

Executive Summary

Environmental Risk Based Approaches for Managing MWWE

The objective of this project was to conduct a comprehensive review and analysis of current approaches to environmental risk assessment for municipal wastewater effluents (MWWE) that are in practice within Canada and internationally. This study augmented a previous survey that was conducted by the Canadian Council of Ministers of the Environment, which summarized the regulatory requirements and implementation mechanisms currently in place for regulating MWWE discharges in Canada. Canadian jurisdictions were approached again to obtain additional information regarding current regulatory practises and, specifically, those that take into account some aspect(s) of the receiving environment. In addition, surveys were sent to and received back from contacts within regulatory agencies in the United States (Florida, Ohio, New Jersey, and Washington) and overseas (Australia, England, Finland, Germany, New Zealand, Sweden).

A variety of regulatory approaches are presently utilized in Canada for managing MWWE, ranging from a strictly technology-based (generic effluent limits) approach (Newfoundland) to an environmental risk-based approach involving derivation of site-specific discharge limits for protecting specific water uses (Quebec). The majority of Canadian jurisdictions have adopted a hybrid approach, with generic guidelines or regulatory limits for a limited suite of conventional parameters (e.g., biochemical oxygen demand- BOD₅ or carbonaceous biochemical oxygen demand-CBOD₅, total suspended solids-TSS, fecal coliforms), and mechanisms for imposing more stringent limits or more parameters on a site-specific basis at the discretion of the regulatory authority. In some cases, environmental risk is considered in a limited way (e.g., generic discharge criteria within broad categories reflecting receiving environment type and/or dilution/mixing characteristics). Several provinces have policies, guidelines, and/or formalized procedures for deriving site-specific effluent limits for ammonia and other parameters, but they are not necessarily universally applied among treatment facilities.

Where utilized, site-specific discharge criteria are typically developed by back calculation from water quality standards, objectives, or guidelines for protecting uses of the receiving water. In Quebec, this has been adopted as the preferred approach for derivation of effluent limits, although it has been relying to date on voluntary compliance because it lacks a regulatory mechanism for enforcement. Alberta and Ontario may apply either a site-specific or a generic criterion, typically whichever is more stringent. Other Canadian jurisdictions have only rarely derived site-specific limits for municipal facilities, most often for newer and larger facilities than for older, smaller facilities.

Internationally, the United States is the only jurisdiction of those surveyed that formally regulates MWWE using an environmental risk-based approach. There, most receiving waters, or portions thereof, are formally designated as having one or more beneficial uses (aquatic life, recreation, drinking water, etc.), although the use designations (categories) vary from state to state. The most stringent of the applicable quality criteria (pertaining to the various applicable beneficial uses) is then applied to each receiver and effluent limits for all dischargers to the receiver are back-calculated from the criteria to ensure that the criteria can be met in the receiver.

U.S. jurisdictions also use toxicity tests for managing MWWE, whereby laboratory tests of effluent toxicity are expected to demonstrate that toxicity does not occur at concentrations occurring in the receiver. In some U.S. jurisdictions, assessments of indigenous receiving water biota are also required to verify that aquatic life is adequately protected. Although the specifics of the approaches differ, this is analogous to the Environmental Effects Monitoring requirements currently specified in the Canadian *Fisheries Act* regulations respecting metal mines and pulp and paper mills.

While several Canadian jurisdictions utilize environmental risk-based approaches for MWWWE that are similar to those used in the U.S., the U.S. approaches are nationally more widely and consistently applied, and more extensively documented (e.g., more formal procedures and specific guidance). This reflects the fact that MWWWE have been actively regulated in most states for decades, and all facilities have been expected to comply.

None of the European countries surveyed formally employ environmental risk-based approaches for MWWWE regulation. Finland has the flexibility to impose site-specific limits but there is no formalized policy or approach for doing so.

Environmental risk-based guidelines exist in Australia and New Zealand but these are not consistently applied. The basis for establishing limits is left to the discretion of the responsible regulatory authorities. Like the approach used by the U.S. and some Canadian provinces, the guidelines generally involve back calculation to achieve criteria that protect beneficial uses of the receiving environments.

None of the jurisdictions surveyed uses environmental risk-based approaches for management of combined (sanitary and stormwater) sewer overflows (CSOs).

In summary, the majority of jurisdictions in Canada and internationally presently emphasize a technology-based approach for managing MWWWE, with some jurisdictions (e.g., U.S., Alberta) also using environmental risk-based approaches to establish more stringent limits or set effluent limits for non-conventional parameters. Each of the various technology-based and environmental risk-based approaches are associated with advantages and disadvantages, which will need to be taken into account during the development of a national strategy for Canada. The technology-based approaches employed in Canada generally accept varying degrees of treatment, with limits established based on the level of performance that can be expected from such treatment technologies. In contrast, the US has established secondary treatment as the minimum acceptable standard, reflecting a value judgement that it is unacceptable to pollute when there is adequate technology to reduce pollutant loadings. The main advantage to an environmental risk-based approach is that MWWWE treatment is geared specifically toward site-specific conditions and costs are thus proportionally allocated to sites that will likely demonstrate the greatest measurable improvement.

With respect to environmental risk-based approaches, there are three general approaches that have been adopted among the various jurisdictions surveyed, each with its own benefits and limitations:

1. Derivation of site-specific effluent limits based on back calculation from water quality criteria developed to protect specific beneficial uses of the receiver (e.g., protection of aquatic life, recreation, drinking water etc.).
2. Derivation of site-specific effluent limits based on protection against whole effluent toxicity (i.e., toxicity must not occur at concentrations exceeding the available dilution).
3. Surveys of receiving water biota to assess the efficacy of the established MWWWE limits in terms of protecting such biota.

Consideration should be given to the use of any or all of the above as part of a potential framework for regulating MWWWE in Canada.