PROCEDURE F-10-1
(formerly referenced by 08-06)

Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only)

PROCEDURE F-10-1

PROCEDURES FOR SAMPLING AND ANALYSIS REQUIREMENTS FOR MUNICIPAL AND PRIVATE SEWAGE TREATMENT WORKS (Liquid Waste Streams Only)

1.0 General

The primary purpose of the sampling and analysis program covered by Guideline F-10 is to evaluate a sewage treatment works' performance and compliance with effluent requirements. Guideline F-10 and this procedure are meant to apply to all municipal and private (non-industrial) sewage treatment works in the Province of Ontario, except for those exempted from the requirements of Section 53 of the *OWR Act* (R.S.O. 1990).

While it is realized that the more frequently samples are taken and analyzed, the more reliable the performance evaluation will be, it is also recognized that more extensive sampling and analysis will result in greater expense. Ideally, all sewage treatment works could be sampled 24 hours per day every day, but such a program would be unaffordable at all except the largest plants in the Province.

If sample data are to be used for prosecution purposes, the reliability of the data must be high. On the other hand, if the data are only to be used for screening purposes (e.g., to decide when and if more intensive sampling should be carried out), the data reliability need not be as great, and in such instances, the frequency of the sampling and analysis program can be reduced.

The sampling and analysis requirements outlined in this procedure are considered to be suitable for screening purposes only* (a minimum program). The requirements of such an intensive sampling and analysis program and any subsequent prosecution mode sampling program would have to be developed on a case-by-case basis and in accordance with Guideline F-5: "Levels of Treatment for Municipal and Private Sewage Treatment Works Discharging to Surface Waters" and Procedure F-5-3: "Derivation of Sewage Treatment Works Effluent Requirements for the Incorporation of Effluent Requirements Into Certificates of Approval for New or Expanded Sewage Treatment Works". Prior to any legal action being taken as a result of a sewage treatment works' effluent appearing to be in noncompliance with the conditions in a Certificate of Approval, an intensive sampling and analysis program may have to be undertaken to confirm the noncompliance.

*Except for severe and well defined cases of noncompliance where Ministry staff may consider proceeding with legal action based on data from this screening
sample.

The following sections deal in detail with the 'routine' sampling and analysis program and discuss special sampling and analysis programs only in general terms.

The 'routine' sampling and analysis program is the minimum requirement of this procedure and is outlined in detail in Tables 1, 2 and 3 and applies in cases where only BOD_5, suspended solids and phosphorus parameters require monitoring. Although ammonia plus ammonium nitrogen (for effluent only) is included in the 'routine' sampling and analysis program, it is included primarily for the purpose of building a data base to define the performance of individual sewage treatment works. If a sewage treatment works is required to achieve nitrification, a special sampling and analysis program more stringent than the 'routine' program may be necessary to adequately monitor this effluent parameter.

Special sampling and analysis programs may be necessary for sewage treatment works discharging to sensitive receiving waters. These special sampling and analysis programs may deviate from the 'routine' program requirements with respect to sampling and analysis frequency, compositing procedures, parameters to be analyzed for, in-plant analysis requirements, etc. Special sampling program requirements will be developed on a case-by-case basis by Regional Operations Division in conjunction with the Science and Technology Branch and other relevant Ministry Branches to ensure Province-wide consistency and proper allocation of the Ministry's laboratory resources.

The overall responsibility for monitoring a sewage treatment works' performance, including sampling and analysis programs, rests with the plant's operating authority. Although the following procedures indicate that the Ministry Laboratories **will** currently undertake the analytical work for routine sampling programs and <u>may</u> for special sampling programs, this service could be discontinued in future.

2.0 'Routine' Sampling and Analytical Program

2.1 Sample Collection

(a) For all plants with design capacity in excess of $4.54 \times 10^3 m^3/d$, samples should be composited over a twenty-four hour period. For smaller plants, samples composited over the normal hours of manned operation of the plant or at least over an eight-hour period, will be acceptable.

(b) Composite samples shall ideally consist of flow-proportioned aliquots taken at least once per hour over the required sampling period. All aliquots should be thoroughly mixed.

(c) Grab samples will be acceptable for lagoon systems.

(d) To ensure that the best possible accuracy is obtainable from analytical results, all equipment coming in contact with the sample shall be clean.

2.2 Sample Preservation

(a) If an automatic sampler is used, it should be located in a shaded area, rather than in direct sunlight.

(b) The sample itself should be refrigerated at 4EC, if at all possible throughout the collection period, and during the time taken to transport the sample. If plant personnel deliver the samples, a styrofoam cooler can be used for this purpose. Small refreezable ice packs can be placed within the cooler. If, however, the samples must be shipped by courier or express service, it is recommended that a one-day delivery period should be requested.

2.3 Sample Size

(a) At least one litre of sample from each sampling location should be submitted for the minimum analysis requirements (BOD_5, SS, Ammonia plus Ammonium Nitrogen and total P). If the effluent sample has less than 1 mm of solid matter when settled, or is almost clear when shaken, provide an extra litre of sample.

2.4 Timing of Sample Collection and Submission for Analysis

(a) Each sewage treatment works should be assigned a sample submission week by the Regional Office of the Ministry to avoid overloading laboratory facilities. Iter-regional scheduling of sample submissions will be coordinated by the Science and Technology Branch. Allowances should be made to schedule sampling and delivery to coincide with the days on which the analyses are normally performed. For example, samples arriving after noon on Friday will be at least three days old before analyses are done.

(b) Samples should be submitted for analyses as soon as possible following collection. Since it is recommended that analyses be carried out within one day of sampling, sample delivery should ideally be made to the Laboratory within a one-day period.

2.5 Sample Analysis and Data Reporting

(a) The Ministry of Environment and Energy Laboratories will accept for analysis samples associated with 'routine' sampling programs from all sewage treatment works.

(b) Operating authorities who use their own analytical equipment or submit samples to commercial laboratories, shall still submit samples to the Ministry of Environment and Energy Laboratory for purposes of quality control auditing. Until the capability and accuracy of the plant or other laboratory are known, samples shall be submitted as normally required to the Ministry of Environment and Energy Laboratory. As the capability and accuracy of the plant or commercial laboratory become known, the frequency of sample submission to the Ministry Laboratory may be reduced or possibly eliminated entirely. The frequency of submissions for quality control auditing will be suggested by the Ministry's Regional Office. To allow comparison of

analytical results, samples submitted for quality auditing purposes shall be duplicates of the samples analyzed by the plant or commercial laboratory.

(c) To satisfy all, or a part of, the analytical requirements of Guideline F-10, operating authorities using their own facilities or commercial laboratories shall submit copies of the analytical results at least once per month to the Regional Office of the Ministry. The Regions will forward copies of these results to Environmental Monitoring and Reporting Branch.

(d) Eventually, all analytical data determined by the Ministry of Environment and Energy Laboratories from sewage treatment works sampling programs will be fed into a computerized database. Data from other laboratory analyses will also be fed into this database by the Environmental Monitoring and Reporting Branch as they are received from the Ministry's Regions. Thus, annual averages of plant performance and plant status with respect to compliance can be automatically determined. Results will be forwarded from the Science and Technology Branch to the Regions for action.

3.0 Special Sampling and Analysis Programs

Where water assessment studies have indicated the need for limiting the concentrations of ammonia plus ammonium nitrogen, hydrogen sulphide, chlorine or other substances, effluent sampling for these parameters should be undertaken in addition to the monthly analysis for BOD_5, suspended solids and total phosphorus. Deviations from the routine program requirements with respect to sampling and analysis requirements, etc., may also be necessary. In these cases, the special sampling and analysis programs will be developed on a case-by-case basis by Regional staff in consultation with other Ministry Branches. Ministry Regional staff should be contacted by the operating authorities so that clearance can be granted for the submission of samples from special programs to Ministry Laboratories. The Environmental Monitoring and Reporting Branch should be consulted by the Ministry's Regions to ensure Province-wide consistency and equitable allocation of the Ministry's Laboratory capacities.

4.0 Less Stringent Sampling and Analysis Programs

Sampling and analysis programs less stringent than the routine program may be considered for special cases, such as small sewage treatment works discharging to non-critical receivers. Any proposed relaxation from the 'routine' sampling program must be justified (based on additional factors such as manpower limitations, economics, etc.) and agreed to by the Ministry's Regions in consultation with the Environmental Monitoring and Reporting Branch and other relevant Ministry Branches.

5.0 Additional References Pertaining to Sampling and Analysis Techniques

The Ministry's Laboratory Services Branch has prepared the following publications which should serve as reference documents:

(a) Outlines of Analytical Methods, Coordinated by Water Quality Section, Laboratory Services Branch, 1981;

(b) A Guide to the Collection and Submission of Samples for Laboratory Analysis, Fourth Edition, Coordinated by Water Quality Section, July 1979.

SAMPLING OF SEWAGE TREATMENT WORKS

Table 1: Mechanical Treatment Plants (Primary and Secondary)

FREQUENCY	SAMPLE TYPE	SAMPLING LOCATION AND NOTES	PARAMETERS
Monthly	PHYS/CHEM	Raw (minimum 8 hour composite)[1]	BOD_5 Suspended Solids Total Phosphorus
Twice per month	PHYS/CHEM	Treated	Total Phosphorus
Monthly	PHYS/CHEM	Treated (minimum 8 hour composite)[1]	BOD_5 Suspended Solids Ammonia + Ammonium Total Kjeldahl Nitrogen Nitrite as N Nitrate as N
Monthly	BACTI	Treated (if disinfection practised)	Fecal Coliform or *E. coli*
Daily	PHYS/CHEM	Treated (if chlorination disinfection practised)	Total Chlorine residual
Quarterly	PHYS/CHEM	Sludges (if utilized)	<u>All Sludges</u> Total Solids Total Phosphorus <u>Only Anaerobic Sludge</u> Ammonia + Ammonium Nitrate as N <u>Metal Scan All Sludges</u> - Arsenic - Cadmium - Cobalt - Chromium - Copper - Lead - Mercury - Molybdenum - Nickel - Potassium - Selenium - Zinc
Yearly	PHYS/CHEM	Sludges (if not utilized)	<u>All Sludges</u> Total Solids Total Phosphorus <u>Only Anaerobic Sludge</u> Ammonia + Ammonium Nitrate as N <u>Metal Scan All Sludges</u> - Arsenic - Cadmium - Cobalt - Chromium - Copper - Lead - Mercury - Molybdenum - Nickel - Potassium - Selenium - Zinc

[1] For plants with design capacity in excess of $4.54 * 10^3$ m^3/day, samples should be composited over a 24 hour period

Table 2: Lagoons, Seasonal Discharge

FREQUENCY	SAMPLE TYPE	SAMPLING LOCATION AND NOTES	PARAMETERS
Monthly	PHYS/CHEM	Raw, Influent (minimum 4 hour composite)	BOD_5 Suspended Solids Total Phosphorus
Prior to discharge	PHYS/CHEM	Contents of Lagoon	BOD_5 Suspended Solids pH Total Phosphorus Total Kjeldahl Nitrogen H_2S (if odour is present) Dissolved Oxygen on-site (if odour is present)
Twice per week, with a minimum of two samples during discharge	PHYS/CHEM	Effluent (during discharge)	BOD_5 Suspended Solids Total Phosphorus Ammonia + Ammonium Total Kjeldahl Nitrogen Nitrite as N Nitrate as N H_2S (if odour present)
Twice per week, with a minimum of two samples during discharge	BACTI	Effluent (during discharge)	Fecal Coliform or *E. coli*

Table 3: Lagoons, Continuous Discharge

FREQUENCY	SAMPLE TYPE	SAMPLING LOCATION AND NOTES	PARAMETERS
Monthly	PHYS/CHEM	Raw, Influent (minimum 4 hour composite)	BOD_5 Suspended Solids Total Phosphorus
Twice per month	PHYS/CHEM	Effluent	Total Phosphorus
Monthly	PHYS/CHEM	Effluent	BOD_5 Suspended Solids Ammonia + Ammonium Total Kjeldahl Nitrogen Nitrite as N Nitrate as N H_2S (if odour present)
Monthly	BACTI	Effluent	Fecal Coliform or *E. coli*