Reductions in contaminant yields required to achieve a 10% step towards Scenario 1

Technical Leaders Group 21st April 2016

Purpose

To assist CSG in its deliberations on the policy mix, by providing information on the contaminant load reductions required by FMU to achieve the proposed 10% step towards Scenario 1.

Background

A key work-stream of the CSG and its sub-groups has been deciding which mitigations to include as part of the policy mix in the HRWO Plan. As part of its technical information needs, at its workshop on 4-5 April the CSG tasked the TLG with providing estimates of the contaminant yield reductions required from farmed land, by FMU, to achieve the required '10% step' towards reducing contaminant concentrations from current state to Scenario 1.

TLG also understand that the current policy mix being considered by CSG would potentially see much of the action for reducing N loadings over the next 10 years falling to the dairy sector. Although not specifically requested by the CSG, TLG thought it may be helpful to the CSG to express the N yield reductions per FMU in terms of a per hectare reduction from dairy land.

Approach

We extracted and summarised the modelled data that sits behind the contaminant rankings and maps presented as part of the paper "Priority sub-catchments for staged development of property plans" at the 4-5 April CSG. As a reminder, this modelling utilised the water routing, water quality and land use information components of the HRWO model and:

- Removed the influence of point sources and geothermal inputs
- Included the N 'load to come' within the 'current state' as this is a better reflection of the water quality effects of current land management practices
- Used the routing algorithms to ensure the downstream benefits of upstream reductions are properly accounted for.

Findings

The requested information is presented in Table 1 below. Some key observations:

- For all contaminants, within an FMU there is wide spatial variation in the estimated reduction required (as expected from the contaminant maps presented at the 4-5 April workshop).
- Between FMU's there are differences in the estimated area-weighted average yield reductions required:
    - For P, the Central FMU shows the highest average yield reduction required (with small variation around that average), followed by the Upper FMU (with wide variation), with the Lower and Waipa FMUs being lowest and similar;
    - For N, the largest average yield reduction required is in the Upper FMU, with the other four FMUs being similar – this also applies to the dairy land per ha reduction
    - For sediment, the largest average yield reduction required is in the Lower and Waipa FMUs with Upper and Central FMUs being low;
    - For *E.coli*, the Waipa FMU average yield reduction is approximately double that required for the Central and Lower FMUs and 10x that required for the Upper FMU.
- Between FMU's there are differences in the estimated total load reductions required. These total load reductions are calculated as the product of the area weighted average yield and the area of farmed land in each FMU. Because the farmed areas are similar for the Upper,

Lower and Waipa FMUs, the pattern between them of the total reductions required mirror closely the patterns for the area weighted averages, whereas the relative importance of the smaller Central FMU to total reductions required is less.

Table 1: Reductions in contaminant yield required from farmed land to close the gap in concentrations from current state to Scenario 1 by 10%

		Upper Waikato FMU	Central Waikato FMU	Lower Waikato FMU	Waipa FMU
Farmed area in each FMU (ha)		**221,600**	**39,350**	**202,400**	**221,100**
Reduction in P yield required (kg/ha/yr) by sub-catchment	**min**	0.00	0.064	0.00	0.00
	max	0.185	0.088	0.089	0.081
FMU area weighted average (kg/ha/yr)	**Average**	0.065	0.080	0.057	0.056
FMU total reduction required (tonnes/yr)		14.5	3.2	11.6	12.4
Reduction in N yield required (kg/ha/yr) by sub-catchment	**min**	0.00	0.00	0.00	0.00
	max	3.30	2.55	2.99	2.34
FMU area weighted average (kg/ha/yr)	**Average**	1.87	1.35	1.36	1.43
(FMU average reduction if dairy only (kg/ha/yr)		4.34	2.78	3.40	2.90
FMU total reduction required (tonnes/yr)		415	53	276	317
Reduction in sediment yield required (kg/ha/yr) by sub-catchment	**min**	0.00	0.00	0.00	0.00
	max	44	31	171	109
FMU area weighted average (kg/ha/yr)	**Average**	9	10	44	34
FMU total reduction required (tonnes/yr)		2019	391	8875	7577
Reduction in e.coli yield required (10^9/ha/yr) by sub-catchment	**min**	0.0000	0.0000	0.0000	0.3826
	max	0.7546	1.9400	2.0078	2.6910
FMU area weighted average (10^9/ha/yr)	**Average**	0.109	0.7702	0.761	1.493
FMU total reduction required (10^9/yr)		24,262	30,308	154,019	330,124