MUNICIPAL-INDUSTRIAL STRATEGY FOR ABATEMENT

(MISA)

A Policy and Program Statement of the Government of Ontario on Controlling Municipal and Industrial Discharges into Surface Waters

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A POLICY AND PROGRAM STATEMENT OF THE GOVERNMENT OF ONTARIO ON CONTROLLING MUNICIPAL AND INDUSTRIAL DISCHARGES INTO SURFACE WATERS

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MINISTER'S FOREWORD

I am pleased to release the Government's White Paper entitled "Municipal-Industrial Strategy for Abatement (MISA)." This Paper describes my Ministry's new program to reduce the flow of toxic chemicals into our waterways.

The water pollution control system I inherited regulated only a limited number of conventional contaminants.

Yet scores of persistent toxic substances -- some thought to be cancer-causing or able to mutate genetic structure -- are of prime concern today. These chemicals are not adequately addressed by the pollution control system now in place. Furthermore, that system's major criterion governing industrial waste water discharges was concentration -- in other words, if you dilute, you could pollute.

That system was up-to-date a decade ago, but it is inadequate now and I am replacing it. A new set of tough measures designed to deal with persistent toxic chemicals will take its place.

For the first time, the total amount of each toxic contaminant from each polluter will be capped. This will be done by requiring each direct discharger to meet standards attainable by the best available pollution abatement technology.

MISA's best available technology provision will require pollution reductions -- sometimes great, sometimes small, depending on current performance -- from virtually every major discharger of contaminants into Ontario waterways.

Receiving water bodies will be analyzed to see if these stringent standards are enough to protect them. Where they are not sufficient, contaminant limits will be further reduced to protect local water quality.

In addition to reducing pollution from direct dischargers, MISA also seeks to cut contamination from the thousands of industries that discharge waste water into municipal sewer systems, which, in turn, discharge into our waterways. This will be accomplished by setting strict pollution control standards for municipal sewage treatment plant effluent.

Another key departure from past practice is the dynamic nature of the program. This is not a one-step exercise where each polluter must merely meet a single, lower discharge limit. We have included a provision for periodic re-examinations of every discharger. When re-examinations find better technology has been developed, or industry abatement standards have improved, or the receiving body of water is suffering, new and lower limits will be imposed.

The periodic re-examination provision drives MISA toward the goal of the virtual elimination of persistent toxic pollution from our waterways. This is an idealistic goal, yet I believe we have fashioned a program at once immediately practical and capable of getting us all the way to that distant destination.

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STRENGTHENING OUR POLLUTION CONTROL SYSTEM

The Toxics Issue

Like many industrialized areas, Ontario is faced with the challenge of dealing effectively with the increasing presence of toxic contaminants in the lakes, rivers and streams of its aquatic environment.

High mercury levels in fish, dioxin in the Niagara River, the perchloroethylene spill in the St. Clair River -- all have focussed attention over the past decade on toxic contaminants and the potential risks they pose to aquatic life, public health and drinking water quality. The problems of toxic contaminants are of particular public concern in the Great Lakes System, where 800 different chemical compounds have been found.

Water pollution control efforts in Ontario have been hampered by outdated control concepts.

Until now, controls were aimed at the conventional pollutants such as biodegradable wastes, suspended solids, ammonia, phosphorus, some metals, oils, grease and phenols.

The newer, more complex pollutants have escaped specific control and present a threat to our drinking water, fisheries, and wild life.

There are two main groups of toxic contaminants of concern: toxic metals, such as mercury, lead and arsenic; and toxic organics (carbon-based compounds), such as dioxins, PCBs and chlorinated benzenes.

These toxic contaminants differ from conventional pollutants in one or more of the following ways: They pose a risk to fish, plants, wild life and human beings, even at low concentrations. They are persistent and either never break down or do so only very slowly. They accumulate in the environment. They are passed up the food chain in increasing amounts. This process, biomagnification, can result in thousands-fold increases in the concentrations of toxic contaminants from the levels present in the ambient water to those found in large fish.

Toxic contaminants will almost certainly have serious adverse effects over the long term. These effects have been demonstrated in the environment as indicated by the lowered reproduction rates of certain species of birds due to food chain effects.

New Initiatives

MISA will establish an abatement program for all the major specific toxic pollutants. The waste streams for each discharger will be analyzed. Hazardous pollutants will be identified, and discharge standards will be set using as a criterion the best available technology that is economically achievable (BAT).

To cope with the enormous diversity of chemicals found in the environment, target compounds are being selected for monitoring and control. This selection is based on:

- known use of compounds and their release to the environment;

- known toxic effects on plants, aquatic biota, animal life and human health;

- known presence in Ontario's environment.

These target compounds will be used to focus our control programs in a manageable and effective manner. Toxic contaminants must be reduced, at source, before they escape into the environment.

This will be achieved by establishing regulations for each industrial sector and the municipal sector. First, a monitoring regulation will be established requiring each company to monitor its effluent for a wide range of contaminants. The self-monitoring program will be policed by the Ministry taking samples from time to time on unannounced visits. As well, all samples taken by the companies will be duplicated, with the duplicate sample being available for the Ministry.

The MISA program will cover all major toxic polluters of waterways within three years as it encompasses eight industrial sectors, including (in alphabetical order):

- electric power generation
- industrial minerals
- inorganic chemicals
- iron and steel
- metal mining and refining
- organic chemicals
- petroleum refining
- pulp and paper

These sectors comprise some 200 of Ontario's 300 direct dischargers. Most of the remaining direct dischargers will be covered as other minor sectors are brought under the program. The municipal sector, consisting of 400 sewage treatment plants taking waste water from some 12,000 industries, will also be covered. The first two sectors to

be brought under regulation will be the petroleum refining and organic chemical industries. Monitoring regulations for them are planned for mid-1987.

A pre-regulation consultation and cooperative monitoring program with these two industrial sectors and with the municipal sector is currently underway. Confidential information on the companies' own effluent testing programs is being shared with the Ministry.

Abatement regulations for each sector will be introduced nine to twelve months after the monitoring regulation for that sector comes into effect. These regulations will establish best available technology (BAT) standards for each sector, and will require each polluter to meet its sector's BAT standards.

Early 1989 has been targetted for having the complete abatement program for the eight industrial sectors in place. For the organic chemical companies and petroleum refineries, the new abatement programs should be in place early in 1988.

Sensitive and confined aquatic areas may require more stringent reduction programs. These areas will receive individual aquatic monitoring, and discharge standards will be set accordingly,. Six pilot studies will be undertaken in the following areas:

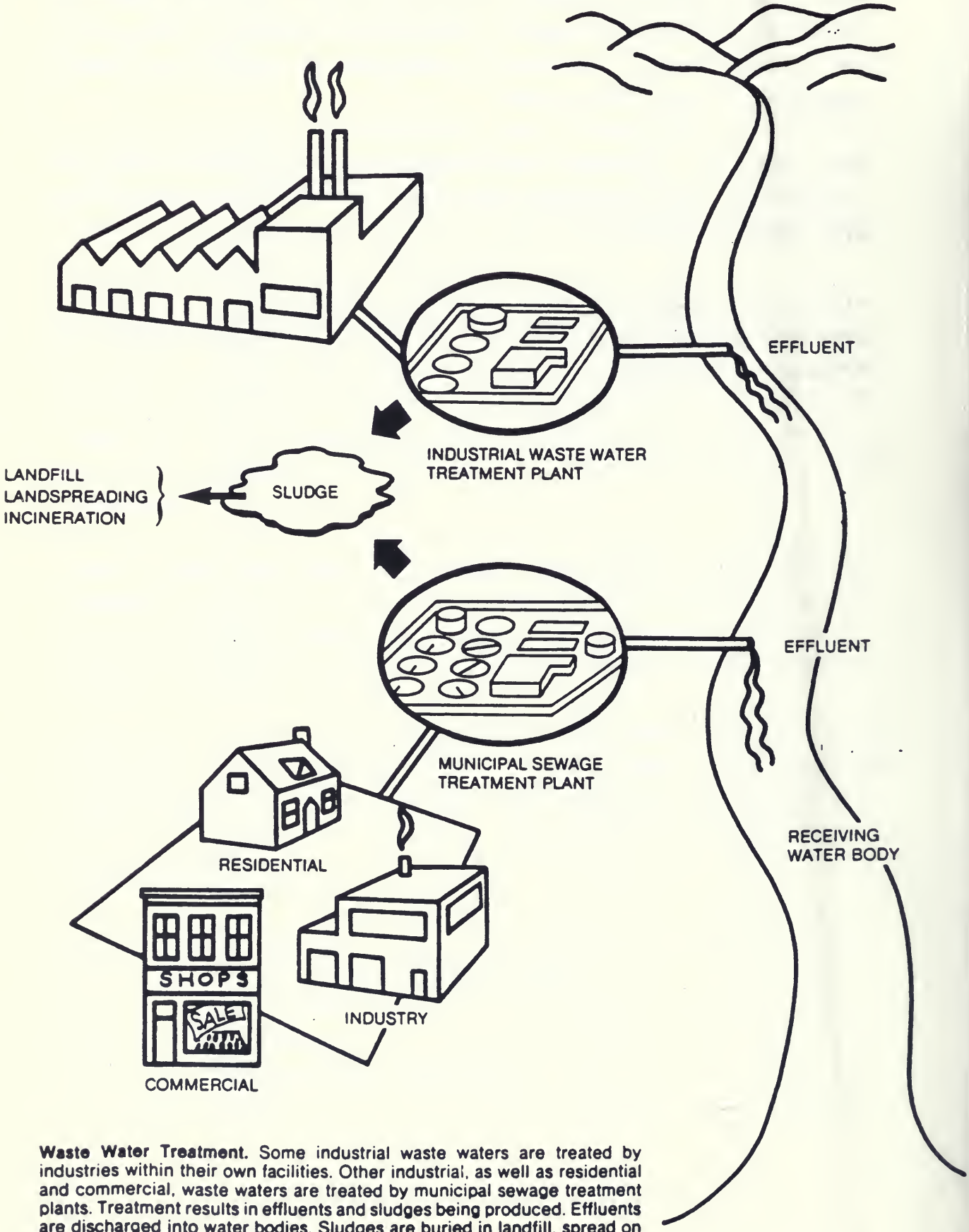
- St. Clair River
- Kaministikwia River (Thunder Bay)
- St. Mary's River
- Toronto Harbour
- St. Lawrence River (Cornwall)
- Grand River

The industries, municipalities and the public will be consulted on the development of the MISA program. There will be 60-days for interested parties to submit written comments on this White Paper.

The Ministry, as well, will continue to consult with the industries, municipalities and the public as the regulations are being developed.

After the regulations are in place, there will be scheduled, periodic reviews to examine and upgrade them as knowledge and technology improve.

FIGURE 1: POLLUTION PATHWAYS FOR MUNICIPAL/INDUSTRIAL WASTE WATERS



Waste Water Treatment. Some industrial waste waters are treated by industries within their own facilities. Other industrial, as well as residential and commercial, waste waters are treated by municipal sewage treatment plants. Treatment results in effluents and sludges being produced. Effluents are discharged into water bodies. Sludges are buried in landfill, spread on agricultural lands or incinerated.

THE MISA SOLUTION

The Ontario Ministry of the Environment is developing the Municipal-Industrial Strategy for Abatement (MISA) to protect Ontario's water quality. This program is being undertaken in full consultation with Environment Canada, municipalities, affected industries, interest groups and the general public.

Goal

MISA's **ultimate goal is the virtual elimination of toxic contaminants in municipal and industrial discharges into waterways.** The fulfilment of this goal is necessary to reduce the risk of damage to the ecosystem and to protect public health by minimizing the presence of toxics in drinking water, fish and wildlife.

This goal will be achieved by:

1. **Identifying and measuring the discharge of toxic substances in addition to conventional contaminants** in municipal and industrial effluents. The result will be the build-up of <u>a comprehensive data base</u> on contaminant discharges across Ontario.

2. **Increasing the emphasis on control technology** to achieve greater reductions of pollution at source. Best available technology (BAT) effluent limits will be set for each industrial sector and the municipal sector as the minimum pollution control requirement for each discharger in that sector.

3. **Strengthening and expanding the existing water quality impact approach** for establishing effluent limits. This approach will complement the BAT approach, with the more stringent effluent limit of the two applying to each discharger.

4. **Strengthening enforcement mechanisms,** including the introduction of monitoring and effluent limits regulations (under Section 136 of The Environmental Protection Act), to set down the obligations of the discharger to participate in the abatement process.

5. **Involving municipalities and industry** in the MISA development process to ensure maximum technological and economic efficiency.

6. **Involving the general public and interest groups** in the MISA development process to promote awareness and to gain widespread comment and advice.

Two Approaches For Setting Effluent Limits

The **best available technology economically achievable (BAT)** and the **water quality impact evaluation** will provide the Ministry with two complementary approaches for setting effluent limits:

1. **BAT approach:** the Ministry will develop regulations setting effluent limits for major industrial sectors and the municipal sector. Effluent limits will be based on the use of the best available technology that is economically achievable for each sector. (See Appendix, p. 31, for details.)

2. **Water quality impact approach:** Dischargers will be required to carry out receiving-water assessments to evaluate the water quality impacts of the various toxic

contaminant levels in their effluents. After validation of these assessments by the Ministry, and taking into account other pertinent information, effluent limits will be set to protect water quality at the site in question. (See Appendix, p. 39, for details.)

For a given site, the requirements of the two approaches will be compared, and the discharger will be required to comply with the more stringent of the two limits. These will be imposed through regulations and appropriate control documents.*

Toxic loadings will be further reduced in future, as individual dischargers are periodically examined, and new technology is developed. By requiring ever more stringent levels within an appropriate time-frame, MISA will progressively reduce the total loadings of toxic substances to Ontario's surface waters.

With the adoption of monitoring and effluent limits regulations, Ontario's water quality management program will be brought more in line with similar Ministry programs for controlling toxic emissions to air and toxic waste disposal to land, which are already governed by regulations under The Environmental Protection Act. Ontario Regulation 308 for air quality management is currently being revised. Ontario

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* A control document is any written instrument that carries statutory authority. These include Minister's reports, licences, permits, certificates of approval, control orders, orders, requirements and directions and program approvals.

Regulation 309 for waste disposal to land has been similarly upgraded, in particular to include a waste generator registration component.

Taken together, these reforms and the MISA regulations, as well as other relevant federal and provincial initiatives, will provide a comprehensive approach to all of Ontario's toxic waste management programs.

Program Benefits

The regulatory development and environmental protection reforms of the MISA program offer several advantages:

- The program will **reduce total loading** of toxic contaminants to Ontario's lakes and rivers.

- The **comprehensive data base** will provide a register of toxic contaminants in municipal and industrial effluent discharges.

- The **uniform application of BAT** effluent limits across each sector in the province will provide **improved pollution control**, and, at the same time, avoid putting any individual discharger at a competitive disadvantage.

- The complementary BAT and water quality impact approaches will allow for greater **economic and administrative efficiency** in the application of full environmental protection measures.

- The rules will be clearly identified at the outset, allowing industries and municipalities to know what will

be required of them, and the public to know what is being done to protect water quality.

- Abatement of toxic chemical discharges from industrial and municipal plants can then be scheduled. Enforcement of these requirements will be facilitated and strengthened by giving effluent limits a legal status.

KEY COMPONENTS OF MISA PROGRAM

The key components of the MISA program are:

1. pre-regulation consultation with the affected municipalities, industries and the public to achieve the optimum program;

2. a comprehensive data base of toxic contaminants in effluent discharges;

3. a best available technology approach for setting effluent limits for each industrial and municipal sector;

4. a water-quality impact approach for setting effluent limits for each body of receiving water;

5. abatement and enforcement mechanisms.

Pre-Regulation Consultation and Public Participation

The full participation of affected municipalities, industries and the public is a vital aspect of the MISA program. Ministry officials have held a series of preliminary meetings with some municipal, industrial and public interest groups as part of the pre-regulation phase of MISA development.

Municipal/Industrial Consultation. During the pre-regulation phase, the Ministry will administer preliminary effluent monitoring programs designed to lead to effective and practicable monitoring and effluent limits regulations. Several industrial sectors and the municipal

sector have already agreed to cooperate with the Ministry in this work.

They will be involved through individual sector technical committees made up of Ministry, Environment Canada and respective sector representatives. The sector committees supervise the work of consultants engaged at the expense of the respective industries for the pre-regulation monitoring program, make recommendations regarding the program, and advise on the content of the monitoring regulation. The Ministry anticipates that the sector committees will also continue to advise on the development of the effluent limits regulations. Industrial sectors are typically represented on committees by their industry associations. The municipal sector is represented on committees by the Municipal Engineers' Association of Ontario.

General Public and Interest Groups. The general public and interest groups have significant opportunities for involvement throughout the MISA development process:

- Public review of, and comment on, this White Paper are invited for a 60-day period following its publication.

- Regulations will be drafted in the first instance with advice from technical committees with municipal and industrial representation.

  An advisory committee, including public interest group representatives, will review the draft regulations, and provide advice and recommendations to the Minister of the Environment on the contents of the regulations.

- There will be a formal period for public review of, and comment on, the draft regulations.

- The public will have complete access to data on contaminant discharges to surface waters and on the effluent limits set for all discharges. They will know which dischargers are in compliance, which dischargers have to implement further pollution abatement and the status of individual abatement programs.

Data Base

Through the monitoring regulation, a large data base on toxic contaminants in direct discharges will be built on existing industrial and municipal data bases, with uniform sampling, testing and reporting methods. This information will be used:

- to measure contaminant loadings and variations over time;

- to relate known environmental degradation to specific pollution sources;

- to act as the trigger for abatement and enforcement.

Best Available Technology Economically Achievable (BAT)

BAT effluent limits will be set by regulation for each industrial sector and the municipal sector. In this regard, the experience of the U.S. Environmental Protection Agency (EPA) will be particularly useful. Effluent limits will be those attainable by a combination of control technologies that constitute BAT. These can include: on-site treatment; in-plant treatment; recycling and water re-use; process change; substitution or replacement of materials used in the process. (For full details of BAT effluent limits

development, see Appendix, p. 31). In the case of municipal sewage treatment plants, pre-treatment for industries discharging into sanitary sewers will also be considered.

In establishing the appropriate control technology, factors other than water quality, such as air quality and solid waste disposal, should be taken into account. For example, it would be unacceptable to have a treatment process that would reduce pollution in water while significantly aggravating air quality or sludge disposal problems.

Once effluent limits are set, the actual choice of methods or technologies to be used will generally be up to the individual discharger as long as sector effluent limits are met.

Regulations setting out effluent limits will also require that industries have programs in place for controlling on-site spills and leaks, as well as the run-off from raw materials storage and handling areas. The term "Best Management Practice" is applied to these programs.

Water Quality Impact

The calculation of effluent limits involves the collection and analysis of data on water quality, effluent quality, sediments, aquatic life, and local stream flow and lake currents. This information is incorporated into modelling and other assessment techniques selected by the Ministry to permit evaluation of impacts on the receiving water body that correspond to a given set of effluent limits.

Through this process, the effluent limits required for protection of receiving-water quality at a given site will be determined. In all cases, a preliminary assessment of

receiving-water impacts will be required to confirm (1) whether BAT effluent limits are sufficient for protection of water quality, or (2) whether full-scale, detailed, receiving-water studies are required to establish more stringent water quality impact effluent limits. (For details on the setting of water quality impact effluent limits, see Appendix, p. 39).

Abatement and Enforcement

Under The Ontario Water Resources Act and The Environmental Protection Act, the Ministry can control the discharge of contaminants that may impair the quality of water or the environment. The Acts provide for a number of control methods, set out in written control documents, which include requirements for dischargers to abate pollution.

Regulations under The Environmental Protection Act are a key component of MISA. A **monitoring regulation** (see p. 21 for details) will set out requirements for dischargers to sample their effluents and submit data on a set schedule. An **effluent limits regulation** (see p. 22 for details) will set out requirements for dischargers to meet specified effluent limits defined in statistical terms.

The Ministry will become aware of effluent limit violations by: (1) dischargers being required to notify the Ministry of violations, (2) Ministry staff screening the monitoring data submitted by dischargers, (3) Ministry staff evaluating data collected during inspections. The Ministry will evaluate violations for abatement and enforcement actions. All violations will be evaluated using established principles to determine if a prosecution should be launched.

Abatement responses include:

- **Notification of violation** to the discharger, including a request to explain the violation and remedy the problem. Where the Ministry makes a written abatement request for action to reduce, prevent or eliminate pollution, a reasonable time to comply will be specified.

- **Control orders,** including orders under the EP Act and requirements and directions under the OWR Act. Control orders require specified abatement actions to be accomplished under a given schedule.

Irrespective of their routes to abatement, and the fact that the Ministry may issue a control order, dischargers must apply to the Ministry for certificates of approval for proposed works to be constructed for abatement programs. (For more details on abatement and enforcement procedures, see Appendix, p. 45.)

MISA PROGRAM DEVELOPMENT

The Process to Put MISA into Place

The MISA program will be put into place as follows:

1. **Pre-regulation Phase.** A pre-regulation consultation and monitoring phase will be conducted to provide data and information for the development of effective and practicable regulations for each sector.

2. **Monitoring Regulations.** When the pre-regulation monitoring period for a given sector has been completed, a monitoring regulation will be promulgated for that sector.

3. **Effluent Limits Regulations.** As pollution data are collected and pollution control technology assessed, BAT effluent limits regulations will be promulgated for each sector.

4. **Abatement and Enforcement.** Implementation of the monitoring and effluent limits regulations will lead to the abatement of discharges at source. The Ministry will back up abatement requirements with established enforcement procedures.

5. **Timing and Sequencing.** The monitoring and effluent limits regulations will be phased in over a three-year period for the industrial sectors and by the end of 1989 for the municipal sector.

6. **Public Participation.** Municipalities, industry, the public and interest groups will all participate in the development of the MISA program.

Pre-Regulation Phase

As mentioned previously, the Ministry will administer preliminary effluent monitoring programs designed to lead to effective and practicable monitoring and effluent limits regulations. Pre-regulation monitoring will provide a wide range of information regarding location of monitoring points; understanding of plant processes, including effects of operations on toxic loads; designation of substances to be tested, and frequency of monitoring and sampling, analytical and reporting procedures and related quality-control requirements; and exploration of biomonitoring techniques for measuring the impact of toxics. Existing data bases assembled by industries are being made available to the Ministry of the Environment.

Guiding the MISA process through the pre-regulation phase are a number of committees made up of representatives of the Ontario and federal governments, the public and, in turn, the municipal sector and each industrial sector (see Figure 2).

The overall efforts of the pre-regulation phase are being conducted on a joint basis by representatives of the Ontario Ministry of the Environment and Environment Canada. Together they have formed an Ontario/Canada Steering Committee supported by technical working groups to deal with the following items: regulation development, industrial sector effluent characterization* and limits, municipal sector effluent characterization and limits, toxicity testing and other forms of biomonitoring, pilot site studies and receiving-water assessment modelling, data management systems development, and sampling and analytical procedures.

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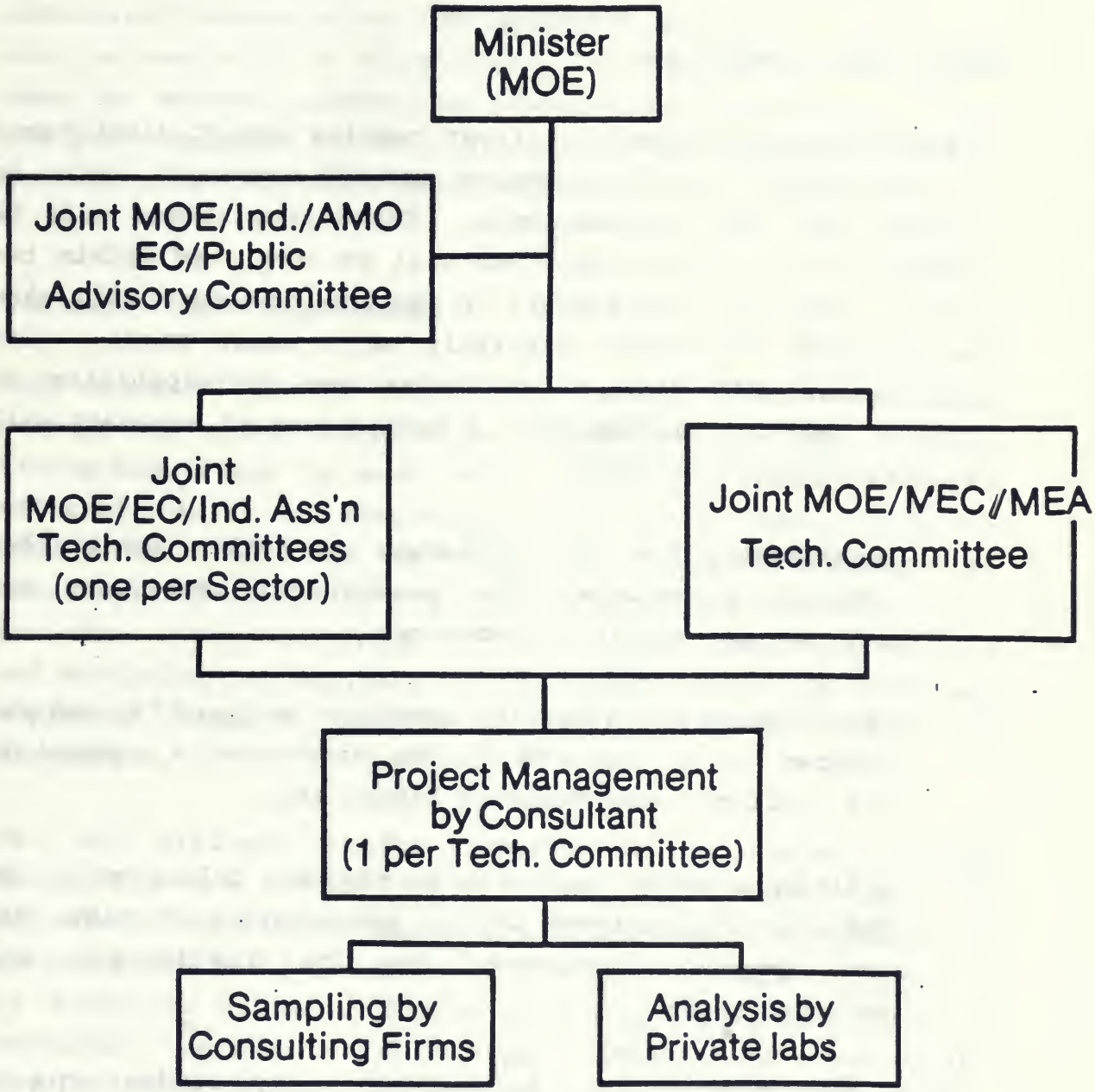
* A process to identify the presence and level of the chemical compounds in an effluent.

FIGURE 2:

PRE-REGULATION MONITORING PROGRAM

COMMITTEE STRUCTURE



LEGEND:

MOE	Ministry of the Environment (Ontario)
Ind.	Industry
AMO	Association of Municipalities of Ontario
EC	Environment Canada
MEA	Municipal Engineers' Association (of Ontario)

The process is complemented by individual sector technical committees made up of Ministry, Environment Canada and respective sector representatives. (See p. 13 for sector committee composition and functions.)

Monitoring Regulations

Monitoring regulations will first require direct dischargers in eight major industrial sectors and the municipal sector to monitor for toxic contaminants. These regulations will be phased in on a sector basis and will be completed within two years. Remaining dischargers in the minor sectors will also be required to monitor similarly at a later stage. The regulations will require industries and municipalities to monitor their own discharges. A high degree of accuracy will be ensured in three ways:

1. requirements for the discharger to follow established sampling procedures, flow measurement procedures and laboratory analytical procedures;

2. requirements for a quality-assurance and quality-control program to be followed by the discharger's laboratory and checked by the Ministry laboratory;

3. additional audit samples to be randomly collected by the Ministry and analyzed in its laboratory to verify that the samples collected by the discharger are representative.

These requirements will be backed up by random on-site inspections by Ministry staff, and by the penalty provisions of The Environmental Protection Act relating to non-compliance with regulation requirements and to knowingly giving false information.

The monitoring regulations will state procedures for the collection and submission of data and the keeping of records. The intent is to accumulate data to identify problem discharges. The existing computerized data centre linked to the Ministry's six regional offices is being improved for the speedy and efficient collection of the data and its subsequent dissemination for abatement purposes. These data will be available to the public. The data base will also be used to augment information provided by dischargers during the pre-regulation monitoring phase on the use and release of contaminants from their point sources.

Effluent Limits Regulations

BAT effluent limits regulations will follow monitoring regulations within nine to twelve months. The BAT effluent limits regulation for each sector will be developed to define effluent limits in statistical terms such that compliance with these limits can be measured. A clear definition of non-compliance with any requirement of the regulation will be included. Responsibility for maintaining operating records and notifying the Ministry of violations, upsets, planned and unplanned bypasses, spills and leaks will rest with the discharger.

The BAT effluent limits regulations will also include specific steps to be followed when an effluent limit is exceeded. These steps include: notification of exceedance of effluent limits to the Ministry; intensive sampling; actions to establish cause of violations; and requirement to take abatement action. The Ministry anticipates that these regulations will result in significant pollution reduction.

To provide for more stringent effluent limits to be applied as abatement technology improves, a requirement for regular review of those limits will be incorporated in the regulation and/or in the appropriate control documents.

Socio-economic impact studies will be done for each industrial sector and the municipal sector as the effluent limits regulation for that sector is prepared. This economic impact will be one of the factors considered by both the joint technical committees and the advisory committee (Figure 2) as the regulations are developed, and by the Government when it promulgates the regulations described above.

Abatement and Enforcement

The Ministry will improve and strengthen existing abatement and enforcement (summarized on p. 16 and described in detail in Appendix, p. 45) as follows:

1. Stiffer penalties for violation of environmental laws are being proposed.

2. Effluent limits regulations will outline specific abatement responsibilities and include steps to be followed when violations occur.

3. Existing control documents will be revised to be compatible with the effluent limits regulation. Periodic review of control documents will be introduced.

4. Control of industries discharging to municipal sewer systems will be reinforced; they may be required to pre-treat their wastewater at source.

5. Computer operations will be streamlined to aid in (a) managing the anticipated flow of extensive monitoring data, (b) identifying violations, and (c) triggering abatement and enforcement action.

Sequence and Timing

The MISA program will be applied in stages to the municipal sector and eight major industrial sectors.

The program will first be applied to the petroleum refining and organic chemicals sectors, which have already entered the pre-regulation consultation and monitoring phase. The program will then be applied to the other six major industrial sectors (listed alphabetically):

- electric power generation
- industrial minerals
- inorganic chemicals manufacturing
- iron and steel
- metal mining and refining
- pulp and paper

The municipal sector has also entered the pre-regulation phase. Regulations will be applied to municipal STPs on a staged basis. Mechanisms for the control of industrial discharges to municipal sewer systems will be developed in parallel with the municipal control program for STPs; they are expected to be completed by the end of 1989.

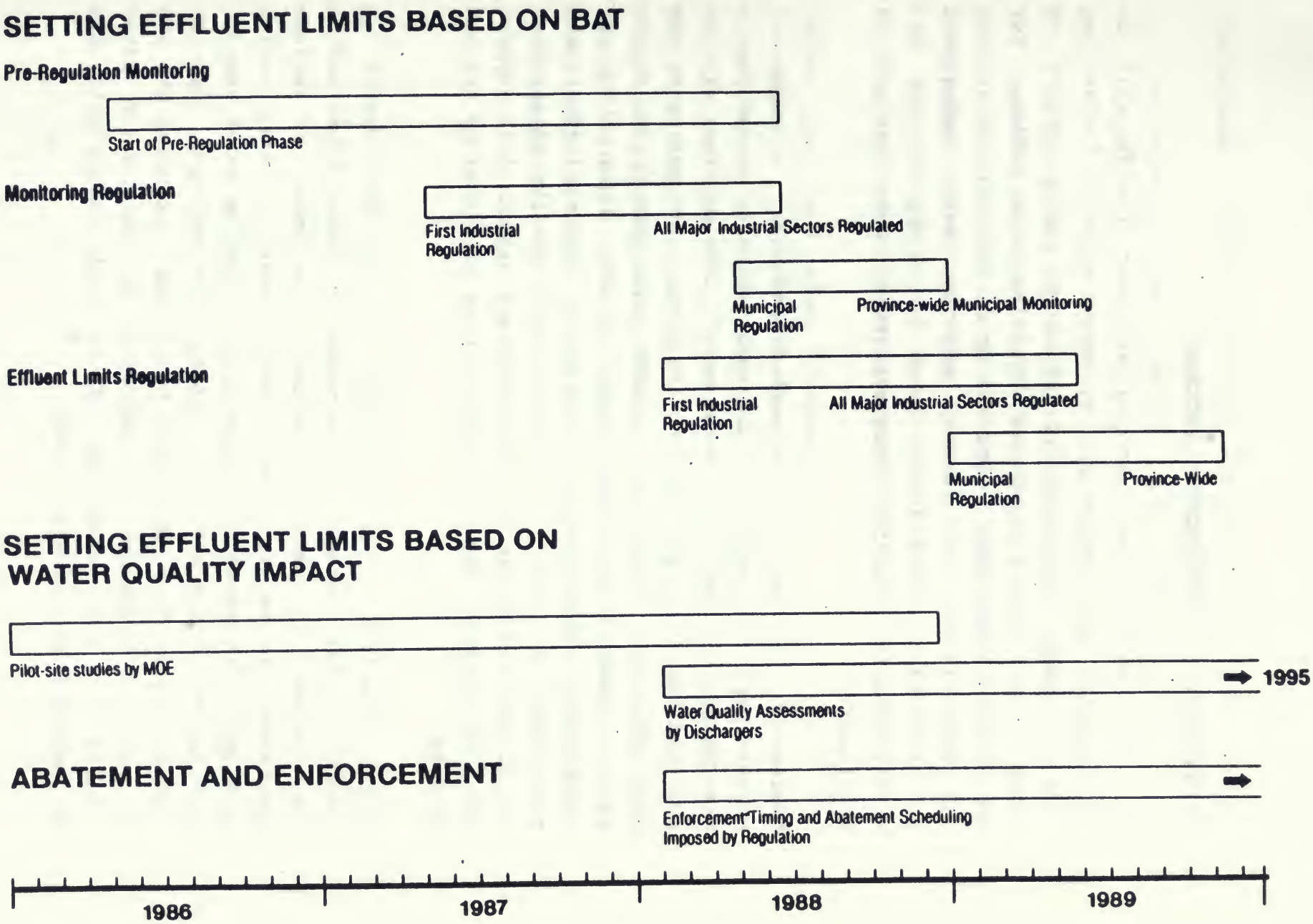
Monitoring regulations should be in force for the petroleum refining and organic chemicals sectors by the spring of 1987, for other industrial sectors by mid-1988 and for all municipalities through to the end of 1988. Effluent limits

regulations are expected to be in force nine to twelve months after monitoring regulations. Figure 3 is an implementation schedule for the phasing in of the MISA program.

Public Participation

As has been indicated (see p. 12), the municipalities, affected industries and interest groups have important roles in the development of the MISA program. Their representatives will participate on committees to be established on a sector basis. Each committee will be activated as the pre-regulation monitoring phase for that particular sector is being initiated. The general public will be invited to review and comment on the draft regulations as they are developed.

FIGURE 3: MISA IMPLEMENTATION SCHEDULE



DEVELOPMENT OF COMPLEMENTARY PROGRAMS

The BAT approach for setting effluent limits will be complemented by the water quality impact approach for setting more stringent site-specific effluent limits needed to protect particularly sensitive receiving water bodies. For the water quality impact approach to be effective in setting effluents limits for toxics, existing water management policies and procedures must be revised and new receiving water quality impact assessment techniques must be developed.

Review of Existing Policies and Procedures. A number of related policies, guidelines and implementation procedures in the MOE publication "Water Management" (1984 edition) will be reviewed and revised to reflect the changes brought on by the MISA program. These will include such issues as mixing zones, receiving-stream design flows, definitions of technical terms (e.g., lethality, persistence) and development of additional ambient water quality objectives. All of these policies and procedures are essential to support the MISA program, and revisions will be completed by the end of 1988.

Pilot Studies. The Ministry of the Environment is conducting field studies at a number of pilot sites across the province to assess and evaluate the impact of various discharges on receiving-water environments. Water bodies with different beneficial uses (e.g., drinking water supply, fish habitats) are included in those sites selected. Special modelling and other assessment techniques, including the use of aquatic organisms as indicators of impacts on water quality, are being developed. These pilot studies will also be completed by the end of 1988.

The purpose of these pilot site studies is two-fold:

1. to develop water quality impact effluent limits for these sites;

2. to develop standardized water quality assessment procedures that a discharger or its consultant can follow for application in other locations. Both simple procedures to be used in preliminary assessments, and complex procedures involving field data collection and modelling for detailed studies will be described.

Water Quality Impact Assessments. Receiving water assessments (to determine water quality impact effluent limits) will be the responsibility of the discharger. These assessments will be continuing at all other watersheds and sub-watersheds where there are dischargers; they will be progressively completed through to 1995. Interim controls based on BAT will be established for industries and municipalities where receiving water assessments have not yet been completed.

FUTURE LOAD REDUCTIONS

The Ministry of the Environment will monitor improvements in abatement technology that will provide the basis for setting progressively more stringent effluent limits. Industry will be encouraged to carry out research and development into new technology and improvement in the operation of existing technology. New options for control (e.g., more in-plant recycling, further substitution and replacement of toxic chemicals in processes) will be encouraged. Some of these alternatives may save money as well as reduce toxic loadings. The BAT levels will be revised periodically to reflect recent advances in technologies and their economic viability. These new BAT limits will then be incorporated in revisions of effluent limits regulations.

Water quality impact effluent limits will be continually reviewed and updated as ongoing scientific studies indicate further environmental impacts.

New and expanded municipal or industrial treatment plants will be required to meet more stringent limits than older established plants.

Effluent limits for existing systems achieving BAT levels will be reviewed periodically; their limits will be reduced if the updated BAT levels or water quality impact effluent limits have become more stringent. In this way, the total loadings of toxic substances to Ontario's surface waters will continually be brought closer to virtual elimination, and receiving water quality will be improved.

A P P E N D I X

SETTING BAT EFFLUENT LIMITS

BAT effluent limits will be based on the performance of treatment and control technologies appropriate for each particular industrial or municipal sector. This approach was first spelled out in the United States as part of the Federal Water Pollution Control Act Amendments of 1972 and the Clean Water Act of 1977. Ontario will be basing its approach on the work of the United States Environmental Protection Agency (EPA), which has carried out extensive technical development of effluent limits based on technology.

EPA Approach

Various levels of technology were defined in the EPA approach including:

<u>For The Control of Conventional Pollutants</u>

- **Best Practicable Control Technology** currently available **(BPT)**, to be applied to existing sources by 1977. This represents the average of the best existing performances in controlling conventional pollutants from plants of various ages, sizes, processes or other common characteristics.

- **Best Conventional Pollutant Control Technology** for existing sources **(BCT)**, to be applied to upgrade existing sources beyond BPT levels (originally) by 1984 if costs were reasonable (as determined by EPA). In many cases additional treatment costs were not deemed to be justified by benefits, and BCT has been set equal to BPT.

For the Control of Toxic (or Priority) Pollutants

- **Best Available Technology Economically Achievable (BAT)**, established as the principal national (U.S.) means of controlling direct discharges of toxic (or priority) pollutants. This represents the best existing economically achievable performance of plants in the industrial category or subcategory.

- **New Source Performance Standards (NSPS)**, based on **Best Available Demonstrated Technology (BADT)**. This requirement may be more stringent than BAT and was considered reasonable in view of the higher performance achievable for newly designed industrial plants. New plants would have more options to use less polluting processes, improved recycling of process streams, reduced water use and more efficient treatment processes at lower cost.

For the Control of Industrial Dischargers into Sanitary Sewers

- **Pretreatment Standards for Existing Sources (PSES) and Pretreatment Standards for New Sources (PSNS)**, designed to prevent the discharge of pollutants that pass through, interfere with, or are otherwise incompatible with the operation of municipal sewage treatment plants.

In setting out requirements for industries to achieve best available technology, the Clean Water Act gave the Environmental Protection Agency the responsibility for determining what the technology included and what the effluent performance should be. The factors considered in establishing the best available technology economically achievable (BAT) level of control include: the costs of

applying the control technology, the age of process equipment and facilities, the process employed, process changes, the engineering aspects of applying various types of control technologies, and non-water quality environmental considerations. In general, the BAT technology level represents, at a minimum, the best economically achievable performance of plants of shared characteristics.

The statutory assessment of BAT considers costs, but does not require a balancing of costs against effluent reduction benefits. In assessing BAT, EPA has given substantial weight to the reasonableness of costs. The Agency has considered the initial volume and nature of discharges, the volume and nature of discharges expected after application of BAT, the general environmental effects of the pollutants, and the costs and economic impacts of the required pollution control levels. Despite this expanded consideration of costs, the primary determinant of BAT is effluent reduction capability using economically achievable technology.

For both BPT and BAT levels, if existing treatment systems in place for a given category or subcategory were judged to be uniformly inadequate in performance, then BPT or BAT standards were transferred from a different category or subcategory.

In addition to a number of treatment-before-discharge technologies, BAT may include process changes in the plant, substitution of chemicals, in-plant treatment, recycling and reduced water usage.

EPA is also authorized to establish best management practices (BMP) for an industrial sector to prevent the release of toxic and hazardous pollutants from plant runoff, spillage and leaks, sludge and waste disposal, and drainage from raw materials associated with the manufacturing or treatment process.

In establishing BAT, NSPS, PSES and PSNS, EPA was required to consider non-water quality environmental impacts, including air pollution, solid waste disposal and energy consumption. It was considered undesirable to eliminate or reduce one form of pollution (in water) if another (in air or on land) was aggravated, or if energy consumption was increased significantly.

The U.S. EPA followed a systematic approach in establishing effluent limits. A comprehensive study of the toxic pollutant problem in each industrial sector was preceded by an intensive evaluation by the EPA of the kinds of data and supporting information that should be assembled as a basis for the development of regulations. All major decisions on the identity of pollutants and the establishment of effluent limitations and standards of performance for each subcategory had to be supportable by documented evidence collected from operating production facilities. Similarly, the necessary information on production rates, processes, raw materials, water use, waste sources and treatment technologies in practice had to be acquired with sufficient detail and breadth of coverage to permit the analysis of the engineering and economic variables that are characteristics of each subcategory. Toxic pollutant control regulations would be based on the application of best available technology for treatment and reliable performance evaluations for the removal of specific waste substances.

EPA first established industrial sector definitions and broke each sector or category down to subcategories, when sufficient differences in age, raw materials and products, processes or waste stream were justified. Screening and verification sampling programs were then carried out to establish the presence of toxics and other pollutants in wastewater and treated water, and to evaluate the environmental significance. Engineering evaluations were

conducted to establish which technologies were available and their performance levels, especially with respect to treatment efficiencies. Treatment system cost estimates were made to determine the probable costs of achieving BPT or BAT levels for each industry.

It should be noted that the EPA program for developing effluent limits in "rules" is not yet complete; however, proposed rules are available for a number of sectors.

Ontario Approach

The Ministry will be defining BAT effluent requirements for each industrial and municipal sector. The U.S. EPA approach, and the supporting information developed in the process of defining regulations under the U.S. Clean Water Act, will be used where appropriate. Ontario and other Canadian data sources and experiences with technology will be considered where available. The procedure will contain the following steps:

1. Definition and establishment of municipal and industrial sectors (individual companies and municipalities included).

2. Consideration of toxic and conventional contaminants of concern for each sector. This will include literature reviews of existing data and consideration of new data produced during voluntary or regulated monitoring programs. This process will identify candidate pollutants for consideration in the effluent limits regulation.

3. Review of existing treatment technologies in use and the status of each industry with respect to compliance with existing guidelines or control orders.

4. In order to establish best available technology for each sector, a review will first be made of EPA documents for their definition of best available technology for control of toxics and best conventional technology for control of conventional pollutants. Use of EPA data is considered valid since EPA used a large data base for most sectors, and most industries use similar processes in North America.

   Secondly, consideration will be given to technology in use in Ontario and other Canadian provinces that is applicable for each sector, including recent research and demonstration programs in control technology. The review will also establish if substantial differences exist between Ontario industries and U.S. sectors because of differences in raw materials, processes, economics or operating conditions. Several levels and kinds of technology may be defined in this step for consideration in subsequent steps.

5. The performance level for the defined technologies will be established in statistical terms for removal efficiencies of conventional and toxic contaminants. Relationships to units of industrial production, gross water use and pollutant loadings to the treatment system will be established. Final performance levels will be established in units of concentration (mg/l) and either mass loading (Kg/day) or load per unit of production (Kg/day/production unit). Performance will be established statistically for normally well operated plants in terms of long-term average (LTA) performance

and maximum variations in performance normally expected to determine a maximum permissible daily value. (This will require definition of the effluent variability-probability distribution generally established in EPA reports).

6. Up-to-date estimates of costs to achieve technology levels for each individual industry will be calculated from readily available information in the U.S. EPA documents and relevant Canadian data.

7. Parameters for definition of limits will be chosen on the basis of potential environmental impact, relationships to toxics (surrogates), or single toxic compounds representative of groups of toxics, and cost. Ideally, a short list of easy-to-measure toxics and conventional pollutants will form the basis of the limits definition. This is on the assumption that compliance with requirements for the short list would achieve control of the long list of contaminants of concern. This short list will be measured frequently in routine monitoring programs, with less frequent sampling of the long list of toxics to check the validity of assumptions.

8. Based on treatment-efficiency and cost, the best available technology and its abatement performance will be defined. In choosing best technology, the Ministry will consider non-water quality impacts in order not to favour technologies that would transfer equal or greater problems to other media (air or solid wastes).

9. Effluent requirements for toxicity, biomonitoring and mixing zones will be considered.

10. Best management practices for each sector will be defined.

11. Municipal and industrial input to the above steps will be provided by frequent opportunities to comment on the requirements before the regulation is drafted. Opportunities for formal review will also occur when the regulation is circulated in draft form.

12. The Ministry will specify the details of information to be submitted by each industry necessary to identify the effluent requirements of that industry.

13. The Ministry will have in place, through prior implementation of a monitoring regulation for each sector, a data base system and reporting procedure. Sampling, flow measurement and analytical protocols will also have been established.

14. The effluent limits will be framed in terms of performance only. The industry or municipality will have the option to choose the means of achieving the effluent limits. An exception to this is being considered in the case of volatile organic compounds where the industry may not have the option of using technologies that would result in air pollution, but would be required to remove these compounds using specific technologies.

SETTING WATER QUALITY IMPACT EFFLUENT LIMITS

The application of BAT effluent limits will not always provide sufficient control of discharges to prevent adverse effects on receiving waters. Care must be taken to ensure that discharge loadings and concentrations do not adversely affect public health, aquatic life, wildlife or any other water use over the short or long term. Water quality criteria for these uses are normally expressed in terms of Provincial Water Quality Objectives (PWQO).

Accordingly, the Ministry is undertaking a major review and revision of its traditional water quality impact approach:

- to provide a capability to assess the impacts of toxics;

- to develop ambient water quality objectives (PWQO) for more toxic substances;

- to set clear policies for assessing the acceptability of discharges, including size of mixing zones*, acute and chronic toxicity, design flows, etc.

This will allow identification of situations where more stringent effluent limits are called for, and development of effluent requirements based on water quality impacts for individual waterways.

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* Mixing zone: an area of water contiguous to a point source where the water quality does not comply with PWQO.

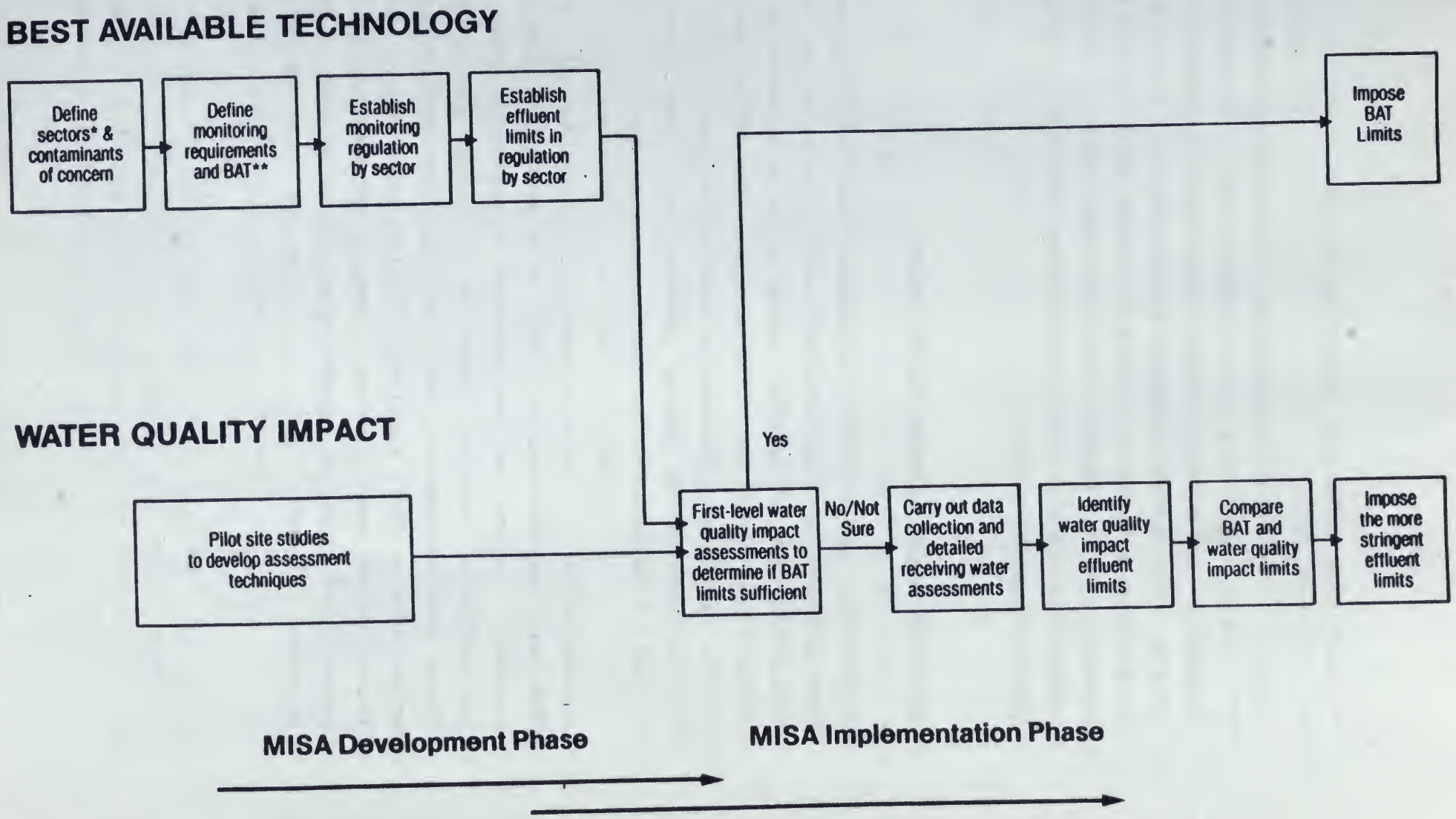
Modelling and other innovative assessment techniques (currently under development through the MISA Pilot Site program) will provide dischargers and the Ministry with the tools for developing these water quality impact effluent requirements.

These assessment techniques will permit the evaluation of the receiving-water impacts, which will result in a given set of effluent limits. In general, it will be the responsibility of dischargers to assess the water quality impacts associated with various effluent levels. Based on this and other pertinent information, the Ministry will specify the effluent requirements that must be met to protect water quality at the site in question. The discharger's assessment will be carefully reviewed and checked for accuracy by the Ministry. The key steps in implementing this approach are outlined below.

Preliminary Assessment

The discharger will carry out studies using several assumed effluent levels above and below the BAT limits to determine the resulting receiving water quality impacts. General requirements established by the Ministry regarding size of mixing zone, toxicity, calculation of design flows, etc., will be used. Existing or readily collected chemical, physical and biological information will also be employed to yield an initial indication of whether the BAT effluent limits are sufficient to protect water quality. If it does, the BAT limits will be imposed. If not, or if the results are inconclusive, then a detailed study will be required to set water quality impact effluent limits. (See Figure 4).

FIGURE 4: TWO APPROACHES FOR SETTING EFFLUENT LIMITS



*Sectors include industrial sectors and the municipal sector
**Best Available Technology economically achievable

Prioritizing Sensitive Receiving Waters

Using a variety of information, including knowledge of areas of concern and impacts on water uses, the Ministry will initially prioritize areas where more stringent effluent limits than those imposed by technology will be needed. Guidelines will be available for both existing and proposed dischargers to enable them to make such a determination themselves, and to get them ready for the detailed water quality impact study.

Detailed Water Quality Impact Study

A detailed water-quality assessment may take various forms, depending on the characteristics of the receiving water and the discharge, and whether the study site represents a simple or complex situation. For example, streamflow variability, current patterns, presence of sensitive aquatic life, bathing beaches and water supply intakes will help identify the extent of detailed water quality assessments.

An evaluation of the site-specific conditions and a review of the data already available will show what additional data are needed. Activities to generate these data could include monitoring of ambient water or effluent, biota, sediment, flows and currents. Such data will be combined with the appropriate BAT effluent limits and other pertinent information, such as the PWQO, interim water quality guidelines and biomonitoring results for assessment purposes.

In simple situations, relatively straightforward data collection and assessment will be sufficient. Major toxic discharges in complex settings could require extensive data collection and complex computer modelling. The Ministry will develop a series of standardized water quality assessment procedures that a discharger or its consultant can follow. This will include both general guidance (manuals outlining typical requirements and preferred assessment procedures) and specific directions for individual situations on the procedures needed.

In cases where a number of dischargers are in close proximity, the Ministry will assist them in planning and coordinating their water quality assessments. The required studies will entail evaluations of (1) the water quality impacts associated with various levels of effluent limits, and (2) the effluent limits resulting from specified boundary conditions (e.g., the size of the mixing zone). Total loading of certain chemicals to the waterbody may be the limiting factor leading to more stringent effluent limits for all dischargers located on that waterbody.

Capabilities (analytical, biological, modelling) to assess water quality impacts are constantly being improved and expanded. With this in mind, requirements for water quality impact effluent limits may change from time to time. For example, biological testing may show a link between chemical constituents in an effluent and tumors in fish. The discharger may be required to eliminate the genotoxic element(s) and demonstrate that removal through a mutagenicity test on the treated effluent.

Waste loading limits are usually developed through the application of mathematical models and other assessment techniques, such as biomonitoring, used in conjunction with environmental protection objectives.

Models can include complex mathematical relationships that incorporate functions for such factors as volatilization, biodegradation, adsorption and sedimentation. Models can reflect a steady-state condition (i.e., a "snapshot"), usually when factors such as waste loading, streamflow, current patterns or temperature reflect a worst-case situation. Other models are called dynamic. They can accommodate changing conditions (waste input, flow, etc.) over a period ranging from hours to months.

Establishment of Effluent Requirements

Using the results of the above studies by dischargers and any other information deemed necessary, the Ministry will establish the effluent limits that will protect water quality. Interim controls based on BAT will be established for industries and municipalities where receiving-water assessments have not been completed.

ABATEMENT AND ENFORCEMENT

Ontario's environmental laws, primarily The Ontario Water Resources Act (OWR Act) and The Environmental Protection Act (EP Act), prohibit the discharge of contaminants that may impair the quality of water or the environment. The Acts provide for a number of control documents, which set out requirements for dischargers. The Acts make it an offence to impair water quality or to contravene any requirement of the Acts, regulations or control documents. Penalties are outlined for offences.

The Ministry may select a number of abatement and enforcement responses when faced with a pollution problem or a violation of requirements in regulations or control documents. The application of the abatement and enforcement program is described in the sequence of activities from collection of monitoring data leading to construction and operation of an approved abatement system.

1. **Monitoring Regulation.** The monitoring regulation will set out requirements to sample discharges and to submit data on a set schedule. Records will be required to be kept and additional data submitted on the operation of the municipal or industrial processes and treatment system.

   The discharger must comply with all requirements of the regulation to collect and report information or be guilty of an offence. The Ministry will routinely collect and analyze its own samples to audit the procedure. It is also an offence under the Environmental Protection Act to "knowingly give false information."

2. **BAT Effluent Limits Regulation.** This regulation will set out requirements for specified effluent limits defined in statistical terms. In addition, the regulation will include requirements to notify the Ministry of known violations of requirements, spills and leaks, upsets, bypasses and of any basic change in the operation of the industrial processes or the treatment system that would increase loading or concentrations.

3. **Violation Reporting.** The Ministry will become aware of effluent limit violations in one of three ways: (a) the discharger will notify the Ministry; (b) a review of submitted data by Ministry staff will identify violations; (c) Ministry sampling during inspections will lead to identification of violations.

   The Ministry will process the monitoring data submitted by the discharger on a timely basis and screen the data to identify violations. The existing "Occurrence Reporting System for Violations of Ministry Legislation" will be utilized for bringing violations forward for review.

4. **Violation Evaluation.** Violations will be evaluated for abatement and enforcement actions. They will be classified by type and severity, frequency of violation, actual or anticipated environmental damages and the environmental history of the dischargers. Appropriate abatement and enforcement responses will be laid out in accordance with the Ministry's policies on "Pollution Abatement Program" and "Uniform Environmental Enforcement."

5. **Enforcement.** The Ministry will follow established principles of prosecution, which include the proper exercise of prosecutorial discretion in achieving its objectives of abating pollution sources.

6. **Abatement Responses.** Abatement responses include:

a) **Notification of violation** to the discharger, including a request to explain the violation and remedy the problem. This could be an informal letter or a formal notification under the authority of a provincial officer to survey, collect information and report on contaminant sources. An informal or formal notification of violation would be appropriate for certain minor or infrequent cases that do not cause environmental damage. Criteria for use in determining responses will be laid out in Ministry policy documents.

b) **Control Orders,** including orders under the EP Act, and requirements and directions under the OWR Act. Control orders refer to a requirement by the Ministry for specified abatement actions to be accomplished under a given schedule. Control orders are legally binding. Failure to make a scheduled improvement is a violation of the control order and an offence.

7. **Abatement Requests.** Where the Ministry makes a written request for action to reduce, prevent or eliminate pollution, a reasonable time to comply will be specified. This applies to the period of time immediately after the effluent limits regulation has been promulgated, when industrial and municipal dischargers may be in violation of these limits. The specified time limit shall not exceed 180 days. After the time limit, the discharger must either be in compliance with limits, or an abatement program must be agreed to and documented in a control document or satisfactory progress towards development of an abatement program (to be spelled out in a control document) must be demonstrated.

For cases where compliance with written requests is not forthcoming, formal abatement or enforcement proceedings will result. This does not prevent the application of these proceedings at an earlier time, if progress has not been made on an abatement program.

8. **Abatement Options.** The discharger has the responsibility of choosing the best combination of technology and techniques for meeting effluent limits. Industries may meet the limits by combinations of external treatment, in-plant treatment, recycling and reuse, and substitution or replacement of chemicals or processes. Municipalities may choose either: (a) to upgrade treatment facilities or (b) to locate sources of contaminants in the industries or commercial establishments discharging to the system and to control them through application of the municipal sewer-use bylaw.

   The Ministry is looking further into modifications of the model sewer-use bylaw: (a) to improve control of toxics; (b) to review means of strengthening regulatory components; (c) to give consideration for specific, pre-treatment requirements for certain industries and types of pollutants.

9. **Certificate of Approval.** Irrespective of the route taken to achieve abatement, the discharger must make application to the Ministry for a certificate of approval (C. of A.) of the proposed works to be constructed for the abatement program. The proposal will be reviewed by Ministry staff and approval given if it is considered capable of achieving the desired effluent limits and meets other requirements of the abatement program.

When issued, the certificate of approval replaces other control documents if their terms are fulfilled by the proposed works. The certificate will restate, or have appended to it, effluent limits from the effluent limits regulation or more stringent water quality impact effluent limits. All other requirements stated in the effluent limits regulation will be restated, or appended, such that a single document will be available containing all requirements for the facility. Additional conditions may be set in this document, including: requirements to monitor substances not included in the monitoring or effluent limits regulation; specific programs for best management practices to be in place; a general requirement to operate the facility in an efficient manner to meet requirements.

RELATED ISSUES

There are several other initiatives regarding the control of toxics that are being, or will be, developed in parallel to the monitoring and effluent limits regulations. These initiatives are complementary to the MISA thrust for improved abatement; when completed, they will be integrated into the MISA Program.

Sludge Production and Utilization

Background. Treatment processes in STPs and industrial operations remove toxic chemicals by three principal mechanisms: stripping; adsorption on to organic and inorganic solids with subsequent sedimentation in clarifiers; biochemical oxidation/reduction. In the case of biological treatment processes, all three mechanisms occur to a varying degree. Many persistent toxic compounds have a propensity to concentrate in sludge. Thus, it is imperative that strict controls be applied to sludge utilization/disposal so as to minimize the release of these contaminants to the environment.

Sludge Utilization in Agriculture. The guidelines for the agricultural utilization of sewage sludge are contained in the publication "Guidelines for Sewage Sludge Utilization on Agricultural Lands". These guidelines set allowable limits for the concentrations of only 11 heavy metals in sludges applied to soil. The guidelines also specify the operating conditions for the spreading of sludge and the physical site characteristics needed to minimize pollutant runoff and groundwater contamination.

The MISA program will provide a data base on toxics (including organics) in sludges. These data, together with further research on soil transport of contaminants and crop uptake, will provide criteria by which the need for standards for toxic organics and other persistent contaminants in the sludge guidelines can be assessed.

Sludge Disposal. Guidelines for the disposal of sludge in landfill are under development with a view to minimizing the release of toxics and other contaminants to the environment. Similarly, guidelines for the design and operation of incinerators used to burn sludge are also under development to control emissions.

Strengthening the Regulatory Framework and Enforcement Mechanisms

The regulatory framework will continually be reviewed and updated to further reinforce the legal structure, improve legal remedies and facilitate MISA implementation.

Regulatory Structure Reinforcement. Parallel to the regulatory development of the **BAT approach**, the possibility of incorporating certain elements of the **water quality impact approach** into a regulation will be explored. Examples of these elements could include requirements for dischargers or proposed dischargers to carry out receiving water assessments, principles and criteria for risk assessment, a practical definition of "mixing zones," the Provincial Water Quality Objectives, etc.

Improvement of Legal Remedies. The existing delivery vehicles are being critically reviewed in the context of MISA abatement and enforcement. The strength and weakness of control documents (e.g., orders, certificates of approvals,

etc.) are being examined in light of the continuing need to update effluent limits to reflect state-of-the-art advances in control technology (economically achievable) or more severe receiving-water constraints.

Stiffer Penalties. To further back up the force of regulations and to ensure abatement measures to follow, it is proposed that the penalty provisions contained within Ontario's environmental legislation be stiffened. At the present time, the maximum fine for conviction of the first offence under The Ontario Water Resources Act and The Environmental Protection Act is $5,000 and for each subsequent conviction it is $10,000 for each day the offence continues. Anyone who contravenes the Municipal Act (Sewer-Use Bylaw) can be fined up to $2,000 upon conviction.

Non-Point Sources

The toxic contaminants problem in Ontario will not be solved completely by controlling the point source discharges from municipalities and industries. Point sources are more amenable to the regular monitoring and control approach, but non-point source discharges must also be considered. Urban runoff, such as stormwater and combined sewer overflows, will be addressed by the Urban Drainage Management Program and by extending the existing Ministry Municipal Pollution Control Program to cover that area. Runoff from industrial sites will be addressed on a site-specific basis as part of the MISA Program. Agricultural runoff is being addressed mostly through best management practices, such as controlled application of pesticides, soil conservation practices and good manure/fertilizer handling and animal husbandry. These programs are now being implemented.

Integrated Ecosystem Approach

The toxic contaminants problem is not unique to water. Toxic contaminants also pose a threat to air quality and form toxic rain. Leachates from landfill sites can potentially contaminate ground-water and surface-water supplies. All of these circumstances are interrelated aspects of an overall problem of environmental degradation, since toxic contaminants can be transferred from one medium to another.

To provide an effective solution to the management of toxic contaminants, Ontario has introduced an integrated and comprehensive strategy for attacking all sources of these contaminants in the ecosystem as a whole. In this respect, all the air, water and land regulatory components will be made compatible and complementary.