



Water Quality

Water Quality Criteria for Molybdenum

Overview Report

Prepared pursuant to Section 2(e) of the Environment Management Act, 1981

Original signed by B. Marr
 Deputy Minister
 Environment and Parks
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Tables

Table 1: Summary of Water Quality Criteria for Molybdenum

Water Use	30-Day Average mg/L Total Molybdenum	Maximum mg/L Total Molybdenum
Raw Untreated Drinking Water	None proposed	0.25 mg/L
Fresh Water Aquatic Life	Less than or equal to 1 mg/L	2 mg/L
Wildlife	None proposed	0.05 mg/L
Livestock Watering Supply (consuming forages not irrigated or if no molybdenum containing fertilizers are applied to grow feed consumed by livestock)	None proposed	0.08 mg/L
Livestock Water Supply (all other cases)	None proposed	0.05 mg/L
Irrigation Water - Poorly Drained Soil Cu:Mo ratio is less than 2:1 in the irrigation water (forage crops)	Less than or equal to 0.01 mg/L	0.05 mg/L
Irrigation Water - Poorly Drained Soil Cu:Mo ratio is greater than 2:1 in the irrigation water (forage crops)	Less than or equal to 0.02 mg/L	0.05 mg/L
Irrigation Water - Well Drained Soil (forage crops)	Less than or equal to 0.02 mg/L	0.05 mg/L

Irrigation Water - All Soils (non-forage crops)	Less than or equal to 0.03 mg/L	None proposed
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1. The average is calculated from at least 5 weekly samples taken in a period of 30 days.

Preface

THE MINISTRY OF ENVIRONMENT, LANDS AND PARKS (now called Ministry of Water, Land and Air Protection) develops province-wide ambient water quality guidelines for variables that are important in the surface waters of British Columbia. This work has the following goals:

1. to provide guidelines for the evaluation of data on water, sediment, and biota
2. to provide guidelines for the establishment of site-specific ambient water quality objectives

Ambient water quality objectives for specific waterbodies will be based on the guidelines and also consider present and future uses, waste discharges, hydrology/limnology/oceanography, and existing background water quality. The process for establishing water quality objectives is more fully outlined in *Principles for Preparing Water Quality Objectives in British Columbia*, copies of which are available from Water Quality Section of the Water Management Branch.

Neither guidelines nor objectives which are derived from them, have any legal standing. The objectives, however, can be used to calculate allowable limits or levels for contaminants in waste discharges. These limits are set out in waste management permits and thus have legal standing. The objectives are not usually incorporated as conditions of the permit.

The definition adopted for a guideline is:

A maximum and/or a minimum value for a physical, chemical or biological characteristic of water, sediment or biota, which should not be exceeded to prevent specified detrimental effects from occurring to a water use, including aquatic life, under specified environmental conditions.

The guidelines are province-wide in application, are use-specific, and are developed for some or all of the following specific water uses:

- Raw drinking, public water supply and food processing
- Aquatic life and wildlife
- Agriculture (livestock watering and irrigation)
- Recreation and aesthetics

- Industrial (water supplies)

The guidelines are set after considering the scientific literature, guidelines from other jurisdictions, and general conditions in British Columbia. The scientific literature gives information on the effects of toxicants on various life forms. This information is not always conclusive because it is usually based on laboratory work which, at best, only approximates actual field conditions. To compensate for this uncertainty, guidelines have built-in safety factors which are conservative but reflect natural background conditions in the province.

The site-specific water quality objectives are, in most cases, the same as guidelines. However, in some cases, such as when natural background levels exceed the guidelines, the objectives could be less stringent than the guidelines. In relatively rare instances, for example if the resource is unusually valuable or of special provincial significance, the safety factor could be increased by using objectives which are more stringent than the guidelines. Another approach in such special cases is to develop site-specific guidelines by carrying out toxicity experiments in the field. This approach is costly and time-consuming and therefore seldom used.

Guidelines are subject to review and revision as new information becomes available, or as other circumstances dictate.

The guidelines apply to the ambient raw water source before it is diverted or treated for domestic use.

The Ministry of Health regulates the quality of water for domestic use after it is treated and delivered by a water purveyor.

Guidelines relating to public health at bathing beaches are the same as those used by the Ministry of Health which regulates the recreation and aesthetic use.

Recommended Guidelines

These criteria for molybdenum are based on a detailed analysis given in a technical document.

DRINKING WATER (Includes Food Processing Water)

1. Raw Drinking Water With or Without Treatment

Total molybdenum: 0.25 mg/L maximum

Advanced water treatment methods may remove molybdenum, and allowances could be made on a site-specific basis if information on treatment efficiency is available.

AQUATIC LIFE

1. Freshwater

***Total molybdenum: less than or equal to 1 mg/L average for 30 days from a minimum of five weekly samples
2 mg/L maximum***

2. Marine

There is not enough information available at this time to recommend marine criteria.

WILDLIFE

Total molybdenum: 0.05 mg/L maximum

LIVESTOCK WATERING

1. Where forage is not irrigated, or if no molybdenum-containing fertilizers are applied to grow feed consumed by livestock

Total molybdenum: 0.08 mg/L maximum

2. All other cases

Total molybdenum: 0.05 mg/L maximum

IRRIGATION WATERS

Maximum and average values cited apply during the irrigation season, with average values being calculated from samples collected at a minimum of once per week for five weeks in a period no longer than thirty days.

1. Poorly-drained soils used for forage crops, and Cu:Mo less than 2:1 in irrigation water

*Total molybdenum: less than or equal to 0.01 mg/L average
0.05 mg/L maximum*

2. Well-drained soils used for forage crops, or poorly-drained soils used for forage crops, but where Cu:Mo ratio greater than or equal to 2:1 in irrigation water

*Total molybdenum: less than or equal to 0.02 mg/L average
0.5 mg/L maximum*

3. All soils used for non-forage crops

Total molybdenum: less than or equal to 0.03 mg/L average

INDUSTRIAL WATER SUPPLIES

No criterion is proposed.

Application of the Guidelines

Concentrations of molybdenum normally will be well below the proposed criteria in streams unaffected by anthropogenic activity. Therefore little concern usually will exist with respect to aquatic life, wildlife, irrigation, livestock, and human consumption of these waters.

Judgment will have to be used when applying these criteria for irrigation purposes. Ideally, an analysis of the irrigated land should be done to provide information on soil pH, copper and molybdenum content, and to determine if the soil is well drained. When such information is not available, soil survey maps can be used. Three drainage classes from these maps would be associated with the class of well drained, in

this document. These are rapidly, well, and moderately well drained. Corresponding to the class of poorly drained in this document are the map classifications of imperfectly, poorly, and very poorly drained.

Objectives which are established should consider the drainage of the soil, the type of crop and whether high copper concentrations exist in the irrigation water which would offset deleterious effects of molybdenum.