

APPLICATIONS OF CONTINUOUS NITRATE-N ANALYSERS IN NEW ZEALAND FOR IMPROVED NUTRIENT ESTIMATION

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Nutrient enrichment is a major contributor to water quality impairment internationally. The New Zealand response to water quality problems includes the National Objectives Framework (NOF), and the National Policy Statement for Freshwater Management (NPS-FM 2014, amended in 2017), which describe water quality targets and resource management actions. These targets include nitrate-N concentrations and loads.

Recently NIWA reviewed data derived from hyperspectral devices used to measure near real-time nitrate-N concentrations in several catchments in New Zealand. Several themes were explored, with implications for resource management:

1. Relationships between discrete grab sample and continuous data.

Good relationships between grab water quality samples and spectral data were achieved over wide concentration ranges, and very different river discharge conditions. Bias between grab sample estimates and nitrate sensor results could be addressed using regression techniques.

2. Understanding flow and concentration dynamics.

High frequency data allow discharge-concentration relationships to be determined during multiple flood events under different seasonal conditions, providing insights regarding contaminant mobilisation, which may be used to guide mitigation strategies.

3. Understanding short-term variability and potential drivers of this variability.

High frequency data reveals diurnal trends in nitrate concentration similar to those observed for dissolved oxygen, and will prove informative regarding nutrient cycling and short-term ecological processes.

4. Trend assessment.

High frequency data are likely to be very useful for trend detection once adequate data exist. The case studies indicate that estimates of concentration at frequencies greater than fortnightly appear necessary to provide estimates of trend over two-year periods.

5. Nitrate-N load estimation.

The case studies indicate that reasonable estimates of nitrate-N load may be derived from sensor data collected at daily frequency. The uncertainty in the load estimation decreases as the frequency of concentration measurement increases.

Editor's Note: An extended manuscript has not been submitted for this presentation.