



Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses

INTRODUCTION

Canadian water quality guidelines (CWQGs) are developed to provide basic scientific information on the effects of water quality variables on the uses of Canadian waters (including raw water for drinking water supply, aquatic life, agricultural uses, recreation and aesthetics, and industrial water supplies). CWQGs are designed to provide a means of assessing water quality issues and concerns and to aid in establishing site-specific water quality objectives. This chapter contains (a) a summary table of the guidelines, listing the ones that either have been carried over from the original *Canadian Water Quality Guidelines* (CCREM 1987), revised since then, or newly developed; (b) the protocol (originally published in 1993); and (c) fact sheets for the respective substances and parameters of concern. These guidelines, therefore, replace the former recommendations published in CCREM (1987) and its appendices. The fact sheets, and, more extensively, the technical supporting documents on which they are based, provide details for the derivation of the guidelines, physical-chemical properties, fate in the aquatic environment, use patterns, environmental concentrations, and toxicological data. The recommended guideline values are expressed to two significant figures, unless otherwise required or indicated by the original toxicity study. The guideline values apply to the total element or substance in an unfiltered sample, unless otherwise specified. It should be noted, however, that certain information about a parameter changes over time, and that the data presented in the fact sheets may not reflect current use patterns. The guidelines and their technical supporting documents will be reviewed and updated following national priorities and as further relevant information becomes available.

Agricultural water quality guidelines are being developed in response to a request by organizations and jurisdictions involved in agricultural operations. The initial approach (CCREM 1987) in deriving agricultural water guidelines in the past was based on existing guidelines obtained from other jurisdictions. If these guidelines were considered appropriate for Canadian agricultural conditions, they were adopted as CWQGs. If the guidelines were not applicable to Canadian conditions, but additional scientific information was available, they were modified appropriately and then adopted. For many substances, however, guidelines from other jurisdictions were either

not available or could not be appropriately modified. Therefore, the need for a consistent, scientifically defensible approach for the derivation of agricultural guidelines for priority substances was identified by the members of the CCME Task Force on Water Quality Guidelines.

Protocols for deriving agricultural water quality guidelines, were published in 1993 as Appendix XV to CCREM (1987), and since then have provided a consistent, scientifically defensible approach to deriving guidelines for irrigation and livestock water to protect crops and livestock from contaminants. Users of these guidelines (e.g., resource managers and farmers) are reminded that these values are recommended concentration limits of contaminants in irrigation and livestock water; above these limits, possible harm to crops and livestock may result. The description of potential remedial action to be taken in the event of water being contaminated above recommended guideline levels is beyond the scope of these protocols and is the responsibility of individual water users and/or jurisdictions. The protocols allow for site-specific objectives that are tailored to a particular farm or region for which national water quality guidelines may not be appropriate. It is recognized that combinations of chemicals are potentially toxic mixtures that must be assessed; however, an acceptable method of determining the risk of mixtures has not been developed. Thus, these protocols only account for individual contaminants. When an acceptable methodology for addressing the potential toxicity of mixtures is available, these protocols will be updated. Currently, new approaches for toxic mixtures are beginning to appear.

Canadian Water Quality Guidelines for Irrigation Water

Canada is a world leader in the production of many crops, especially wheat and other cereal grains. In many regions, yields are maintained by irrigation of agricultural crops during periods of insufficient precipitation. The protocol for deriving of water quality guidelines for irrigation water (CCME 1993) is designed to develop guidelines to protect sensitive crop species that may be exposed to toxic

substances in irrigation water. The protocol outlines the minimum data requirement, derivation procedures, and review procedures for irrigation guidelines. The guidelines are based on two critical pieces of information: (1) the sensitivity of nontarget crops and (2) maximum irrigation rates for crops. CWQGs for irrigation water are preferentially derived from long-term studies in which crops were exposed to contaminants via irrigation water. When these studies are available, the crop species maximum acceptable toxicant concentrations (SMATCs) are calculated by dividing the geometric mean of the lowest-observed-effect concentration (LOEC) and the no-observed-effect concentration (NOEC) by a safety factor of 10.

Canadian Water Quality Guidelines for Livestock Water

A variety of livestock are raised in Canada for both export and domestic consumption. Successful livestock production is dependent on the availability of ample supplies of good quality water (Ayers et al. 1985). Water of inferior quality may cause adverse effects on the health of animals and, consequently, economic losses to the farmer (Rowe and Hymas 1954). The current CWQGs for the protection of agricultural livestock (CCME 1993) are based on four critical pieces of information: (1) tolerable daily intake rates of the contaminant for livestock species; (2) daily water intake rates of livestock; (3) livestock body weights; and (4) potential for bioaccumulation in livestock products. The protocol does not apply to carcinogenic (nonthreshold) substances, and for this class of compounds, the Canadian guidelines for drinking water quality (Health Canada 1996 and future updates) should be adopted. The protocol also does not apply to setting maximum residue limits (MRLs) in livestock

products that may be consumed by humans; these national limits are set by Health Canada.

CWQGs for livestock water should be derived from the results of acute or, preferably, chronic exposure studies that consider sensitive life-stages and endpoints. The tolerable daily intake (TDI) is calculated by dividing the geometric mean of the lowest- and no-observed-effect dose by an appropriate safety factor (Stephan et al. 1985). The TDI is used in conjunction with the daily water intake rates and body weights to derive the final guideline value (CCME 1993).

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Reference listing:

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