
Chairperson and Members  
Policy and Planning Committee**

## **Update on Waiokura catchment best practice dairying study**

### **Purpose**

1. The purpose of this memorandum is to update Members on the latest findings of an on-going study taking place in the Waiokura Stream catchment in southern Taranaki, and to discuss some of the implications of this work. A presentation will be made at the meeting on the findings and how riparian management is improving water quality.

### **Key points for Members' information in the item are:**

- The work reported here comes out of the Council's investment in focused and relevant research to assist and enable better resource management.
- The Waiokura catchment was chosen by Council staff, upon request to nominate a catchment for a national 'best practices in dairying catchments' study, as a 'worst-case' stream- arising within the ring plain and with high-intensity dairying and a high density of waterways running through it. It is not typical of ring plain streams.
- The catchment has been closely studied for 8 years. The fencing of stream banks was identified as a key measure that would promote stream health.
- Results to date have been reported recently, and are presented here to Members.
- There has been an increase in the length of stream bank protected by riparian works. There has also been a reduction in phosphate fertiliser application and conversion of shed pond discharges from the stream to land. Yields of dissolved and total phosphate and of suspended solids to the stream have reduced 25-40%, as have concentrations of bacteriological indicators.
- Productivity within the catchment has increased by almost 25% during the same period.
- Nitrogen fertiliser usage, supplementary feeding, and nitrogen losses into the stream have increased during the same period.
- The MCI values in the stream indicate a good to excellent ecological community, notwithstanding that nutrients guideline values are exceeded.
- There is an increased level of farm dairy discharge consent compliance within the

catchment, from more than 1 UIR per year (97% compliance) to 1 incident since 2004 (99.5% compliance).

## Background

2. The question of the environmental consequences of dairying as a land use, and ways of reducing those consequences, has come to the fore nationally in recent years. Concern about the perception of increasing degradation of soil and water quality and about the long-term sustainability of dairy farming led the dairy industry to set up a study in which four dairying catchments were chosen for long-term monitoring, with the goal of identifying which best management practices could lead to improved environmental outcomes. A fifth catchment was added to the study later.
3. The catchments selected for the study are the Waiokura (south Taranaki coastal ring plain) and Toenepi (Waikato), both traditional dairying catchments, and Pigeon Creek (West Coast), Waikakahi Stream (Canterbury), and Bog Burn (Southland), all more recent conversions to dairying in the South Island. The study involves a number of parties- AgResearch, NIWA, regional councils, DairyNZ, and of course the local farming communities.
4. Issue 6.2 of the *Regional Freshwater Plan for Taranaki* addresses adverse effects on surface water quality from the discharge of contaminants from point sources, while Issue 6.3 addresses adverse effects from diffuse sources. Under these issues, the Council has adopted methods of implementation that mean the Council will :
  - Apply... the best practicable option for preventing or minimising any actual or potential adverse effect;
  - Consider the use of riparian planting as a means to mitigate the effects of point –source discharges, where appropriate;
  - Support the preparation and implementation of codes of practice and guidelines..;
  - Promote, through the Taranaki Regional Council’s sustainable land management programme, sustainable land use practices that will avoid, remedy or mitigate the adverse effects of diffuse source discharges; and
  - Promote or undertake research into methods of water quality management
5. The Waiokura catchment study is an integral part of the Council’s research portfolio. The Council’s *Annual Plan* for 2008/2009 identifies that as part of its commitment to resource investigations and projects that provide relevant and quality information for resource management purposes, the Council intends to support the dairying catchment water quality study being conducted by AgResearch and NIWA in the Waiokura Stream catchment.
6. By comparison with the other catchments in the study, the Waiokura has the heaviest stocking intensity, similar rainfall, the highest proportion of the catchment area in dairying, and a high stream density (32 metres of stream per hectare of the catchment).
7. The Waiokura Stream has poorer water clarity than the other four dairy catchment streams, due largely to sediment inputs from bank erosion. This would also contribute

to elevated suspended solids and higher total and dissolved phosphorus (although the ratio of dissolved to total phosphorus in the Waiokura catchment was lower than for the other four catchments, indicating a higher proportion bound in sediment and less dissolution of phosphate fertiliser as a source).

8. The fencing of stream banks, to prevent stock access to water and trampling of the banks, was identified as a key 'best practice' in the catchment for improving water quality. This has been pursued by Land Management Officers of this Council.
9. It is important to note that the reason Council staff selected the Waiokura catchment when approached to nominate a suitable catchment for the 'best practice' study, was because it was an impacted stream with a number of factors militating against it. The Waiokura is a lowland stream, fed by groundwater originating from beneath dairy pasture, rather than by springs fed from Mt Taranaki. The stream has been highly modified, and flows through some of the most intensively farmed pasture in the region. Dairying is a traditional land use practice in the area. Essentially, the view was that if the application of 'best practice' could make a difference in this catchment, then it could make a difference anywhere in the region.
10. The Waiokura Stream is not and was never intended to be used as a stream typical of Taranaki ringplain streams. However, staff note that in some cases the catchment has been referenced as though this is the case (against all advice from this Council).
11. Similarly, staff have challenged any reference of the bacteriological quality of the stream to swimming standards. Given the relatively small size of the stream, it is considered by staff that the application of swimming standards to it is inappropriate.

## **Discussion**

12. NIWA have completed a review of trends within the catchment over the period from the start of the study (2001) to 2008. This material was presented to the Freshwater Sciences Society Conference held in November 2008 in New Plymouth.
13. The data referenced in the NIWA paper included information upon the preparation and implementation of farm plans, provided by Council staff.
14. The study notes that poor water quality in the Waiokura catchment is due to diffuse and point source inputs from dairy farming as a land use.
15. Analysis of trends in the catchment has now identified that significant improvements have occurred since 2001.
16. Yields (release of contaminants per land area) of dissolved reactive and total phosphorus (derived from fertiliser runoff, treatment pond effluent, and sediment loss) and of suspended solids (bank erosion, stormwater run-off, and pond effluent) have declined (improved) by 25 to 40% over this period.
17. The study puts this improvement down to a number of factors. There has been an increase in the length of stream bank protected by riparian works (increased from 40% to 52% during this period), especially in the reaches of the stream where surveys had previously identified there were significant inputs from diffuse sources. The number of dairy treatment pond systems discharging to the stream has been reduced, with conversions to land irrigation. There has also been a 25% reduction in the average rate of phosphate fertiliser application.

18. The average concentrations of bacteriological indicators (*E. coli.*) have been falling, by about 8% per year (fewer pond discharges, improved riparian management intercepting runoff).
19. The improvement in in-stream water quality is put down to the adoption of best management practices, fewer pond discharges, exclusion of stock from stream banks, and riparian planting to mitigate pasture run-off.
20. These improvements came during the same period that productivity in the catchment increased by almost 25% (to 1262 kg ha<sup>-1</sup>). That is, the improvement in environmental performance was not at the expense of economic performance.
21. The survey does also note an increase in nitrogen fertiliser use in the catchment (30% increase between 2001 and 2006), and a massive increase in the use of supplementary feed (130%). Probably as a direct result of these increased inputs, nitrogen losses from the catchment increased, as did peak nitrogen concentrations in the water column.
22. While ANZECC guidelines for nutrients intended to protect in-stream ecology are exceeded in the Waiokura, it is noteworthy that biomonitoring surveys find the stream to have average to above average community composition and abundance. The MCI values in the stream have not shown a significant change, despite either the reduction in phosphate or the increase in nitrogen. This may be due to the short monitoring period (the Council requires a minimum of ten years before undertaking trend analysis), the pre-existing benefits of the riparian planting already undertaken in the catchment prior to the commencement of the study (i.e. the benefits of riparian shading were already being realised), or because excessive water temperatures that constrain ecological health are not experienced within the catchment. There is also an absence of streams sourced from native forest flowing through the catchment to re-colonise the restored stream.
23. As an additional indicator of environmental performance, Members may also note that the Council's own records show improved consent compliance and fewer unauthorised incidents in the catchment in more recent years. While during the period 1999-2004 incidents involving unauthorised discharges that entered the stream averaged more than one per year (there are 44 farms in the catchment), equivalent to a compliance rate of 97.3%, since 2004 to date there has been only one additional incident, which is a drop of over 75% in the rate of non-compliance and is equivalent to an annual compliance rate of about 99.5%.
24. Members will recall that in the middle of last year Fish and Game New Zealand released a report that was critical of the performance of farmers and of regional councils in respect of the 'Clean Streams Accord' (Deans and Hackwell). That report included derogatory comments about the performance in catchments in the 'Best practice' study. Council staff have responded to the report via correspondence. An excerpt from the letter is as follows (quotation from the report, followed by Council officer comment):-
25. *Even in the five closely monitored "best practice" catchments that have been managed above Accord standards, water quality has not improved or has declined prior to and during the period of the Accord* (pg 4, Executive summary, Deans and Hackwell)

**Comment:** The annual report of NIWA ('Year in review, 2007-2008') reports that the Waiokura Stream shows significant improvements since monitoring began in 2001. *'Phosphorus has declined by 25-40% and sediment levels have dropped, partly as a result of*

*increased riparian protection. A reduction in the discharge of dairy shed effluent into ponds and conversion to land irrigation has led to a 25% decline in the applications of phosphorus fertiliser in the catchments area, while concentrations of the faecal bacterium E coli have also reduced significantly.* I also refer you to the paper presented by NIWA's Principal Scientist and Group Manager for Aquatic Chemistry at the recent Freshwater Sciences Society Conference, entitled 'Restoration of a Taranaki dairy catchment stream'. I understand that you also presented a paper at the same conference. Dr Wilcox's paper presented a fuller discussion of the progress within the catchment. Phosphorus in both dissolved and reactive forms has reduced, riparian plantings have increased from 40 to 52% of the stream length, and stock exclusion from stream banks has increased. While nitrate yields and concentrations have increased, MCI values show no trend.

Thus, both water quality and farm practice have improved (not declined) in this 'best practice' catchment.

26. The analysis of sources of contaminant release within the Waiokura catchment proved that stream bank erosion rather than nutrient migration from fertiliser or animal wastes on pasture or from dairy treatment pond discharges was the single greatest factor for water quality intervention (although the other factors are still significant). Riparian fencing, and seeking to divert runoff from the catchment's 107 bridges and culverts away from the stream, are considered the appropriate 'best management practices' for the catchment.
27. A submission on the Proposed National Policy Statement for Freshwater Management was considered at the last meeting of this Committee. This Proposed Policy Statement, amongst a large number of matters, promotes integrated management of the effects of land use and the discharge of contaminants on the quality of fresh water resources, and notes this is to be achieved, as a minimum, by the use of industry good practice. Hence the work in the Waiokura catchment shows what can be achieved by the dairy industry and others in improving environmental quality and demonstrates what may constitute industry good practice which may be applied, depending upon the outcome of the submission process, through the Proposed Policy Statement.

## **Recommendations**

THAT the Taranaki Regional Council:

1. receives this report updating Members on the latest findings of the 'dairying best management practices catchments' study, which includes the Waiokura Stream catchment of Taranaki;
2. notes that the findings identify significant improvements in water quality parameters (dissolved phosphorus, total phosphorus, faecal coliforms, and suspended solids), alongside increased nitrogen use and loss in the Waiokura catchment since the study began;
3. notes that farming practices such as increased riparian fencing and planting, diversion of treatment pond discharges from the stream to land, and reduced use of phosphatic fertilisers, have been identified as drivers of improved environmental performance in the catchment;

4. notes that productivity has increased in the catchment during the period of the study;  
and
5. notes the continuation of the study, including involvement of officers in both the preparation and implementation of riparian plans and in the monitoring of the catchment, as part of the Council's research portfolio to deliver relevant and quality information for resource management purposes.

GK Bedford  
**Director-Environment Quality**

Approved:

B G Chamberlain  
**Chief Executive**