ENVIRONMENT SOUTHLAND PROPOSED REGIONAL WATER PLAN — COMMENTS ON THE BACTERIOLOGICAL STANDARDS

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ENVIRONMENT SOUTHLAND
PROPOSED REGIONAL WATER PLAN
— COMMENTS ON THE BACTERIOLOGICAL STANDARDS

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DISCLAIMER

ACKNOWLEDGMENTS

This report was prepared from information provided by Ms Rachael Millar, Environment Southland (ES).

Dr Hilary Michie, ESR, Christchurch, provided valuable comments on presentation.

The authors particularly appreciate the critical review by Graham McBride, NIWA, Hamilton.

Review does not imply agreement with every finding in this report.

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ABBREVIATIONS

ANZECC	=	Australian and New Zealand Environment Conservation Council
ARMCANZ	=	Agriculture and Resource Management Council of Australia and New Zealand
E. coli	=	*Escherichia coli*
ES	=	Environment Southland
ESR	=	Institute of Environmental Science and Research
FC	=	Faecal coliforms (considered here to be equivalent to "thermotolerant coliforms")
MfE	=	New Zealand Ministry for the Environment
MoH	=	New Zealand Ministry of Health
NHMRC	=	National Health and Medical Research Council
NWQMS	=	National Water Quality Monitoring Strategy
QMRA	=	Quantitative microbial risk assessment
RMA	=	Resource Management Act
USEPA	=	United States Environmental Protection Agency

SUMMARY

1. In response to deteriorating microbial water quality in lowland streams, Environment Southland (ES) has developed a Proposed Regional Water Plan incorporating a standard of 1,000 faecal coliforms (FC)/100 mL, based on a recommendation by Ryder Consulting to adopt the stock drinking water guidelines in ANZECC (1992).

2. Aspects of the Plan have been questioned by the Southland Fish and Game Council, who have suggested that the permitted activity of stock access is contrary to Section 70 of the RMA, and that the stock drinking water standard should be based on the ANZECC and ARMCANZ (2000) guideline of a median of 100 FC/100 mL.

3. ES thus obtained an Envirolink grant enabling ESR to review the faecal coliform standard, and define the appropriate organism(s) and concentration(s) indicating suitability of water for consumption by farm animals. However, it became clear that there is insufficient scientific information available to achieve this outcome within the structure of an Envirolink contract. Thus, in consultation with ES, the scope of this report was reduced to providing comments and suggestions on the microbial standards in the Plan.

4. This issue confronts other NZ regional councils, and presents a conundrum, because there appear to be no scientifically defensible microbial standards for water used for stock drinking or secondary contact recreation, and few defensible standards for fresh waters used for primary contact recreation.

5. In view of the dearth of defensible standards, we suggest that the best approach is to adopt a practical and realistic standard based on the most common water use, existing water quality, and opportunities for improvement. The most common use of lowland streams in Southland is likely to be secondary contact recreation, rather than consumption by stock. We thus suggest adoption of the ANZECC and ARMCANZ (2000) guidelines for secondary contact recreation (a median value of 1,000 FC/100 mL). This coincides with the ANZECC (1992) animal drinking water standard recommended in the Ryder report.

6. In our view, the ANZECC and ARMCANZ (2000) guidelines for stock drinking water, which are largely derived from other Australian guidelines on the use of recycled sewage, are not appropriate for natural waters in New Zealand, being at least partly based on an unsubstantiated assumption that the "underlying issues" are the same. However, we note that the 2000 guidelines are intended as "trigger values", and allow an unspecified level of exceedence of four times the median value in 20% of samples. They also appear to offer considerable scope for modification by water managers, including in response to existing contamination levels.

7. As written, the microbial standard for lowland waters in the ES Plan appears to have become (possibly unintentionally) a single sample maximum, which is a considerably more stringent requirement than in the ANZECC (1992) guidelines (which are based on a geometric mean). Whatever figure is adopted, we recommend that it be based on median value, rather than a single sample maximum, and that it refers to a specified sampling regime.

BACKGROUND

Environment Southland (ES) faces significant problems in managing the microbial quality of lowland streams and rivers, which are impacted by non-point discharges arising from wildfowl and grazing animals. This situation is likely to worsen with intensifying agricultural development.

Accordingly, ES has developed a Proposed Regional Water Plan (Environment Southland, 2008), which incorporates microbial standards designed to assist in managing, mitigating, and ultimately improving microbial water quality in the region; see:

http://www.es.govt.nz/Documents/Resource%20Planning/Fresh%20Water%20Plan/Water%20Plan%20-%20June%202008.pdf.

The faecal coliform standard in the Plan is based on advice from Greg Ryder, Ryder Consulting (Ryder, 2004). The recommendation in the Ryder report was that a realistic standard for lowland and hill country rivers in Southland is one based on the:

> *….. Stock drinking guideline (1,000 faecal coliforms/100 mL — ANZECC 1992) to be met in all waters except those managed for contact recreation (then an intermediate contact recreation guideline to apply — i.e., 260 E. coli/100 mL).*

This recommendation appears in the ES Proposed Regional Water Plan as follows:

> *The concentration of faecal coliforms shall not exceed 1,000 coliforms per 100 millitres, except for popular bathing sites….*

This standard has been questioned in relation to the permitted activity rule in the Water Plan for stock access to surface water. The Southland Fish and Game Council have lodged an appeal to the Environment Court suggesting that the current rule, which requires compliance with a number of water quality standards, including the faecal coliform standard, is contrary to Section 70 of the Resource Management Act (RMA, 1991), *viz*:

> **Rules about discharges**
>
> (1) Before a regional council includes in a regional plan a rule that allows as a permitted activity—
>
> (a) A discharge of a contaminant or water [*sic*] into water; or
>
> (b) A discharge of a contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water,—
>
> the regional council shall be satisfied that that none of the following effects are likely to arise in the receiving waters, after reasonable mixing, as a result of the discharge of the contaminant (either by itself or in combination with the same, similar, or other contaminants):
>
> (f) The rendering of fresh water unsuitable for consumption by farm animals

Furthermore, the Southland Fish and Game Council contends that the permitted activity rule

should refer to the Australia and New Zealand Environment and Conservation Council (ANZECC and ARMCANZ, 2000) guideline for stock drinking water, *viz*:

> *Drinking water for livestock should contain less than 100 thermotolerant coliforms/100ml (median value).*

In response to this issue, ES obtained an Envirolink grant to enable a scientific provider to review the faecal coliform standard contained in its Proposed Regional Water Plan for lowland, hill and spring-fed water bodies. ESR agreed to carry out this review, to be conducted by Lester Sinton and Louise Weaver, from the Water Microbiology Team in the ESR Christchurch Science Centre.

In essence, ES is seeking a defensible microbial standard for lowland and hill country surface waters impacted by non-point source pollution from grazing animals.

A preliminary investigation of this issue by the two ESR staff indicated that animal-impacted, surface waters create a scientific conundrum in terms of setting defensible standards (see below), and it was not possible to resolve this issue within the structure of an Envirolink contract. Thus, we considered that it was not feasible to meet the broader outcome requested, *viz*:

> *The review should define the appropriate indicator organism(s) and the appropriate (maximum/median) concentration of those organisms which indicate the suitability of water for consumption by farm animals. Justification should be given for the choice of indicator organisms and the concentration permitted.*

However, following consultation with ES, we were able to review the general issues and make several comments and recommendations.

GENERAL COMMENTS ON THE PROPOSED ES STANDARD

Although not stated in the Ryder Report, the ANZECC (1992) guideline for stock drinking water is a *geometric mean* value, based on no less than five water samples taken per month. However, in the ES Proposed Regional Water Plan, this figure appears to have become (possibly unintentionally) a *single sample maximum*, *i.e.*:

> *The concentration of faecal coliforms shall not exceed 1,000 coliforms per 100 millilitres….*

It should be noted that this requirement is considerably more stringent than that in the ANZECC (1992) guidelines. Whatever standard is adopted, we recommend that it be expressed as a median value, rather than a single sample maximum, and that it include a specified sampling regime.

In addition, the use of the term "….1,000 *coliforms* per 100 millilitres…" here is confusing. Coliforms (sometimes called "total coliforms") comprise a wider group of bacteria than faecal coliforms and, although they are sometimes used to monitor drinking water supplies, they have limited utility in environmental waters. We recommend the consistent use of the term "faecal coliforms". The existing standard could be more simply and accurately expressed as:

> *The concentration of faecal coliforms shall not exceed 1,000 per 100 millilitres….*

A DEFENSIBLE STANDARD

As we see it, the microbiological standard selected by ES for lowland streams and rivers in the region should ideally:

1. be consistent with all existing legislation, particularly the Resource Management Act (1991);

2. relate to the predominant water use;

3. be scientifically defensible;

4. be realistic in terms of existing water quality and opportunities for improvement.

Each of these points is discussed separately below.

1. Be consistent with all existing legislation, particularly the Resource Management Act (1991)

Here, the authors can offer little useful comment, as ES staff will be more familiar with the RMA than we are. It appears that Section 70 of the RMA may create a problem for ES in terms of the selected standard. However, whether or not it does so may depend on interpretation of the wording and intent of the ANZECC and ARMCANZ (2000) guidelines (see "FURTHER COMMENTS" section).

2. Relate to the predominant water use

The standard in the proposed Regional Water Plan is based upon a stock drinking water guideline (1,000 FC/100 mL), with recreational water standards as the exception. However, it is our understanding (Rachael Millar, ES, pers. comm) that, although some of the region's sheep farms will probably obtain stock water from a network of farm drains, many farms use sources such as groundwater and woolshed roof water for this purpose. Thus, we question whether stock watering could be regarded as a significant or predominant water use of lowland streams in Southland. It is also worth noting that the ANZECC and ARMCANZ (2000) guidelines (Section 9.3.3.2) state, with respect to suitability of waters for stock drinking, that although some shallow groundwater supplies have the potential to be contaminated, "…the incidence of groundwater contamination by pathogens is generally low."

We suggest that secondary contact recreation — *e.g.*, fishing, shallow wading, and boating — will be at least an equally significant water use, and it may be better to set the standards in terms of this use. We recommend the guideline value(s) specified for secondary contact recreation in terms of faecal coliforms in Chapter 5 of ANZECC and ARMCANZ (2000), *viz*:

> *1000 faecal coliform organisms/100 mL (minimum of five samples taken at regular intervals not exceeding one month, with four out of five samples containing less than 4000 organisms/100 mL)*

Note that the above 1,000 faecal coliforms/100 mL is a *median* value (see page 5-4, ANZECC and ARMCANZ, 2000).

We acknowledge that there is at least one potential problem associated with our recommendation, *i.e.*, we are not aware of the application of any secondary recreational contact standards elsewhere in New Zealand. Thus the implications of this approach being a "first" for this country may need to be considered by ES at a policy level.

The ANZECC and ARMCANZ (2000) guidelines offer enterococci as an alternative indicator, but we do not recommend their use for fresh waters. Although the USEPA criteria for fresh recreational waters also allow the use of both *E. coli* and enterococci for fresh waters (USEPA, 1986), enterococci are listed by the New Zealand Ministry for the Environment as the preferred indicator for marine recreational waters only (MfE & MoH, 2003). The MfE guidelines maintain that this is because enterococci can be found in "pristine" waters as a result of replication in plant material, although, as noted in a review by Sinton *et al*. (1993), the evidence that this occurs in enteric strains is equivocal.

Although the use of a secondary contact recreation standard will not avoid the RMA Section 70 requirement, it may move the emphasis of the classification away from stock watering. This standard would also appear to be more relevant to the "primary contact" standards set for specific recreational waters in the region. It also happens to coincide with the existing guidelines (based on stock drinking waters) of 1,000 FC/100 mL recommended in the Ryder report.

However, *there do not appear to be any scientifically defensible microbial standards for secondary contact recreation* (see comments below).

We again note that, whereas the 1,000 faecal coliforms/100 mL for secondary contact is a *median* value, the ANZECC (1992) figure of 1,000 faecal coliforms/100 mL for stock drinking water is a *geometric mean*. However, for microbial data in freshwater environments, medians and geometric means will tend to be similar numbers (G. McBride, pers. comm.).

3. Be scientifically defensible

Recreational Water

The most appropriate microbial water quality standards for natural surface waters are generally considered to be those based on data from epidemiological studies, most of which have been conducted on waters used for primary contact recreation (bathing, diving, white water kayaking, etc.). In essence, these studies (based on various protocols) endeavour to relate the disease risk associated with bathing in faecally contaminated water to the concentrations of different indicator organisms in the water.

One of the largest (and most influential) epidemiological studies was conducted for the USEPA in the 1980s (Cabelli, 1980; 1983) in coastal waters impacted by municipal effluents. This study led to the widespread adoption of enterococci for marine recreational waters. A companion study was conducted in lakes by Dufour (1984), and led to the adoption by the USEPA of guidelines for fresh waters based on *E. coli* or enterococci (USEPA, 1986).

It is important to note that most epidemiological investigations, including the above USEPA

studies, have been conducted at beaches impacted by point sources (primarily human effluents). Very few equivalent studies have been published on recreational waters impacted by non-point sources, such as wildfowl and farm animals. Such studies as have been conducted in animal-polluted bathing waters (*e.g.*, Calderon *et al.*, 1991; Colford *et al.*, 2007) have largely failed to reliably demonstrate an indicator-disease risk relationship, although some of the conclusions in Calderon *et al.* (1991) have been questioned (McBride, 1993). Recent European studies have demonstrated that non-point sources from rural areas are likely to be the major inputs to bathing areas, but they make no assessment of the likely impact on human health (Aitken, 2003; Kay *et al.*, 2007).

Recently, a USEPA workgroup (USEPA, 2007) specifically highlighted this lack of information on disease risk in animal-impacted waters. The workshop members noted that this may be for the simple reason that there is a lower health risk associated with bathing in animal-impacted waters compared to those impacted by human effluents. A point of interest here is that, although the etiological agents have almost always remained unidentified in studies of sewage-impacted waters, enteric viruses are normally the prime suspects. The USEPA workgroup regarded the threat to humans from animal enteric viruses as non-existent or negligible, although they considered that cattle and sheep posed a moderate risk to humans in terms of protozoans, and a moderate-to-high risk in terms of bacteria.

The USEPA workgroup agreed that epidemiological studies are the most desirable approach to define and quantify health risks to humans swimming in faecally-contaminated waters. However, some members noted that epidemiological studies cannot be performed in all the types of non-point source-impacted waters for which there is a need to know risk. In many situations, it will be necessary to use other techniques, such as quantitative microbial risk assessment (QMRA). This involves calculating the risk of infection to bathers, based on a number of assumptions, such as quantities of water swallowed, and the dose-response relationship (between illness risk and microbial density). The problem with the QMRA approach is a paucity of realistic model inputs, particularly reliable dose-response data.

The New Zealand recreational water guidelines for marine waters (MfE & MoH, 2003) are derived (by rounding up) from the results of the USEPA epidemiological studies (Cabelli, 1980; 1983). The equivalent freshwater guidelines were derived from a QMRA study (Till *et al.*, 2008), in which concentrations of *E. coli*, *Clostridium perfringens* spores, F-RNA phages, somatic coliphages, human enteroviruses, human adenoviruses, *Cryptosporidium* oocysts, *Giardia* cysts, *Salmonella* and *Campylobacter* from 25 freshwater sites were compared. With the exceptions of "moderate" correlations between thermophylic *Campylobacter* and two indicators (*E. coli* and somatic coliphages), there was a general lack of correlation between pathogens and indicators. The *Campylobacter - E. coli* association was used to derive four 95th percentile values for *E. coli* as estimates of the risk of *Campylobacter* infection (MfE & MoH, 2003, page H26). In our view, these figures should be treated with some caution. Apart from the inherent uncertainties in the QMRA approach, it is difficult to reliably establish linkages between human infections and environmental isolates of *Campylobacter* (Lake, 2006), and there is some evidence of differences in the genomic profiles of thermophylic *Campylobacters* isolated from natural waters in New Zealand and those in local human cases (Devane *et al.*, 2005; French *et al.*, 2008; B. Gilpin, ESR, pers. comm).

Stock Drinking Water and the ANZECC Guidelines

There appear to be few, if any, reliable data on "acceptable" numerical levels of microbial pollution for stock drinking water. The relevant studies have been very well summarised in a MAF (2004) technical report. Although there are several more recent studies (*e.g.*, Lardner *et al.*, 2005) showing apparent gains in stock thrift through improved water quality, none have offered a recommended limit for faecal indicator organisms.

The ANZECC and ARMCANZ (2000) guidelines for stock drinking water are based on an associated National Water Quality Management Strategy (NWQMS) document pertaining to the use of reclaimed water from sewage systems (ARMCANZ, ANZECC and NHMRC, 2000). The guidelines (Section 9.3.3.2) also claim that, "Although the present guidelines concern natural waters rather than reclaimed waters, the underlying issues regarding risks to human and animal health are the same". The term "underlying issues" is rather vague in this context, but we nevertheless question this assumption. Stock probably shed higher numbers of some enteric pathogens compared to humans, and are more exposed to them. However, we are not aware of any reliable evidence that humans and animals are equally, or even similarly, susceptible to waterborne enteric infections. Furthermore, microbial removal processes can differ significantly between natural systems and effluent treatment plants, and treatment can bring with it both the expectation and the ability to significantly improve water quality above the 1,000 faecal coliforms/100 mL specified in the equivalent ANZECC (1992) guidelines.

We consider that the issues surrounding scientific defensibility can be summarised as follows:

- There are some scientifically defensible microbial standards for marine recreational waters contaminated by municipal effluents (e.g., the USEPA epidemiological studies), although whether these standards are entirely applicable to the New Zealand environment has been questioned (Sinton, 2004).

- There appear to be no scientifically defensible microbial standards for secondary contact recreation (regardless of the pollution source).

- There is a dearth of scientifically defensible microbial standards for primary contact recreation waters contaminated by grazing animals and/or wildfowl. The few overseas epidemiological studies that have attempted to address this issue have largely been unable to define a risk. The New Zealand freshwater guidelines are based on a QMRA approach. This at least provides a set of numbers, based on New Zealand conditions, to work with. However, these values should be treated with some caution, in view of uncertainties inherent in QMRA, and in determining which genotypes of assumed zoonoses (including thermophylic *Campylobacters*) in New Zealand rural waters are in fact infectious to humans.

- There appear to be no scientifically defensible microbial standards for stock drinking waters. Thus, there is no scientific basis for either the ANZECC (1992) or ANZECC and ARMCANZ (2000) stock drinking water standards.

4. Be realistic in terms of existing water quality and opportunities for improvement

In the absence of a significant pool of scientific data, standards and guidelines need to be substantially determined by pragmatism. The lowland streams and rivers in Southland are of rather poor microbial quality, commensurate with intensive grazing and reasonably high rainfall. The median FC values for 69 sampling sites were 535 in 2005-06 and 385 in 2006-07. However, the median at 12 sites exceeded 1,000 FC in 2005-05, and 7 did so in 2006-07.

> *Thus we regard the general figure of 1,000 FC/100 mL set in the Ryder report as realistic in terms of the existing water quality (however, see comment below).*

Some strategies for managing and mitigating faecal contamination of New Zealand waters by livestock have been outlined by Collins *et al*. (2007). However, intensifying land use in Southland will make improvement difficult.

To repeat our earlier comments, we have one recommendation in this regard:

- Adhere to the 1,000 FC/100 mL figure recommended in the Ryder report, but set it in terms of a secondary contact recreation (ANZECC and ARCANZ, 2000, Chapter 5), rather than stock drinking. However, as noted elsewhere, we recommend that this be set as a median value, as per the secondary contact guidelines in ANZECC and ARCANZ (2000), rather than as a single sample maximum, as it appears to be in the Proposed Water Plan.

  This change will not entirely avoid the problem with respect to "fitness" for stock drinking in the RMA, but it may indicate that ES is considering the waters in terms of recreational use rather than stock watering.

There is a second option, which we do not recommend:

- Set the standards in terms of the ANZECC and ARMCANZ (2000) stock drinking water guidelines, on the basis that they allow considerable "refinement" by the user according to the "level of exposure to contaminants". This option would appear to allow the setting of higher median trigger values, and greater incidences of exceedence, than in the existing guidelines, but may require legal advice on interpretation of the wording (see comments below).

FURTHER COMMENTS

The situation faced by ES represents a conundrum recognised by water microbiologists, both in New Zealand and overseas, *viz*, the risks to human health from contact (involving both recreation and consumption) with animal-impacted waters are poorly understood. There is also a general lack of reliable scientific information on the impacts on animal health of faecally-contaminated stock drinking water.

It should also be noted that the ANZECC and ARMCANZ (2000) stock drinking water guidelines are based on median values (Section 4.3.2.2), and that investigations of likely causes are only warranted when 20% of the results exceed four times this value. Furthermore, a permissible exceedence is not specified. Thus, theoretically, every 5th sample could reach, for example, 10,000 FC/100 mL or more, and be within the guidelines, provided the other

four are less than 400 FC/100 mL.

Although many sites in Southland are likely to consistently exceed four times the median value of 100 FC/100 mL, the ANZECC and ARMCANZ (2000) guidelines also make it clear (section 2.1.4) that they were formulated in terms of "trigger values". These trigger values are defined as "concentrations that, if exceeded, would indicate a *potential* environmental problem, and so 'trigger' a management response, *e.g.* further investigation and s*ubsequent refinement of the guidelines according to local conditions* [our emphasis]." These conditions are further defined as including "soil type, rainfall, and *level of exposure to contaminants* [our emphasis]." Thus, it seems reasonably clear that the ANZECC and ARMCANZ (2000) guidelines are fully intended to be modified by water managers according to local conditions, including a pragmatic response to the prevailing levels of contamination.

Notwithstanding the flexibility offered in the ANZECC and ARMCANZ (2000) stock watering guidelines (in terms of both "refinement" and allowable exceedences), in our opinion, a 100 FC/100 mL median value has little relevance to the ambient microbial quality of most lowland waterways in New Zealand. We further suggest that to set standards for lowland surface waters based on these guidelines would create an unworkable situation for most New Zealand regional councils.

Finally, we point out that the Proposed Water Plan creates a situation where most of the lowland waters are to be assessed for microbial water quality in terms of faecal coliforms, but bathing waters are to be assessed in terms of *E. coli*. Our proposal (setting standards for most of the lowland waters in terms of the ANZECC and ARMCANZ [2000] guidelines for secondary contact recreation) does not change that situation. In our experience, over 90% of the faecal coliforms isolated from most natural waters are likely to be *E. coli* (ANZECC and ARMCANZ [2000] state that the proportion is 97% for human faeces). However, it should be noted that the two indicators are not entirely equivalent.

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APPENDIX 1: Environment Southland Application for Envirolink Funding.

FOUNDATION FOR RESEARCH SCIENCE & TECHNOLOGY
Tūāpapa Rangahau Pūtaiao

Envirolink application form for medium advice grants

Please fill out this form if you are applying for a medium advice grant.

This grant is available to the trial Regional Councils for

- expert consultation/ advice for a discrete project; or
- for the second phase of an initial small grant Envirolink project.

The form will be used by the Envirolink Governance Committee to screen the project and by the Foundation to consider the proposal for funding

The Regional Council may prepare this form independently or jointly with the selected research organisation.

The grant covers expenses of up to $20,000, excluding GST and does not cover capital purchases.

Please fill in all sections of this form. Typically the application will not exceed two pages of written text. Please note the following points:

- The answers to questions one to four should contain sufficient information to allow the work to be assessed against the following two criteria - Environmental Benefits and Path to Implementation. Details are explained in the eligibility and assessment criteria for medium advice grants, visit http://www.frst.govt.nz/research/Envirolink_medium.cfm

- In the budget section, please itemise hourly rates and number of hours for each external resource, including costs for external facilitators or experts and any other external costs such as travel and materials.

The Regional Council Advice number allows tracking of the advice path. Please use the designated code for your council name (listed below) and a unique number.

Northland Regional Council — (NLRC)
Gisborne District Council — (GSDC)
Hawkes Bay Regional Council — (HBRC)
Horizons Regional Council — (HZLC)
Nelson City Council - (NLCC)
Marlborough District Council — (MLDC)
Tasman District Council — (TSDC)
West Coast Regional Council — (WCRC)
Environment Southland — (ESRC)

Envirolink application for medium advice grants
(up to $20,000 excluding GST)

Regional Council Advice number: ESRC213 Date: 2 April 2008

Regional Council: ESRC

Advice requested by: Rachael Millar, Senior Resource Planner

Phone number: 03 2115115 Email address: rachael.millar@es.govt.nz

Research organisation: ESR

Primary contact providing advice: Louise Weaver

Phone number: 03 351 6019 Email address: louise.weaver@esr.cri.nz

Type of ecosystem involved: Freshwater

Did this request arise from prior advice received under this scheme? No

Name any other councils who are directly linked to this request:

Please answer all questions so that your application can be fully considered.

Short Title Please title the environmental management issue you are seeking advice on.
An appropriate microbiological standard for Southland's rivers and streams that reflects suitability for consumption by farm animals to give effect to Section 70(1)(f) of the Resource Management Act 1991.

1. Work Plan
Please give an overview of the project that you are proposing and identify the deliverables from this project. (e.g. seminar, training, collating research, informal verbal consultation, literature survey, or other services)

Environment Southland is seeking an Envirolink grant to enable a scientific provider to review the faecal coliform standard contained in its Proposed Regional Water Plan (Water Plan) for lowland, hill and spring-fed surface water bodies. It is anticipated that this would be a table top exercise collating and reviewing existing research. The deliverable would be a short report and potentially a presentation on the report if funding allows.

2. Context

Please provide context for why the work is being proposed. To do this you may answer some or all of the following questions:

- How does work fit with other developments being undertaken by your council?
- Does it align with the council's strategy?
- Does it link to previous Envirolink funding or activities undertaken by other councils?
- Why is this beyond business as usual?
- Are there any additional aspects of the issue that needs to be covered?
- Is the information already available elsewhere?

Southland's most significant water issue is the threat to water quality from non-point source discharges. Lowland rivers and streams in Southland show high nutrient and bacteria levels. This reflects the agricultural development in the region, which is currently intensifying with approximately 110 dairy conversions being undertaken in the region at present for the 2008/09 season.

In response to the water quality issues facing the region, Environment Southland adopted the following goal in June 2005:

Southland will have beaten the non-point source pollution problem by 2015 - The facts and peoples' opinions will show that we did a great job

This goal is further defined in the Water Plan, which Environment Southland's Water Plan sets the overall direction for water quality management in the region and contains an objective to achieve a minimum 10% improvement in levels of key contaminants (nitrogen, phosphorus, sediment and microbiological contaminants) in degraded water bodies by 2015.

The Water Plan divides the region's surface water bodies into a number of classes based largely on the River Environment Classification framework developed by NIWA. Water quality standards are identified for each class and the Water Plan sets goals to maintain water quality where these standards are already met, and gradually improve water quality where they are not met. Objective 3 of the Water Plan identifies the following values for the region's water bodies:

- bathing, in those sites where bathing is popular;
- trout where present, otherwise native fish;
- stock drinking water;
- Ngāi Tahu cultural values, including mahinga kai; and
- natural character including aesthetics.

The goal is to protect these values where water quality is already suitable for them and achieve measurable progress towards making water quality suitable for them where it is currently not suitable. As noted above, Objective 4 of the Water Plan specifies a goal of achieving a 10% improvement in levels of microbiological contaminants, nitrate, phosphorus and sediment over 10 years in lowland, hill and spring-fed water bodies.

The faecal coliform standard for lowland, hill and spring-fed water bodies in the Water Plan is based on the ANZECC 1992 guideline for stock drinking water as follows:

Drinking water for livestock should contain no more than 1,000 faecal coliforms/100ml (geometric mean [log] based on not less than five water samples taken per month). No more than 20% of these samples should exceed 5,000 faecal coliforms/100ml.

This standard applies following reasonable mixing and was adopted based on advice from Greg Ryder from Ryder Consulting in June 2004. An excerpt from his report, *Environment Southland Water Quality and the Draft Regional Water Plan: An examination of possible water quality standards,* notes:

> Faecal contamination is a serious issue in Southland's freshwaters with many waterbodies grossly exceeding guidelines for contact recreation and stock drinking water. It is likely that this will continue to be the case for many years, even if best management practices such as riparian fencing become widespread…A…realistic standard for Southland lowland and hill country rivers and springs is: Stock drinking guideline (1,000 faecal coliforms/100ml—ANZECC 1992) to be met in all waters except for those managed for contact recreation…(pg 47).

This standard has been questioned in relation to the permitted activity rule in the Water Plan for stock access to surface water. The Southland Fish and Game Council have lodged an appeal to the Environment Court suggesting that the current rule, which requires compliance with a number of water quality standards including the faecal coliform standard, is contrary to Section 70 of the Resource Management Act 1991 (RMA). Section 70 of the RMA states:

(1) Before a regional council includes in a regional plan a rule that allows as a permitted activity—

(a) A discharge of a contaminant or water into water; or

(b) A discharge of a contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water,—

the regional council shall be satisfied that none of the following effects are likely to arise in the receiving waters, after reasonable mixing, as a result of the discharge of the contaminant (either by itself or in combination with the same,

similar, or other contaminants):

...

(f) ***The rendering of fresh water unsuitable for consumption by farm animals***

In relation to clause (f) above, the Southland Fish and Game Council contends that the permitted activity rule should refer to the 2000 ANZECC guideline for stock drinking water as follows:

Drinking water for livestock should contain less than 100 thermotolerant coliforms/100ml (median value).

The Southland Fish and Game Council is also seeking that a note be added to the rule stating that if a water body has a median thermotolerant coliform count of more than 100/100ml, stock access to the water body is not a permitted activity. Other parties to the appeal have raised concerns regarding this suggestion as median values at 77% of Environment Southland's State of the Environment monitoring sites exceed the faecal coliform standard sought by the Fish and Game Council and these parties believe there is a need to take a balanced approach to the issue of stock access to surface water.

Environment Southland is aware that the present faecal coliform standard in the Water Plan for lowland, hill and spring-fed surface water bodies (1,000 faecal coliforms per 100 millilitres) is no longer a current ANZECC guideline value and may not be an appropriate standard for achieving the region's water quality goals. For this reason, Environment Southland, supported by the Southland Fish and Game Council, is seeking an Envirolink grant to enable a scientific provider to review the faecal coliform standard in the Water Plan. The review should define the appropriate indicator organism(s) and the appropriate (maximum/median) concentration of those organisms which indicate the suitability of water for consumption by farm animals. Justification should be given for the choice of indicator organisms and the concentration permitted. Should this review indicate that the current standard in the Water Plan is no longer appropriate, Environment Southland would look to update the faecal coliform standard in the Water Plan for all activities (as opposed to just stock access activities) through the upcoming Discharge Plan process.

The Discharge Plan is a project to:

(a) review two of Environment Southland's existing regional plans prepared under the RMA (the *Regional Effluent Land Application Plan* and the *Regional Solid Waste Management Plan*); and

(b) combine these plans with the Water Plan to create a single document.

With the region currently experiencing significant growth in the dairy industry, the Council has directed that Phase 1 of the project is to address discharges of agricultural effluents/sludges and the cumulative effects of intensive land use. Initial scoping work is currently being undertaken with consultation with key stakeholders likely to begin in April 2008. The advice sought will feed into this process. It is likely to also be relevant to the policy development processes of other regional councils. The Ministry of Agriculture and Forestry has also expressed interest in the advice and has confirmed that no similar work has already been commissioned.

The following two questions are used to help us assess and score the proposed work. The project will be scored against key points which are provided on the Envirolink website - http://www.frst.govt.nz/research/Envirolink_medium.cfm

3. Environmental benefits of project

Please explain how the advice sought will contribute to enhanced environmental management by the council, or assist the council to help others to improve their environmental management.

The following questions should be addressed in your explanation:

- If good advice is received and used effectively, how will the environment benefit?
- When might that benefit come about? Will the benefit be sustainable and if so, to what extent? (For example, The advice might affect decision making for all future aquaculture developments in Southland)
- Will the advice stimulate a positive change in how your council operates?

The advice sought is critical to future management decisions regarding Southland's water resources. Policy 4 of the Water Plan provides that point source and non-point source discharges must be managed to meet or exceed the water quality standards in the Water Plan therefore the standard set for faecal coliforms will have a significant impact on future management decisions in relation to all discharges.

If the scientific provider identifies the need to update the current faecal coliform standard in the Water Plan, this would occur through the Discharge Plan project currently underway, which is a 2 to 3 year process.

The advice will provide certainty regarding an appropriate faecal coliform standard for the region and influence Environment Southland's future work programmes, which are focused on achieving the water quality goals identified for the region. As noted above, the advice is likely to also be relevant to the policy development processes of other regional councils.

4. Implementation of project

Consider how the new information will be used to influence change and achieve outcomes as discussed in question three above. Show that you have identified a plausible pathway in which the advice sought will be used or passed onto others for use. You should explain and justify your choice of pathway.

We suggest you address the following questions:

- How will the council realise the benefits?

• What happens next with the advice? Who will use it? What will it influence? • What might it lead to? • Who will take it up? • Will you be training others as a result of receiving the advice? • Have future users made a commitment to use the advice and are they fully aware of its nature? • Is there any budget commitment to use this advice?
Environment Southland will realize the benefits from a review of the current faecal coliform standard by incorporating the advice into future policy development. As outlined above, the advice will be used as part of the Discharge Plan process and will also influence other future work programmes. Stakeholders such as Fish and Game, the Department of Conservation, Federated Farmers, Fonterra and others are aware of the advice being sought and very interested in the outcome. Environment Southland will also circulate the advice to other regional councils. Environment Southland has made a commitment to using the advice through the Discharge Plan process. The advice will also be useful to the parties involved in the current appeal to the Environment Court regarding the stock access provisions of the Water Plan.

Has application has been sighted by your Council's Envirolink Coordinator? Yes

Name of person completing form: Rachael Millar

The Regional Council Governance Committee will screen your application before it is submitted to the Foundation. Please contact your Regional Council Envirolink coordinator for next steps.