



Environmental Guidelines

318-6

Management of Wastewater Treatment Systems

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ENVIRONMENTAL GUIDELINES (EG) – MANAGEMENT OF WASTEWATER TREATMENT SYSTEMS

PRIMARY GOALS

To reduce environmental impacts of effluents from wastewater treatment systems operated by the Correctional Service of Canada (CSC) to a minimum.

To ensure that raw water and wastewater are treated using technologies and practices that minimize harmful environmental impacts, and that the sludge removed during raw water and wastewater treatment is recycled or disposed of properly.

SPECIFIC OBJECTIVES

To ensure that the management of wastewater treatment systems operated by CSC is conducted in compliance with applicable laws, regulations, guidelines, standards and codes.

To ensure that preventive and standardized practices are in place concerning the operation, the maintenance and the monitoring of the quality of wastewater treatment systems.

To ensure that sewage does not contain environmentally harmful contaminants that cannot be removed by, or that affect the efficacy of, wastewater treatment.

To reduce the financial and environmental risks (sediment, surface water and groundwater contamination) resulting from the operation of wastewater treatment systems.

To maintain a registry on effluent quality (i.e. on the treatment performance) of wastewater treatment systems.

AUTHORITIES

Correctional Service of Canada Commissioner's Directive 318 – Environmental Programs.

Canadian Environmental Protection Act, 1999.

Fisheries Act, R.S.C. (1985), c. F-14.

Migratory Birds Convention Act, 1994, R.S.C. (1985), c. M-7.01.



Migratory Birds Regulations, C.R.C., c. 1035.

Sustainable Development Strategy (SDS) of the Correctional Service of Canada.

Guidelines for Effluent Quality and Wastewater Treatment at Federal Establishments, Environment Canada, April 1976.

Final Report – Proposed Approach for Wastewater Effluent Quality Framework and Guidelines for Federal Facilities, FCEMS / Wastewater Working Group, Environment Canada, June 1, 2000.

Provincial acts and regulations on environmental protection.

Provincial and/or municipal regulations on the discharge of wastewater into sewage systems and streams.

Regional municipality and city handling requirements, by-laws and regulations on wastewater.

SECTION 1 – DEFINITIONS, RESPONSIBILITIES AND SCOPE

DEFINITIONS

For the purpose of these Environmental Guidelines:

Advanced wastewater treatment – Treatment systems designed to remove pollutants that are not adequately removed by conventional secondary treatment processes.

Biochemical oxygen demand (BOD₅) – Quantity of oxygen used for biological oxidation of organic compounds in five days at 20°C in an aerobic environment.

Contaminant – Any chemical substance whose concentration exceeds background concentrations or which is not naturally found in the environment.

CWQG – Canadian Water Quality Guidelines.

Effluent – All wastewater discharged directly or indirectly into surface water, a storm sewer or a municipal sewage system.

EMS – Environmental Management System.

FCEMS – Federal Committee on Environmental Management Systems.

Grab sample – A single sample of wastewater taken at neither a set time or flow.

Land runoff – Water reaching the receiving streams or other body of water directly or indirectly as runoff from precipitation.

pH – A value taken to represent the acidity or alkalinity of an aqueous solution. It is defined as the negative logarithm of the hydrogen ion activity of the solution.



Primary treatment – An initial treatment, where the most easily separated effluents are eliminated: solids that separate easily, oil film or other light compounds. Primary treatment eliminates approximately 60% of total suspended solids, nearly 35% of BOD and 50% of pathogens. Dissolved impurities are not eliminated. This treatment is usually used as a first step before secondary treatment.

Rainwater – Water from rain or other natural sources of precipitation, or from drainage or melting of snow and ice.

Receiving water (or receiving water body) – Surface or ground water into which treated or untreated waste (effluents) is discharged.

REO – Regional Environmental Officer.

Runoff – The portion of the total precipitation on an area that flows into stream channels. Water from surface runoff does not enter the soil. Water from groundwater runoff or seepage flow enters the soil before reaching the stream.

Secondary treatment – A combination of biological or chemical, and mechanical processes, or processes using gravity to eliminate dissolved materials and colloids as well as suspended matter. This degree of treatment is considered to result in the removal of at least 85% of suspended solids and BOD.

Septic tank – A watertight vault in which sanitary sewage is collected for the purpose of removing scum, grease and solids from the liquid without the addition of air and where solids settling and anaerobic digestion of the sanitary sewage take place. The effluent is then discharged for further treatment or for disposal into the soil.

Sewage lagoon – Sewage lagoons are man-made earthen basins (ponds) used for the treatment of wastewater by applying natural processes of mainly bacteria, light and algae to reduce organic matter to acceptable levels. The types of lagoons that are utilized for the treatment include aerobic, facultative and anaerobic ponds.

Small treatment systems – Systems of relatively small wastewater flows servicing rural communities with populations ranging from 100 to 2000 and more residents. Treatment options that are usually considered for such systems include small package plants, stabilization ponds, septic systems, constructed wetlands, etc.

Storm water – Water from rainfall or other natural precipitation, or from drainage or melting of snow and ice.

Suspended solids – Solid matter that either floats or is suspended in water, sewage, or other liquids and that can be removed largely by laboratory filtering.

Tertiary treatment – A treatment method that eradicates pollutants from the effluent that remain after traditional secondary treatment. Tertiary treatment uses the addition of chemical products, or physical or biological processes to improve the quality of effluents in wastewater that has undergone secondary treatment. It is used to eliminate more than 85% of total solids and BOD, or to reduce the concentration of nitrogen and phosphorus. These processes can eliminate more than 99% of all wastewater impurities. The purpose of tertiary treatment is to produce a high quality effluent using the best available technologies.

Total phosphorous – The sum of all forms of phosphate normally present in domestic wastewater, including ortho-phosphates, polyphosphates, metaphosphates, pyrophosphates, and organic phosphates, expressed in terms of concentration of P.

Toxic – Causing or having the potential to cause adverse effects to organisms or populations.

TSS – Total suspended solids.



24-hour composite sample – A sample that consists of several effluent portions (usually one per hour) collected in a 24-hour period and composited according to flow.

Wastewater – The spent water of a community. From the standpoint of source, it may be a combination of the liquid and water-carried wastes from residences, commercial buildings, industrial plants, and institutions, together with any groundwater, surface water, and storm water that may be present. In recent years, the term wastewater has taken precedence over the term sewage.

Wastewater manager – General term meant to include everyone having something to do with the technical and administrative tasks and decisions related to wastewater treatment and discharge.

RESPONSIBILITIES

The Institutional Head, his or her assistants and the Corcan Operations Managers are accountable to ensure compliance with these Environmental Guidelines.

The Chief, Plant Maintenance (CPM) will normally be the person responsible for enforcing and monitoring these Environmental Guidelines. In that capacity, he or she will ensure that a qualified operator is assigned to supervise the wastewater treatment plant.

SCOPE

All CSC institutions that operate wastewater treatment systems are subject to these Environmental Guidelines.

SECTION 2 – GENERAL REQUIREMENTS

1. The CPM will clarify and formalize the custody and maintenance arrangements for wastewater treatment systems.
2. Data from quality analysis of effluents originating from the wastewater treatment system must be kept up to date at all times and recorded in the appropriate file of the institution's Environmental Management System (EMS).

Note: Quantities of sewage effluent do not need to be measured. For SDS and EMS accounting purposes, institutions that are linked to municipal sewage disposal can equate the quantity of sewage disposed of to the amount of potable water used.

3. Data – in paper or electronic format - entered into the local file for quality assurance of effluents must be legible, dated, easily retrievable and traceable (i.e. must clearly refer back to the activity, and the sampling and analysis period).



4. Copies of documents essential to the management of the wastewater treatment system operated by the institution (e.g. lab analysis reports, non-compliance reports, reconstruction projects) should be sent to the Regional Environmental Officer (REO) for information and future use.

Note: Given the repetitive nature of the monitoring process for effluent quality in the institution's wastewater treatment system, duties related to data entry could be integrated into the Maintenance Management System (MMS) by the assigned officer based on a predetermined sequence.

SECTION 3 – SPECIFIC REQUIREMENTS

WASTEWATER DISPOSAL

1. Before being discharged into receiving waters, effluents from CSC institutions must be treated in order to meet the minimal quality criteria set out in federal guidelines on effluent quality and wastewater treatment at federal facilities.
2. In addition, where appropriate, disposal of wastewater from CSC institutions must meet environmental, provincial and municipal objectives (requirements and standards) relevant to discharge into sewers and streams.
3. If the receiving water upstream from the discharge point does not already meet quality objectives, the quality of the effluents must be such that they maintain or improve the quality of receiving waters downstream from the discharge point.
4. No person shall dilute an effluent in order to meet applicable disposal standards and objectives.
5. No person shall deposit a deleterious substance of any type¹ in water frequented by fish.²
6. No person shall deposit any substance harmful to migratory birds in any waters or any area frequented by migratory birds.³
7. All responsibility centres (i.e. the sector heads) must take actions to reduce the risk that environmentally hazardous wastes are disposed of using the sewage system. (This topic is also addressed in the Environmental Guidelines on hazardous wastes management.)

¹ According to the *Fisheries Act*, a deleterious substance is defined as follows: "any substance that, if added to any water, would degrade, alter or form part of a process of degradation or alteration of the quality of that water so that the water is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by humans of fish that frequent it".

² Excerpt from the *Fisheries Act*.

³ Excerpt from the *Migratory Birds Regulations – Migratory Birds Convention Act, 1994*.



DESIGN AND INSTALLATION

8. The CPM must install and maintain the equipments (such as a sieve) to screen sewage effluent before it enters trunk lines leading to the municipal sewage trunk lines or to the CSC sewage treatment plant.
9. All work on wastewater treatment systems (installation, tests, reconstruction, dismantling) must be done by qualified contractors accredited in water treatment.

MAINTENANCE PLAN – AUDITS AND MONITORING

10. The CPM will confirm once annually before March 31st that the wastewater treatment plant operation is compliant. Every fifth year, the CPM should make arrangements for an external inspection to be performed, that would provide assurances that the design, operation, and maintenance of the wastewater treatment plant meet requirements. The audit reports should be sent to the REO for information and future use.

Among other things, the audits should ensure that:

- a. each wastewater treatment plant is classified properly, that the licences of the operators are appropriate for the plant classification, and that annual training requirements for updating the licences of the operators are met;
- b. if applicable, the treatment chemicals used for flocculation and sterilization are environment friendly;
- c. where applicable, the filter backwash and sludge from drinking water treatment are either sent to the sewage system or are disposed of according to provincial and/or local regulations;
- d. for environmental reasons, the treated wastewater produced meets the Federal Government's requirements as defined in "Proposed Approach for Assessing and Managing Wastewater Effluent Quality for Federal Facilities" [quality control may require daily (or combined hourly samples), weekly, and quarterly water sampling and analysis, and quarterly summary reports of wastewater quality should be sent to the REO];
- e. the sludge from wastewater treatment (which contains relatively high concentrations of flocculants, polymers, heavy metals, trihalomethanes, microorganisms, pathogens, etc.) are treated and landspread or disposed of according to provincial regulations.

Note: Sludge processing may be part of a farm nutrient management plan (refer to Environmental Guidelines on hazardous waste management). Landspreading biosolids is a controversial topic. It is suggested that institutions err on the side of exceeding provincial regulations. Sewage sludge should ideally be aerobically composted and sterile before being landspread.

11. Compliance will be achieved with the maintenance plan for the wastewater treatment system according to manufacturer and installer specifications as well as with a schedule of visual inspections of the areas and equipment that make up the treatment system. Visual inspection must be conducted at least once per week depending on conditions of accessibility to the system.



- With a frequency predetermined according to the receiving environment, samples of effluents originating from the institutional wastewater treatment system must be withdrawn (at the discharge point) and sent to an accredited laboratory in order for all the recommended parameters in **Annex A** to be analyzed.⁴ Consequently, analysis of the 12 parameters mentioned below (i.e. those shaded yellow in Annex A) must be conducted more frequently.

Main parameters to analyze from samples of wastewater at the discharge point:

✓ Biochemical oxygen demand (BOD ₅)	✓ Reactive chlorine	✓ Oils and grease
✓ Total suspended solids (TSS)	✓ pH	✓ Phenols
✓ Total coliform count	✓ Temperature	✓ Ammonia
✓ Fecal coliforms	✓ Phosphorus	✓ Nitrates

SECTION 4 – DATA MANAGEMENT AND REPORTING

RECORDS

- Appropriate on-site records must be kept showing the ongoing results on wastewater treated. The data should be integrated into the appropriate section of the Environmental Management System (EMS) in place and retained for at least five years.
- Since the wastewater management process is a repetitive one, tasks related to data collection could be integrated into the institution's Maintenance Management System (MMS), using a sequence predetermined by the wastewater manager.

REPORTING

- As requested by regional or national authorities, the institutional wastewater manager must submit updated information (e.g. lab analysis results for a given period) on the quality of effluents from the institution's wastewater treatment system.
- The institutional wastewater manager shall periodically provide a report to the Environmental Management Committee (EMC) on the efficiency of the institutional wastewater treatment system.
- All significant incidents of contaminant discharge (not adhering to standards set for any given parameter over a predetermined period based on sample sequence and lab analysis) must be brought to the attention of the Regional Environmental Officer (REO), in an advisory report so that appropriate measures may be taken to correct the situation.

⁴ The quality of effluents should be monitored through sampling and analysis compliant with methods prescribed in the latest edition of the document entitled "Standard Methods for the Examination of Water and Wastewater", published by the American Public Health Association, the American Water Works Association and the Water Pollution Control Federation.



SECTION 5 – TRAINING / REFERENCES

TRAINING

1. The officer in charge of the operation, maintenance and quality control of the institutional wastewater treatment system must have received professional training under existing provincial or federal programs in wastewater treatment.

REFERENCES

2. Environment Canada infonet site – EMS Info on Wastewater:
http://www.ec.gc.ca/emsinfo/wastew_e.htm.
3. Proposed Approach for Assessing and Managing Wastewater Effluent Quality for Federal Facilities (preface and table of contents): http://www.ec.gc.ca/emsinfo/approachtoc_e.htm; and/or (full report): http://www.ec.gc.ca/emsinfo/approach_e.htm#article1; or (in another format – PDF file):
[An%20Approach%20for%20Assessing%20and%20Managing%20Wastewater%20Effluent%20Quality%20for%20Federal%20Facilities%20-%20Final%20Report.PDF](http://www.ec.gc.ca/emsinfo/approach_e.htm#article1).
4. Environment Canada infonet site of the Wastewater Technology Centre (WTC):
http://www.ec.gc.ca/etad/English/wtc_e.htm.
5. Environment Canada infonet site for Canadian Environmental Quality Guidelines (CEQG):
<http://www.ec.gc.ca/ceqg-rcqe/English/ceqg/default.cfm>.
6. Environment Canada infonet site for Canadian Water Quality Guidelines (CWQG):
<http://www.ec.gc.ca/ceqg-rcqe/English/ceqg/water/default.cfm>.
7. Canadian Council of Ministers of the Environment (CCME) website: <http://www.ccme.ca/>.
8. Environment Canada infonet site on water: <http://www.ec.gc.ca/water/index.htm>.

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ANNEX A

Recommendations for Wastewater Discharges from Federal Facilities ⁵

Parameters	Disposal Recommendations [in mg/L] (unless otherwise specified)	
Biochemical oxygen demand (BOD ₅)	Freshwater lakes, slow-flowing streams	5
	Rivers, streams and estuaries	20
	Shoreline	30
Fecal coliforms	100 / 100 ml	
Total coliform count	1,000 / 100 ml	
Total suspended solids (TSS)	Freshwater lakes, slow-flowing streams	5
	Rivers, streams and estuaries	20
	Shoreline	30
Reactive chlorine [Cl]	0.01 or current detection limit	
pH	6 to 9	
Phenols (mono- and dihydric)	0.02	
Oils and grease	5	
Temperature	Do not change ambient temperature by more than 1°C	
Ammonia [NH ₃]	1.0	
Nitrates [NO ₃ , NO ₂ in N form]	10	
Phosphorus [P]	1.0	
Sulphurs [in S form]	0.5	
Glycols (ethylene glycol/propylene glycol)	100	
Hexachlorobenzene	0.001	
Aluminium (total) [Al]	2	
Arsenic [As]	0.05	
Barium [Ba]	1.0	
Boron [B]	5.0	
Cadmium [Cd]	0.005	
Chromium [Cr]	0.05	
Chromium (hexavalent)	0.05	
Chromium (trivalent)	1.0	
Cobalt [Co]	0.1	
Copper [Cu]	0.2	
Cyanide [HCN]	0.025	
Fluoride [F]	5.0	
Iron [Fe]	0.3	
Lead [Pb]	0 (detection limit)	
Manganese [Mn]	0.05	
Mercury [Hg]	0 (detection limit)	
Methylene blue active substance (MBAS)	5.0	
Molybdenum (total) [Mo]	0.2	
Nickel [Ni]	0.3	
Ortho-Phosphates	0.5	
Phosphorus (elemental) [P]	0.0005	
Selenium [Se]	0.05	
Silver [Ag]	0.1	
Tin [Sn]	5.0	
Zinc [Zn]	0.5	
Substances set out in CEPA Annex 1	0 (detection limit)	

⁵ **Source:** Framework and recommendations concerning effluent quality of wastewater disposed by federal institutions – Final Report, June 1, 2000 for FCEMS / Wastewater Working Group, Environment Canada.